Symposia Abstracts

Thursday, October 12, 2017

Symposium 1

EXPECT THE WORST! ANXIETY, EXPECTATIONS, AND SENSORY THREAT PROCESSING

Symposium 2

RECENT DEVELOPMENTS IN FRONTAL EEG ASYMMETRY RESEARCH

Symposium 3

EXTRACTING REGULARITIES FROM SOUND SEQUENCES

Symposium 4

THE LONG-TERM OUTCOMES OF SPORT-RELATED BRAIN INJURIES: INSIGHTS FROM PSYCHOPHYSIOLOGICAL RESEARCH

Symposium 5

MAPPING A SPECTRUM OF AFFECTIVE REACTIVITY IN THE INTERNALIZING DISORDERS

Symposium 6

ELECTRO- AND MAGNETOCORTICAL MEASURES OF DEPRESSION: POTENTIAL RISK AND TREATMENT RESPONSE PREDICTORS

Symposium 7

COMPUTATIONAL MODELING OF MISMATCH NEGATIVITY (MMN)

Symposium 8

FROM BENCH TO BEDSIDE: ELECTROPHYSIOLOGICAL ADVANCEMENTS IN PSYCHIATRIC CARE

Symposium 9

BETA BAND MOTOR OSCILLATIONS AS A MARKER OF DECISION MAKING

Symposium 10

LIAR LIAR, PANTS ON FIRE? PSYCHOPHYSIOLOGICAL DECEPTION DETECTION UNRAVELED

Symposium 11

TOWARD A PSYCHOPHYSIOLOGICAL UNDERSTANDING OF ANGER- AND AGGRESSION-RELATED PROCESSES

Symposium 12

USING OSCILLATORY BRAIN ACTIVITY AS A WINDOW INTO THE NEUROPHYSIOLOGY OF SELECTIVE ATTENTION

Symposium 13

COGNITIVE BIASES IN HEALTH AND PSYCHIATRIC CONDITIONS—LINKING OPTIMISM AND NEGATIVE BIASES

Symposium 14

SOCIAL CUES IN HUMAN VOICES

Symposium 15

VASCULAR FACTORS IN HEALTH AND DISEASE: AN INTRODUCTION TO INNOVATIVE METHODS FOR PSYCHOPHYSIOLOGICAL RESEARCH

Friday, October 13, 2017

Symposium 16

CONSTRUCTING RISKIER TESTS OF THEORY, LINKING PSYCHOLOGICAL AND BIOLOGICAL PHENOMENA, AND INTRODUCING A NEW MECHANISTIC PHILOSOPHY OF SCIENCE

Symposium 17

GETTING SOCIAL – THE IMPACT OF SOCIAL PRESENCE ON OUR PERCEPTION, THOUGHTS AND BEHAVIOR
Symposium 18  
INHIBITORY CONTROL AS A BIOBEHAVIORAL CONSTRUCT: NEURAL MECHANISMS, NEURODEVELOPMENTAL PROCESSES, AND RELEVANCE TO EXTERNALIZING PSYCHOPATHOLOGY  S20

Symposium 19  
TIME-FREQUENCY, SOURCE, AND CONNECTIVITY APPROACHES TO STUDY DYNAMIC RELATIONS BETWEEN MONITORING, CONTROL AND ANXIETY ACROSS DEVELOPMENT  S21

Presidential Symposium  
COMPUTATIONAL NEUROSCIENCE AND ITS INTERSECTION WITH THE NIMH RESEARCH DOMAIN CRITERIA (RDOC) INITIATIVE  S22

Invited Symposium  
RECENT PROGRESS IN COMPARATIVE SOCIAL PSYCHOPHYSIOLOGY  S23

Symposium 20  
NEW COMPUTATIONAL APPROACHES TO P300 RESEARCH IN HUMANS  S24

Symposium 21  
FACE AND PERSON PERCEPTION AS A FUNCTION OF SOCIAL LEARNING  S25

Symposium 22  
EMERGING PERSPECTIVES ON EMOTIONAL STIMULUS PROCESSING  S26

Symposium 23  
CURRENT ATTEMPTS AT UNDERSTANDING P3B'S FUNCTION  S28

Symposium 24  
MORE THAN JUST NOISE: INDIVIDUAL DIFFERENCES IN FEAR ACQUISITION AND EXTINCTION  S29

Symposium 25  
FACE PERCEPTION: INDIVIDUAL DIFFERENCES AND SPECIAL POPULATIONS  S30

Symposium 26  
IMPAIRED PROCESSING OF REWARDS AND PUNISHMENTS IN AFFECTIVE DISORDERS DURING ANTICIPATION AND CONSUMMATION  S31

Saturday, October 14, 2017

Symposium 27  
BARORECEPTOR INFLUENCES ON AFFECTIVE AND NOCICEPTIVE PROCESSING  S32

Panel Discussion 28  
BRAIN, MIND, AND CONSCIOUSNESS: PROGRESS AND PITFALLS  S33

Symposium 29  
USING PHYSIOLOGICAL METHODS TO ASSESS THE EFFECTS OF SOCIALIZATION AGENTS AND PROCESSES ON CHILD DEVELOPMENT  S34

Symposium 30  
HIDDEN SECRETS WITHIN THE AVERAGED ERP WAVEFORM: MEANINGFUL TRIAL-BY-BEHAVIOR VARIANCE  S35

Paper Session I  S37

Paper Session II  S38

Poster Session Abstracts  S40

Index to Abstract Authors  S176

Index to Abstract Descriptors  S184
Fifty-Seventh Annual Meeting of the Society for Psychophysiological Research
The Hofburg, Vienna, Austria
October 11–15, 2017
Website: www.sprweb.org

The 2017 Annual Meeting Program includes three Pre-Conference Workshops, three Invited Addresses, two Invited Symposia, and the SPR Presidential Address. Specific research topics will be covered in the Symposia. The majority of the research reports will be discussed at four Poster Sessions.

This Supplement contains the abstracts from each presentation in the Symposia and Poster Sessions. The abstracts are listed in the order in which they will occur at the Annual Meeting.

All authors are listed in the Index to Abstract Authors. In addition, abstract topics are listed in the Index to Abstract Descriptors.

We would like to thank all contributors for sharing their research and making this meeting a rich and stimulating event!

Markus Ullsperger
2017 Program Committee Chair

Program Committee (2016–2017)
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Annett Schirmer, National University Singapore
Julian F. Thayer, The Ohio State University
Jan R. Wessel, University of Iowa
Frank Wilhelm, University of Salzburg

Pre-Conference Workshops

Wednesday, October 11, 2017
9:00 a.m. – 4:30 p.m.

Pre-Conference Workshop #1
Advanced EEG Single-trial Analysis Techniques
Adrian Fischer, Otto-von-Guericke Universität Magdeburg

Wednesday, October 11, 2017
9:00 a.m. – 4:30 p.m.

Pre-Conference Workshop #2
Multilevel Modeling
Elizabeth Page-Gould, University of Toronto

Wednesday, October 11, 2017
9:00 a.m. – 4:30 p.m.

Pre-Conference Workshop #3
Autonomic Nervous System Laboratory Workshop
Frank Wilhelm, University of Salzburg

Invited Addresses

Thursday, October 12, 2017
1:30 p.m. – 2:30 p.m.

Invited Address
Brain Structure and Dynamics of Language Processing
Angela D. Friederici
Director, Department of Neuropsychology, Max Planck Institute for Human Cognitive and Brain Sciences; Vice President, Max Planck Society, Germany

Friday, October 13, 2017
1:30 p.m. – 2:30 p.m.

Invited Address
The Anterior Cingulate Cortex in Learning and Changing Behavior
Matthew Rushworth
Professor of Cognitive Neuroscience, Department of Experimental Psychology and Centre for Functional Magnetic Resonance Imaging of the Brain, University of Oxford, UK

Saturday, October 14, 2017
2:30 p.m. – 3:30 p.m.

Invited Address
The Future of Cognitive Neuroscience
Russell A. Poldrack
Albert Ray Lang Professor, Department of Psychology and Director, Stanford Center for Reproducible Neuroscience, Stanford University, Stanford, CA USA

10:30 a.m. – 11:00 a.m.

Early Career Award
Brain-Heart Interactions in Perseverative Cognition
Cristina Ottaviani, Department of Psychology, Sapienza University of Rome, Rome, Italy

11:00 a.m. – 12:00 noon

Presidential Address: Overcoming Impaired Cognition in Schizophrenia: New Opportunities for Intervention
Cindy M. Yee-Bradbury
Professor and Director of Clinical Psychology, Departments of Psychology and Psychiatry & Biobehavioral Sciences, University of California, Los Angeles, CA USA
Anxiety is characterized by the anticipation of aversive events and the prioritized processing of threat. The current symposium utilizes a range of neuro- and psychophysiological measures to explore how expectations influence threat processing. As the talks will show, expectations arise from prior learning experiences, suggestions, and personality traits, and change the perception of threat. In the first talk, Gilles Pourtois shows how early visual cortex encodes loss-related stimuli, and how associated enhanced activity in early visual cortex generalizes in a feature-specific manner to new stimuli. Then, Jayne Morriss demonstrates that intolerance of uncertainty leads to over-generalization in aversive learning, and thus might be a potential risk factor for anxiety disorders. Looking at context conditioning in virtual reality, Erik Müller then explores how previously learned threat contexts interact with the subsequent processing of threatening faces. Next, Aprajita Mohanty presents data on how the anticipation of aversive events and related pre-stimulus activity shapes subsequent perception and decision-making. Finally, Matthias Wiesser explores how the anticipation of social and bodily threat is associated with differential processing of threat-specific visual stimuli. Altogether, the talks in this symposium show that threat processing is influenced by expectations in a top-down manner. These data underscore the value of taking expectations as a key factor into account for conceptualizing, studying, and classifying threat processing in normal and anxious populations.

**ABSTRACT CODING OF AVOIDANCE-RELATED MOTIVATION IN EARLY VISUAL CORTEX**

Gilles Pourtois  
University of Ghent

Negative stimuli usually benefit from enhanced sensory processing, with neurophysiological effects visible during the first wave of activation following stimulus onset in V1 (i.e., at the level of the C1 retinotopic component). Yet, what this early boost in visual activation as a function of negative emotion actually reflects, remains somewhat unclear. To address this question, we presented texture-based stimuli in the peripheral visual field that varied in terms of motivational salience, being either loss-related or reward-related, as achieved through a standard associative learning procedure. Crucially, we also manipulated their low-level features and in turn perceptual similarity, to assess whether an early increase in visual cortex activation to negative (as opposed to positive) stimuli could generalize to new stimuli sharing the same features as the motivationally significant ones. Our results showed that the early boost in V1 following stimulus onset (at the C1 level) was confined to loss-related stimuli (with reward-related stimuli influencing later stages of stimulus processing), and that it generalized to new stimuli sharing common features with the loss-related ones. Combined together, these results suggest that early prioritization of emotional stimuli in V1 is both valence-dependent and feature-specific.

**IS IT SAFE? I DOUBT IT: INTOLERANCE OF UNCERTAINTY IS SPECIFICALLY ASSOCIATED WITH THREAT GENERALIZATION ACROSS PSYCHOPHYSIOLOGICAL AND NEURAL INDICES OF AVERSIVE LEARNING**

Jayne Morriss, Miriam Pollard, Anastasia Christakou & Carien van Reekum  
University of Reading

Attending to stimuli that share perceptual similarity to learned threats is an adaptive strategy. However, prolonged threat generalization to cues signaling safety is considered a core feature of pathological anxiety. One potential factor that may sustain over-generalization is sensitivity to future threat uncertainty. For example, during contexts where threat is uncertain, individuals who score high on self-reported Intolerance of Uncertainty (IU) may have difficulty discriminating between threat and safety cues. We sought to examine this question using a series of aversive learning experiments whilst recording electrodermal and neural activity. In the first two experiments using simple fear extinction, we found that higher IU was associated with generalized responses in skin conductance and the amygdala to threat and safety cues, as well as delayed recruitment of the ventral medial prefrontal cortex to threat cues. In the third experiment using a variant of fear acquisition and extinction where threat and safety cues varied in perceptual similarity, we found that higher IU was associated with generalized responding to threat and safety cues during acquisition, and delayed discrimination between threat and safety cues during extinction. The results from these experiments were specific to IU, over other measures of anxious disposition. These findings highlight: (1) a critical role of uncertainty-based mechanisms in threat generalization, and (2) IU as a potential risk factor and treatment target for anxiety disorders.

**THREAT-CONDITIONED CONTEXTS MODULATE THE LATE POSITIVE POTENTIAL TO NEUTRAL VS. ANGRY AVATARS - A MOBILE-EEG/VIRTUAL REALITY STUDY**

Erik Müller, Christopher Stolz & Dominik Endres  
University of Marburg

By analyzing late positive potential (LPP) amplitudes and other event-related potential (ERP) components, prior studies have shown potentiated neural processing of static two-dimensional threat stimuli such as pictures of angry faces. Moreover, threat-related two-dimensional contexts have been shown to modulate the neural processing of neutral and threatening faces. The aim of the present study was to investigate whether these findings generalize to three-dimensional virtual reality (VR) faces (i.e., avatars) and contexts, respectively. N = 26 participants underwent a differential context-conditioning procedure in VR. They subsequently viewed neutral and angry avatars in safe vs. threat-conditioned contexts while EEG was recorded with a low-cost mobile EEG device. In response to avatar onset, solid early, midlatency and late ERP components emerged, indicating successful EEG acquisition with low-cost mobile EEG in VR. Importantly, the early LPP was modulated by a significant interaction of avatar-type and context indicating that angry avatars and/or threat-conditioned contexts enhanced the LPP relative to neutral avatars presented in a safe context. In addition to demonstrating the feasibility of ERP assessment in VR, this study demonstrates that biased processing of threatening stimuli and contexts as indicated by LPP amplitudes generalizes to three-dimensional scenarios. VR in conjunction with mobile EEG thus is a valuable tool to increase the ecological validity of experimental EEG studies on anxiety without giving up stimulus control.

**ROLE OF ANTICIPATORY FACTORS IN THREAT PERCEPTION AND ANXIETY**

Aprajita Mohanty, Tamara Sussmann, Jingwen Jin & Gabriela Imbriano  
Stony Brook University

The importance of top-down factors such as anticipation and expectation is well established in both visual perception and anxiety. However, research on the neurobiology of emotional perception and anxiety is almost entirely based on stimulus-elicited behavior or neural activity. In the real world, even before a stimulus arrives, our prior experiences and learning create expectations regarding what stimuli (threatening and non-threatening) to look for and where to look for them. The changes that happen in the brain prior to a stimulus and how these changes guide perception are well known in basic cognitive neuroscience research; the current talk applies this knowledge to better understand the neurobiology of emotional perception and anxiety. We will show that threat cues and associated prestimulus neural changes in relevant sensory areas facilitate subsequent threat-related perception. Next, we will demonstrate how threat-related predictive “templates” in sensory areas facilitate subsequent perceptual decision making. Finally, we will show that anxiety further enhances threat cue-related facilitation of perception and discuss related psychological mechanisms. Given that threat-related perceptual decision-making often occurs in familiar contexts with prior knowledge, and that anxiety is characterized by inaccurate expectations regarding future threat, research presented in this talk will generate more ecologically pertinent models and hypotheses regarding normal threat perception and its impairment in anxiety.
ANTICIPATION OF BODILY AND SOCIAL THREAT AND VISUAL THREAT PROCESSING: STIMULUS AND THREAT SPECIFICITY OR GENERALIZED EFFECTS?
Matthias Wisser1, Philipp Reicherts2, Georgiana Juravle3 & Andreas von Leupoldt4
1Erasmus University Rotterdam, 2University of Würzburg, 3Lyon Neuroscience Research Center, 4University of Leuven

The anticipation of threat is a key feature of anxiety and its related disorders. It is assumed that anticipation leads to hypervigilance for threatening information. However, it is still not fully explored whether this hypervigilance is threat-specific or general in nature. To this end, we investigated visual threat processing in high socially anxious, high anxiety sensitive, and non-anxious participants, who were told that they would receive aversive electric stimulation and also would have to perform a public speaking task later in the experiment. During these phases of anxious anticipation, participants watched pictures of social and bodily threat, and neutral scenes. Pictures were presented flickering at 15 Hz to elicit steady-state visual evoked potentials. All participants exhibited enhanced visuo-cortical processing during phases of anxious anticipation compared to baseline. Also, across phases and participants enhanced visuo-cortical processing of social threat pictures was observed. The findings are corroborated by higher ratings of arousal and unpleasantness for all pictures during the anticipation phases with small hints of selectivity such that social threat pictures were rated as most arousing during anticipation of social threat. No effects of trait social anxiety or anxiety sensitivity were observed. In line with previous findings the present study points at the notion that anticipation of threat may rather increase attention generally to incoming stimuli than specifically to threat-matching stimuli.

8:30 a.m.–10:00 a.m.
Symposium 2

RECENT DEVELOPMENTS IN FRONTAL EEG ASYMMETRY RESEARCH
Chairs: Johannes Hewig1 & Patrick Mussel2
1University of Würzburg, 2Freie Universität Berlin

Discussant: John Allen, University of Arizona - Tucson
This symposium will present recent developments in frontal EEG asymmetry research. Over the past four decades empirical evidence has supported a relationship between frontal asymmetry and motivational tendency and a role for frontal EEG asymmetry as a risk factor in depression. The present symposium presents recent developments in experimental design, source modelling, applications in personality research, in motivational manipulations, and in clinical psychology. The first talk (Rodrigues) presents a new experimental virtual reality setup to examine frontal asymmetry in context where participants can indeed show approach and avoidance behavior in a virtual l-maze environment. A second talk (Smith) presents a brain source modelling with LORETTA in a large sample of depressives and controls to elucidate neurophysiological underpinnings of frontal EEG asymmetry and possible neural systems that give rise to both risk for depression and frontal EEG asymmetry. A third talk (Mussel) presents evidence that frontal asymmetry relates to approach or avoidance motivation related personality traits only if these traits have been activated as corresponding states. A fourth talk (Gable) revisits the role of behavioral inhibition and frontal asymmetry, expanding the conceptualization behavioral activation and inhibition as influencing asymmetry. A fifth talk (Meier) will address whether the presentation of intensive film clips might lead to weak trauma-like experiences and whether the occurrence of such experiences is related to frontal asymmetry. John Allen will serve as discussant.

FRONTAL ASYMMETRY, MOTIVATION, AND BEHAVIOR IN A VIRTUAL REALITY ENVIRONMENT
Johannes Rodrigues1, Mathias Mueller1, Andreas Muehlberger2 & Johannes Hewig1
1University of Wuerzburg, 2University of Regensburg

Despite over 30 years of frontal EEG asymmetry research and theoretical and empirical links to approach and avoidance motivation, few such studies have assessed approach and avoidance behavior and frontal asymmetry simultaneously. In the present study, frontal alpha activity (8–13 Hz) was investigated with a newly developed paradigm, where participants moved freely in a virtual T-maze via joystick while undergoing electroencephalographic recording. The virtual T-maze had events with positive, negative and neutral outcomes. Events were either “single events”, showing one stimulus, or “conflict events”, with two stimuli. Each event was signalized via color cue. Frontal asymmetry at F4/3 was assessed during cueing period. The free movement of the participants allowed us to classify four patterns of behavior, with relative left frontal brain activation during approach behavior and more relative right brain activation for withdrawal behavior of any kind. Additionally, more bilateral frontal brain activation characterized participants engaged in behavior compared to doing nothing. An influence of relevant traits on the behavior was also present. The study provides evidence for the theory of frontal asymmetry proposed by Davidson and modified by Hewig and colleagues, where frontal asymmetry may index behavioral approach or avoidance motivation and bilateral frontal activation for active behavior as a representation of a bilateral behavioral activation system. Additionally, observable behavior is not just determined by frontal asymmetry, but also by relevant traits.

INTRACRANIAL SOURCE ACTIVITY (ELORETA) RELATED TO SCALP-LEVEL ASYMMETRY SCORES AND DEPRESSION STATUS
Ezra Smith1, James Cavanagh2 & John Allen1
1University of Arizona, 2University of New Mexico

Frontal EEG alpha asymmetry provides a promising index of depression risk, yet very little is known about the neural sources of alpha asymmetry. To identify these sources, this study examined alpha asymmetry using a distributed inverse solution: exact low resolution brain electromagnetic tomography (eLORETA). Findings implicated a generator in lateral mid-frontal regions that contributed to both surface asymmetry and depression risk. Participants with any lifetime history of depressive episodes were characterized by less left-than-right activity in the precentral gyrus and midfrontal gyri. Results are suggestive of convergence between motivational and capability models of asymmetry and replicate results from experimental studies in a large resting-state dataset. The capability model of frontal alpha asymmetry is contextualized in terms of motor preparedness following emotional mobilization.

FRONTAL EEG ASYMMETRY CORRELATES WITH EXTRAVERSION AND NEUROTICISM WHEN ACTIVATING CORRESPONDING STATES
Patrick Mussel1, Johannes Rodrigues2, John Allen1 & Johannes Hewig2
1Freie Universität Berlin, 2University of Wuerzburg, 3University of Arizona

Although the majority of studies have investigated frontal EEG asymmetry under resting state conditions, there is growing evidence that neural correlates of stable individual differences emerge more clearly after the activation of corresponding states. We investigated the relationship between individual differences in extraversion and neuroticism and frontal asymmetry during states corresponding to these personality traits. On each trial, participants made a decision to encounter one of two situations, each of which was described by a half-sentence, and then read a corresponding situation description. The content of the situations was either relevant to the trait of extraversion (concerning gregariousness) or to the trait of neuroticism (concerning self-consciousness). We measured frontal asymmetry by computing the inverse of the power in the alpha band (8–13 Hz) over right and left frontal electrode positions while participants read the situation description. We found a significant correlation between neuroticism and stronger right, compared to left frontal activity while participants read situations concerning self-consciousness, but not while reading situations concerning gregariousness. Contrary, we found extraversion to be significantly correlated with stronger left, compared to right frontal asymmetry while participants read situations concerning gregariousness, but not while reading situations concerning self-consciousness. Thus, our results are in line with the capability model of frontal asymmetry and, more generally, with the notion of functional neural traits.
BIS SENSITIVITY AND GREATER RIGHT FRONTAL ACTIVITY: REGULATORY AND CONFLICT-DETECTION PROCESSES UNDERLIE RELATIVE RIGHT FRONTAL ACTIVITY

Philip Gable
The University of Alabama

Decades of frontal asymmetry research has been based on Gray’s Reinforcement Sensitivity Theory, which asserts three core personality systems: the behavioral approach system driving approach motivation, the fight-flight-freeze system driving avoidance motivation, and the behavioral inhibition system (BIS) mediating conflict and regulating the motivational systems. Much research has linked approach motivation with greater relative left frontal-cortical activity. Other research has linked avoidance motivation with greater relative right frontal-cortical activity. However, past work linking withdrawal motivation with greater relative right frontal activity has been mixed, suggesting that relative right frontal activity may not be driven by withdrawal motivation. This presentation will review evidence suggesting that activation of regulatory and conflict detection processes related to BIS sensitivity - rather than withdrawal motivation - is driving greater relative right frontal activity. Evidence from lesion studies, neuronal stimulation, and fMRI suggests the hypothesis that BIS may be the core personality system related to greater relative right frontal activity. We will present new EEG research suggesting that greater BIS sensitivity is associated with greater relative right frontal activity. In contrast, reduced BIS sensitivity is associated with reduced right frontal activity (greater relative left frontal activity). This research seeks to disambiguate avoidance motivation and BIS as substrates of relative right frontal activity.

FRONTAL ALPHA ASYMMETRY AS A PREDICTOR OF AFFECTIVE RESPONSES TO ANALOGUE TRAUMATIC MEMORIES

Thomas Meyer¹, Conny Quadflieg² & Tom Smeets³
¹Radboud University Nijmegen, ²University of Hamburg, ³Maastricht University

Studies suggest that frontal alpha asymmetry is closely linked to psychological adjustment to stress and trauma. In particular, more left-sided frontal activation during symptom provocation might predict lower levels of Post-Traumatic Stress Disorder (PTSD). The present study investigated a potential role for frontal asymmetry in the onset of re-experiencing symptoms, a core feature of PTSD. For this purpose, we measured frontal asymmetry in 64 healthy participants at rest and while they were exposed to shocking film fragments. Next, we assessed PTSD-analogue re-experiencing symptoms using a one-week intrusion diary and a film reminder task at one-week follow-up. The analyses focus on the idea that more left-sided frontal activation, particularly when measured during film viewing, predicts fewer and less distressing intrusive memories, both in the diary and the reminder task. Preliminary analyses for resting-state frontal asymmetry indicate no association with the frequency of intrusive memories. In addition, and contrary to our expectation, left-sided frontal activity tended to predict stronger rather than weaker affective reactions to intrusive memories.

8:30 a.m. – 10:00 a.m.
Symposium 3

EXTRACTING REGULARITIES FROM SOUND SEQUENCES

Chairs: István Winkler¹ & Erich Schröger²
¹Research Centre for Natural Sciences, Budapest, ²University of Leipzig
Discussant: Susan Denham, University of Plymouth

In everyday situations, we perceive auditory objects rather than individual sounds. An auditory object can be a sound source with its characteristic acoustic features, or a sound pattern, such as a melody. In either case, parts of the acoustic input are grouped together by the regular aspects of the incoming mixture of sounds. Thus the detection of regularities available in the sound input is essential for auditory perception. However, a large part of the processes involved in auditory grouping are transparent to awareness. Therefore, neuroscientific methods can provide important insights into the details of this perceptual function. The tasks comprising this symposium describe novel psychophysiological data with theoretical implications for the nature and brain bases of auditory regularity extraction. One talk will address evidence showing that extracting auditory regularities is an intrinsic property of the whole auditory hierarchy, from at least the midbrain up to auditory cortex. Other talks will address the role of translational probabilities in representing sound sequences, the suggestion that these temporarily directed (predictive) associations are used to construct complex, temporally extended sound representations, and whether patterns attract attention. The final talk will provide electrophysiological evidence for a hierarchically organized inferential system underlying the detection of auditory rule violations. The general discussion of the papers will focus on the role and limitations of predictive processes in auditory perception.

EMERGENCE OF DEVIANCE DETECTION ALONG THE AUDITORY HIERARCHY

Carles Escera, Teresa Ribas, Natàlia Gorina-Careta & Fran López-Caballero
University of Barcelona

Regularity encoding and deviance detection appears as a key property of the functional organization of the auditory system. This is supported from evidence provided by human studies of the scalp-recorded mismatch negativity (MMN) evoked potential, and by animal recordings of single and multi-unit activity that have revealed stimulus-specific adaptation (SSA). Recent studies have shown that regularity encoding can be revealed at early stages of the auditory hierarchy by recording deviance-related correlates on the middle-latency response (MLR), and even in lower anatomical stations as indicated by the subcortical frequency-following response (FFR) in humans. However, the functional relationship between these two processes, regularity encoding and deviance detection, and their realization along the auditory hierarchy is not fully understood. A recent theoretical account inspired by Bayesian inference distinguishes between predictions and prediction errors in the auditory system, and interprets the MMN as a prediction error signal. Yet the neural correlates of these two constructs have not been convincingly established. Using an approach that has become a standard in studies of regularity encoding and deviance detection, the so-called “controlled” condition, we will present evidence that dissociates both the processes of regularity encoding and deviance detection and suggest that whereas regularities are encoded lower station of the auditory hierarchy, deviance detection (i.e., prediction error) emerges gradually along the auditory neuraxis.

MEMORY BASIS FOR PREDICTIVE SOUND PROCESSING

István Winkler¹, Maria Mittag² & Rika Takegata³
¹Research Centre for Natural Sciences, Budapest, ²University of Washington, ³University of Helsinki

Predictions of upcoming sounds in a sequence can be most easily made if the auditory system encoded the probabilities with which sounds follows one another (transitional probability). Although current theories of pre-attentive auditory deviance detection (indexed by the mismatch negativity [MMN]) are based on predictive processing principles, to now no study has tested whether this function involves representations of stimulus/pattern or transitional probabilities. In separate passive and active detection conditions, we presented healthy adults with three types of rare tone-triplets among frequent standard triplets of High-Low-High (HLH) or LHL, pitch structure: proximity deviant (HHH/LLL), reversal deviant (LHL/HHL), and first-tone deviant (LHL/HHL). If deviance detection was based on stimulus probabilities, then no MMN can be expected to be elicited by any of the deviants. If the underlying representation stores pattern probabilities, the reversal and first-tone deviants should be detected with similar latency because both differ from the standard at the first pattern position. If deviance detection was based on transitional probabilities, then reversal deviants should be the most difficult to detect, because, unlike the other two deviants, they do not contain low-probability pitch transitions. The data clearly showed that both behavio regulation and MMN utilize transitional probabilities.
These results suggest that, in contrast to vision, regular auditory patterns are no
sound sequences. However, over several different behavioural and eye tracking
substantial increase in sustained-amplitude for regular relative to matched random
that attention arises from brain mechanisms which infer the predictability of sen-
tion based on local probability if higher-order predictability is present.
changes.

DO ACOUSTIC PATTERNS CAPTURE ATTENTION?
Rosi Southwell, Sijia Zhao & Maria Chait
University College London

Do acoustic regularities (repeating patterns of tone-pips) capture attention? Work
in Vision has revealed attentional capture by statistically-structured stimulus streams, consistent with predictive-coding accounts of perception, which suggest that attention arises from brain mechanisms which infer the predictability of sensory signals. Possibly in line with those findings, our EEG data demonstrate a substantial increase in sustained-amplitude for regular relative to matched random sound sequences. However, over several different behavioural and eye tracking tasks, we find no evidence for explicit attentional capture by acoustic regularity. These results suggest that, in contrast to vision, regular auditory patterns are no more distracting, or salient, than random patterns.

HIERARCHICAL INFERENCE EVIDENT IN AUDITORY EVOKED POTENTIALS
Juanita Todd1, Alex Provost1, Jade Frost1, Katlin Fitzgerald1, Daniel Mullens1 & István Winkler2
1University of Newcastle, 2Research Centre for Natural Sciences, Budapest

Why does early auditory relevance filtering exhibit primacy effects – that is, the
tendency to place higher weight on information learned early, enabling it to have
an undue influence over subsequent responses? This question emerges out of studies that indicate the brain stores information about regularities on multiple timescales, and uses this information to modify cortical responsiveness to sound. There is a large literature on how local probability information modulates components of the auditory evoked potential (AEP). Global, contextual differences can distort the modulation expected based on local probability. However, the reasons for these contextual influences and their implementation are poorly understood. We will demonstrate how primacy effects create a kind of hysteresis with acoustic regularity. We propose that the contiguity between successive elements of the pattern entails temporarily directed associations, which are used to predict the forthcoming acoustic input on an element-by-element basis, enable (hierarchical) chunking. Several factors influence the establishment of the respective regularity representations in tonal patterns (e.g., number of repetitions of the regularity, the type of the transition and the duration of the elements). The finding that repetition positivity emerges (as an additional index of regularity representation of tonal patterns) reveals somewhat different sensitivity to modulating factors suggests the presence of different learning mechanisms.

INCORPORATING EEG AND VIRTUAL REALITY IN CONCUSSION ASSESSMENT AND MANAGEMENT
Semyon Slobounov
The Pennsylvania State University

There is a growing concern around the world about the safety of athletes participat-
ing in contact sports, such as European football (soccer), American football, rugby, and others. Predisposition factors such as genetics, social interactions, and differential dose-response to single and/or multiple high intensity impacts are poorly understood. Unfortunately, there are neither neuroscience-based criteria nor clearly identified biomarkers for this puzzling neurological disorder in athletic populations. Multiple research labs around the world are trying to explore EEG metrics in conjunction with clinical evaluations to more accurately prognosticate the evolution of concussive injuries. These efforts will be presented with respect to clinical implications of collision/contact athletes with these injuries. Specifically, in this presentation EEG alterations in time and frequency domains as well as EEG-based brain functional network deficits demonstrated in multiple labs will be discussed in this panel. Advanced technologies, such as Virtual Reality (VR), aimed at addressing limitations of existing concussion assessment tools will also be discussed to complement EEG metrics in a clinical setting. Empirical evidence will be presented that EEG metrics, in conjunction with balance, executive functions, and neurocognitive indices, can be used for classification of concussed athletes far beyond the acute phase of clinical symptoms resolution.
CONCUSSION AND ERP INDICES OF INTER-HEMISPHERIC TRANSFER ACROSS THE CORPUS CALLOSUM: A POTENTIAL MARKER FOR CONCUSSION DIAGNOSIS AND RECOVERY

Michael Larson1, Tyshae Davis1, Erin Moderzitsky1, Issac Hunt1, Nathan Alder1, Peter Clayson2, Thomas Farrer2 & Erin Bigler2
1Brigham Young University, 2University of California - Los Angeles, 3Duke University

Physiological measures of diagnosis and recovery from concussion remain elusive. Axonal damage of the corpus callosum (CC) is susceptible to shear following severe TBI and may be vulnerable following concussion. We assessed CC white matter integrity using event-related potential (ERP) indices of inter-hemispheric transfer time (IHTT) across the CC in three separate samples of concussed participants: individuals in the chronic stage post-concussion (at least 3-months post) and adults and children, assessed within 3 weeks of concussion and again after 9 months. Participants were compared to matched controls. Neuropsychological testing and a diagnostic interview were followed by an electroencephalogram (EEG) wherein participants manually responded to visual information rapidly presented to their left or right visual fields. We compared P1 and N1 latencies at occipital electrodes across hemispheres and between groups. Across samples, participants showed significantly delayed P1 and N1 latencies in the ipsilateral hemisphere, confirming the presence of significant IHTT. Those with chronic concussion did not show differences from controls in interhemispheric transfer time. IHTT varied as a function of the individual in acute and follow-up visits in the concussed participants, with less variability in the control participants in the longitudinal samples. Results suggest promise in using IHTT-related ERPs in the identification of concussion, although individual differences in injury drive the results. Normalization of IHTT occurs rapidly following concussion.

PERSISTENT EFFECTS OF SPORT CONCUSSION ON MOTOR CONTROL

Steven Broglio
University of Michigan – Ann Arbor

Concussion has historically been viewed as a transient injury with notable deficits to cognitive function and motor control (e.g., balance), as well as increased symptom reports in the immediate post-injury state. Restoration to pre-injury levels of clinical functioning typically occurs within 2 weeks. Recent work, however, has called into question the assertion that full recovery after sport concussion without persistent adverse effects is the norm. Emerging research is now suggesting that the injury may have lasting effects on cognitive and motor function. Individual assessments of retired athletes that participated in the highest level of sport have shown increased phosphorylated-tau that have retroactively been linked to cognitive and motor impairments. This symposium will discuss a series of investigations among young adults with a concussion history that have documented subclinical alterations in balance, gait, and upper extremity function, while normal functioning is maintained. These findings, coupled with research on other areas of cognitive functioning, leads to the hypothesis that concussions may alter the natural trajectory of cognitive health across the lifespan.

FACTORS MODERATING THE LONG-TERM OUTCOMES OF CONCUSSION: IMPLICATIONS FOR CLINICAL MANAGEMENT

Robert Moore & Dave Ellemberg
University of South Carolina

Contrary to the traditional belief that concussive injuries are offset by physiological and adaptive factors, accumulative research indicates that a concussion may lead to persistent symptoms, alter physiological and psychological function, and predispose athletes to subsequent and potentially catastrophic injury. As 20–30% of athletes will exhibit persisting deficits (Cantu, 2012), it is essential to identify which factors predispose athletes towards an abnormal recovery and prolonged dysfunction. Accordingly, the aim of this presentation will be to highlight findings from recent psychophysiological studies that suggest key demographic factors and injury variables influence injury concussion outcomes. Psychophysiological research examining the role of multiple concussions, subconcussive impacts, age at injury, apriori neurodevelopmental disorders and apriori psychiatric conditions will be presented. This presentation will highlight how each of the factors can influence athletes’ long-term health on the psychophysiological and behavioral levels. Together, the synthesized findings presented will help raise awareness about sport-related brain injuries and inform researchers and clinicians about key variables moderating injury outcomes.

10:30 a.m. – 12:00 noon
Symposium 5

MAPPING A SPECTRUM OF AFFECTIVE REACTIVITY IN THE INTERNALIZING DISORDERS

Chair: Annmarie MacNamara
Texas A&M University

Emotional dysfunction is central to anxiety, depression and other internalizing disorders. These disorders share overlapping symptoms, are highly comorbid and are principally diagnosed by clinical interview. Variation in underlying pathophysiology could be used to parse shared clinical presentations, improving treatment efficiency and target precision. This symposium examines growing evidence for a psychophysiological spectrum of affective response across the internalizing disorders, ranging from blunted to exaggerated responding that does not map clearly on to diagnostic boundaries. First, Lisa McCauley will present evidence of heterogeneity in defensive responding across the anxiety disorder spectrum, as measured using startle, heart rate and steady-state visual evoked potentials. Next, Annmarie MacNamara will present evidence of distinct and opposing influences of anxiety and depression on ERP and fMRI measures of aversive responding across multiple patient cohorts. Stewart Shankman will reveal how startle blink to unpredictable threat predicts functioning 1 year later in a group of community adults with internalizing symptoms. Uma Vaidyanathan will present evidence from startle and statistical modeling of self-report and diagnostic data in support of the notion that a small number of dimensions may capture variation both within and across mental disorders. Chris Patrick will discuss the preceding talks in the context of progress toward neuroclinical assessments including inherent challenges and the role psychophysiologists can play in such an undertaking.

DEFENSIVE HYPER- VERSUS HYPO-REACTIVITY: THE INTERSECTION OF FEAR AND DISTRESS IN THE ANXIETY DISORDER SPECTRUM

Lisa McCauley1, Peter Lang2, Margaret Bradley2, Bruce Cuthbert3 & Andreas Keil4
1Medical University of South Carolina, 2University of Florida - Gainesville, 3National Institute of Mental Health

Guided by the diagnostic nosology, individuals with anxiety disorders are expected to demonstrate a propensity for defensive physiological hyperarousal. Due largely to the advent of the Research Domain Criteria (RDoC) initiative there is a rapidly growing appreciation of the tremendous heterogeneity in diagnostic phenotypes. In this talk we will present a series of studies examining heterogeneity in defensive responding across the anxiety disorder spectrum. Focusing initially on a laboratory-based narrative imagery task in more than 500 patients inclusive of each respective anxiety disorder, we demonstrate that exaggerated defensive reactivity is evident among those with focal fear and impairment—most pronounced in startle reflex and heart rate responding. In contrast, those with long-enduring, pervasive apprehension, dysphoria, and impairment are characterized by an opposing diminution of defense. Notably, subjective report does not predict objective defensive reactivity and these patterns of hyper- and hypo-responding in fear and broad distress emerge both between as well as within disorders. We will also present findings suggesting that response heterogeneity as a function of fear and distress is not limited to mental imagery and, in fact, extends to passive viewing of affective pictures. Finally, we will present findings from steady-state visual evoked potential methodology, which suggest that covert attentional facilitation and disattention to aversive cues may be related to defensive over- and under-engagement of reflex physiology in the anxiety spectrum.
NEGATIVE EMOTION GENERATION IN ANXIETY AND DEPRESSION: DISTINCT AND OPPOSING EFFECTS

Annmarie MacNamara1, Autumn Kujawa2, Roman Kotov3, Greg Hajcak4 & K Luan Phan4
1Texas A&M University, 2Pennsylvania State University - Hershey, 3Stony Brook University, 4University of Illinois - Chicago

Significant comorbidity, overlapping symptoms and shared risk factors challenge the notion that the anxiety and depression are distinct disorders. Clinically, both anxiety and depression tend to be characterized by heightened reactivity to unpleasant emotional information. However, the late positive potential (LPP) and IMRI BOLD to unpleasant images may provide a more nuanced account of affective reactivity in anxiety and depression. First, across patients (n=97) with generalized anxiety disorder (GAD) or major depressive disorder (MDD) and healthy controls (HC; n=25), greater depression (diagnosis or symptoms) is associated with smaller LPPs to unpleasant pictures. GAD (diagnosis or symptoms) is associated with larger LPPs to unpleasant pictures, but only when controlling for comorbid depression. Second, youth with anxiety disorders (n=53) exhibit heightened LPPs to angry faces compared to HC (n=57); increased depression is however associated with smaller LPPs. Third, across patients with GAD, MDD or social anxiety disorder (n=142), increased anxiety is associated with greater insula, midcingulate and dorsolateral prefrontal (dPPC) activation to angry faces; depression, on the other hand, is characterized by reduced dPPC activation. In sum, a) anxiety and depression symptom load may track neural dysfunction that extends beyond diagnostic boundaries to characterize abnormal negative emotion responding in the internalizing disorders and b) anxiety and depression may exert distinct and opposing influences on unpleasant stimulus processing, evident in neural measures.

FUNCTION FollowS FORM: STARTLE TO UNPREDICTABLE THREAT PREDICTS FUNCTIONAL IMPAIRMENT AT ONE-YEAR FOLLOW-UP

Stewart Shankman, Elizabeth Stevens, Lynne Lieberman & Carter Funkhouser
University of Illinois - Chicago

Using multiple methods (e.g., startle, ERP, fMRI), numerous studies have shown that heightened defensive responding to unpredictable threat not only characterizes those with anxiety but may connote vulnerability for anxiety as well. Although symptoms of anxiety are important outcomes, impairment in day to day functioning (such as in social and occupational functioning) is perhaps a more important (and often ignored) outcome. Indeed, functioning has been shown to be a stronger predictor of psychiatric relapse than symptom severity. Furthermore, if psychophysiological measures are to have clinical utility, they need to demonstrate incremental validity over and above self-reported symptoms at predicting meaningful outcomes such as functioning. In the present study, we therefore examined the relationship between response to unpredictable threat during the No-Predictable-Unpredictable threat task (Schmitz & Grillon, 2012) and functioning at 1-year follow-up using a broad measure of functioning (World Health Organization Disability Assessment Schedule [WHODAS]) in community participants oversampled to have high levels of internalizing symptoms (N=104). Preliminary results suggest that independent of baseline anxiety symptoms and functioning, baseline startle to unpredictable threat predicted WHODAS functioning at follow-up (β = .20, p < .05) and this effect was not observed for predictable threat responding. These results suggest that unpredictable threat responding is separable from symptoms and may have incremental validity in predicting functioning over time.

PARSING THE DIMENSIONS UNDERLYING INTERNALIZING DISORDERS

Uma Vaidyanathan1, Bruce Cuthbert1, James Yancey2 & Christopher Patrick2
1National Institute of Mental Health, 2Florida State University

Though the DSM advocates a categorical model for psychopathology, it is widely accepted that most mental disorders are likely dimensional in nature, and that a small number of dimensions capture variation both within and across disorders. In this talk, I will discuss evidence for this line of thinking using both data from startle blink response research and from statistical modeling of self-report and diagnoses. In particular, I will focus on dimensions relevant to internalizing disorders including fear/fearlessness and negative affect/distress. I will discuss a number of studies that examine the overlap between these two dimensions and their distinctions. Broadly summarizing, research to date suggests that while a hyper- responding of the startle blink reflex is associated with disorders that are putatively linked with exaggerated fear responses such as phobias, a lack of reactivity is associated with disorders such as depression and somewhat paradoxically, facets of psychopathy. Such results underscore the need for integrating data across multiple methodologies to better characterize and explicate different mental disorders. The utility of frameworks such as the Research Domain Criteria (RDoC) initiative which dovetails with this line of thinking will also be highlighted.

NEUROCLINICAL ASSESSMENT: REFINING PSYCHODIAGNOSIS THROUGH USE OF PHYSIOLOGICAL MEASURES

Christopher Patrick
Florida State University

Calls have increased for a new science of psychopathology that relies on neurobiologically oriented approaches to diagnosing and treating mental health problems. Presentations in this symposium spotlight important ways in which psychophysiologists are contributing to this endeavor. In particular, talks in this session address how use of physiological indicators can help to: (a) address the problem of comorbidity by reducing overlap between fearful/anxious and depressive pathologies; (b) clarify overlap versus distinctiveness in brain mechanisms for disorders of these types and others; and (c) enhance power to predict clinical outcomes of interest across time. As such, current talks demonstrate progress toward a neuroclinical assessment paradigm in which physiological measures are used together with symptom indicators to characterize clinical phenotypes. At the same time, current talks highlight salient challenges to incorporating physiologically measured data into clinical assessments, including: modest relations between variables across domains; uncertain functional meaning of physiological indicators; varied options for combining differing-domain indicators together; and suboptimal coordination of research efforts. This final talk will aim to integrate findings from other talks in this session, discuss prospects for moving toward a feasible and clinically useful framework for neuroclinical assessment, propose solutions for addressing critical challenges that face this endeavor, and describe the leading role psychophysiologists can play in implementing these solutions.

ELECTRO- AND MAGNETOCORTICAL MEASURES OF DEPRESSION: POTENTIAL RISK AND TREATMENT RESPONSE PREDICTORS

Chair: Stephan Moratti
Complutense University of Madrid
Discussant: Gerard Bruder, Columbia University
College of Physicians and Surgeons

The familiar nature and early onset of depression are very well documented so far. This has led to the search of potential endophenotypes of depression in high risk individuals with family history of depression. However, in the present symposia Brady D. Nelson et al. will present data demonstrating that blunted electro-physiological responses to reward predict adolescent onset of depression independently of risk factors such as parental depression status. In contrast, cortically localized ERPs (Jurgen Kayser et al.) and oscillatory stimulus driven neuro-magnetic fields as recorded with MEG (Stephan Moratti et al.) show that depression and family history of depression is associated with reduced right temporo-parietal activity modulation for high arousing emotional stimuli. Further, Mamu Rehbein et al. show that transcranial direct current stimulation (tDCS) of the brain unfolds its antidepressant effect when normalizing right-temporo-parietal hypoactivation during emotional picture viewing. Thus, blunted neurophysiological responses to reward and emotional pictures may represent different risk factors associated with distinct neural network abnormalities in depression. Gerard Bruder will summarize all these results and discuss possible future clinical applications with respect to predicting first-onset depression and treatment response.
ELECTROCORTICAL RESPONSES TO REWARDS PROSPECTIVELY PREDICT THE DEVELOPMENT OF DEPRESSION IN ADOLESCENT GIRLS

Brady Nelson1, Zach Infantolino2, Greg Perlman2, Daniel Klein7, Roman Kotov2 & Greg Hajcak2
1Stony Brook University, 2Stony Brook University - New York

A blunted neural response to rewards has emerged as a potential neurobiological predictor of adolescent depression. The present study examined whether the reward positivity, an event-related potential elicited by feedback indicating monetary gain relative to loss, and time-frequency delta and theta activity prospectively predicted first-onset depressive disorder and greater depressive symptoms 18-months later in adolescent girls. The sample included 444 13-15-year-old girls with no lifetime history of a depressive disorder and a biological parent. At baseline, the adolescents’ reward positivity was measured using a monetary guessing task. Lifetime psychiatric history in the adolescent and parent was evaluated with diagnostic interviews, and the adolescents’ current depressive symptoms were assessed using a self-report questionnaire. Approximately 18-months later, adolescents returned to the lab and were re-administered the interview and questionnaire. A blunted reward positivity at baseline predicted first-onset depressive disorder and greater depressive symptoms 18-months later, independent of other prominent risk factors, including baseline dysphoria symptoms, lifetime history of an anxiety disorder, and parental history of psychopathology. In addition, time-frequency delta activity to gains predicted both measures of depression, independent of the time-domain reward positivity and other risk factors. The present study provides strong converging evidence that a blunted neural response to rewards represents a viable neurobiological predictor of adolescent-onset depression.

MOTIVATED ATTENTION AND FAMILY RISK FOR DEPRESSION: NEURONAL GENERATOR PATTERNS AT SCALP ELICITED BY LATERALIZED AVERSIVE PICTURES REVEAL BLUNTED EMOTIONAL RESPONSIVITY

Jürgen Kayser1, Craig Tenke1, Karen Abraham2, Daniel Aischuler2, Jorge Alvaranga2, Jamie Skipper1, Virginia Warner1, Gerard Bruder2 & Myra Weissman1
1Columbia University - New York, 2York State Psychiatric Institute

Hypovigilation of right parietotemporal cortex and blunted responses to arousing affective stimuli has been linked to major depression (MDD) and clinical high risk for MDD. We systematically explored the impact of family risk and lifetime history of MDD and anxiety disorder (ANX) on 72-channel ERPs recorded from 74 high and 53 low risk (HR/LR) individuals (13–59 years, 58 male) during a hemifield paradigm using highly-controlled negative/neutral picture pairs. Reference-free current source densities of ERPs quantified by temporal principal components analysis revealed three distinct stages of emotional processing comprising the late positive potential (negative-neutral), peaking at 212 (N2 sink), 385 (P3 source), and 630 ms (centroparietal source). Factor-based distributed inverses provided descriptive estimates of emotional brain activations, revealing hierarchical activations along ventral visual processing stream. Compared to LR, HR had reduced early (right occipitotemporal cortex) and late emotional reductions (bilateral posterior cingulate and inferior temporal cortex). Early emotional effects were enhanced for left hemifield (right hemisphere) presentations across groups, suggesting top-down rather than bottom-up effects of risk. MDD or ANX yielded similar effects and did not interact with risk, suggesting largely independent attenuation of attentional resource allocation to enhance perceptual processing of motivationally salient stimuli. These findings further suggest that a deficit in motivated attention preceding conscious awareness may be a marker of risk for MDD.

REDUCED STIMULUS DRIVEN OSCILLATORY RESPONSE MODULATION IN RIGHT TEMPORO-PARIETAL CORTEX IN DEPRESSION

Stephan Moratti, Javier de Echegaray & Juan Ramos Cejudo
Complutense University of Madrid

Steady state visual evoked potentials (ssVEPs in the EEG) or fields (ssVEFs in the MEG) are oscillatory brain responses evoked by a driving flicker stimulus at a certain stimulation frequency chosen by the experimenter. These ssVEPs/ssVEFs are highly sensitive to attention and motivated attention when using emotional stimuli. Further, steady state responses are characterized by high signal to noise ratios allowing good cortical source localization and short experiments rendering this technique very suitable for clinical research. High arousing emotional stimuli normally elicit increased ssVEP or ssVEF responses in healthy participants. Here, we show that cortically localized ssVEF response modulations by high arousing emotional stimuli is attenuated in right temporoparietal cortex in depressed patients. Further, this reduction of ssVEF amplitude modulation by emotional arousal seems to be associated with a high-risk factor such as positive family history of depression. Right temporoparietal dysfunction may be a potential endophenotype of depression.

EMOTIONAL PICTURE PROCESSING IN MAJOR DEPRESSION BEFORE AND AFTER SUCCESSFUL TREATMENT: MAGNETOELECTROGRAPHIC CORRELATES

Maimu Rehbein, Constantin Winker, Swantje Notzon, Volker Arolt & Carsten Wolters
University of Muenster

Major depressive disorder (MDD) patients often show cognitive biases towards emotional material as well as abnormalities in distributed neural network activation that may be ameliorated with successful treatment. Magnetoencephalography (MEG) - with its high temporal and good spatial resolution - is well suited to investigate the temporal-spatial dynamics of emotional processing in MDD. Two recent MEG studies presenting positive and negative emotional scenes revealed an overall reduced activation of parietal and temporal cortices in MDD patients vs. controls at baseline, which normalized under effective antidepressant treatment with mirtazapine or electroconvulsive therapy. Here, we further investigated the neural correlates of emotional picture processing in MDD and its course across treatment. In addition, we evaluated the contribution of transcranial Direct Current Stimulation (tDCS) of the ventromedial prefrontal cortex to a normalization of neural network activation. Two groups of MDD patients undergoing current inpatient treatment and additionally two weeks of daily verum or sham tDCS stimulation viewed emotional scenes before and after treatment in the MEG. Results replicated the overall temporoparietal hypovigilation that normalized with effective treatment and suggested a significant contribution of tDCS. They also showed valence-specific changes in activation of prefrontal cortex regions. The findings point towards dysfunctional affective visual processing in MDD and reveal specific activation patterns that may potentially help to predict treatment success.

SYMPOSIUM DISCUSSION

Gerard Bruder
Columbia University College of Physicians & Surgeons

It is remarkable that all four presentations reported reduced electro- and magneto-physiological responses to emotional or rewarding stimuli in individuals having a depressive disorder or at risk for depression. Rehbein et al. found that the deficit in responsivity to emotional stimuli can be normalized by treatments for depression. Also, Nelson et al. found reduced reward-related ERPs in adolescent girls predicted first-onset of depressive disorder. These findings have important clinical implications for developing biomarkers for predicting a depressive disorder and for targeting treatments. Clinical applications of these low cost and reliable ERP and MEG measures may, however, be limited unless they can be shown to have adequate sensitivity and specificity of predictions. Measures may be strengthened by methodological advances such as principal components analysis and source localization used by Kayser et al. Time-frequency EEG measures, such as used by Nelson et al., have shown promise, too. Two presentations (Moratti et al. & Kayser et al.) found reductions of emotion-related potentials to be largest at temporoparietal or occipital sites, particularly over the right hemisphere. Such findings may help target brain stimulation treatments (tDCS or rTMS) to normalize emotional responsivity and reduce depression. Combining different EEG and MEG measures of responses to emotional or rewarding stimuli, and also other behavioral, EEG or MRI measures, may further improve predictions of first-onset of depression or response to treatments.
The MMN has been the subject and a tool of research in psychophysiology for over three decades, indicated by >3000 hits for “MMN” in Web Of Science™. Our symposium provides a comprehensive overview of recent advances in this field, focusing on the development and use of formal models to better understand the computational relevance of the MMN signal, neural processes underlying the MMN generation and its functional neuroanatomy within brain networks. First, Patrick May presents a simulation study that examines competing theories of MMN mechanisms and offers a fresh view of some experimental paradigms. Second, Gabor Stefanics presents a visual MMN study where a Bayesian learning model was used to generate single-trial prediction error (PE) estimates to demonstrate that MMN represents neural correlates of PEs. Third, Richard Rosch presents a dynamic causal modelling (DCM) analysis of a novel auditory roving oddball paradigm exploring the neuroanatomical basis for mismatch responses to hierarchically structured auditory sequences. Fourth, Holly Phillips presents a novel study on patients with dementia where DCM was used to model hierarchical neural mechanisms of the MMN response. Furthermore, she presents classification results from different patient groups obtained with machine learning techniques using network connectivity parameters. Finally, Srivas Chennu provides an overview of the current modeling approaches to demonstrate the importance of computationally explicit models of MMN but highlighting also shortcomings of current popular models and challenges to be solved.

A RE-EVALUATION OF THE MULTI-STDARD CONTROL CONDITION FOR THE EXISTENCE OF A GENUINE MMN

Patrick May
Leibniz Institute for Neurobiology

The continuing debate on the genesis of MMN centers on the question of whether MMN reflects differential adaptation of the circuits responding to the standard and deviant (the adaptation hypothesis) or whether it is generated by dedicated deviance detection mechanisms relying on sensory memory (the memory hypothesis). That is, either the MMN expresses response modulation, or it has a separate, specialized generator system which produces a “genuine” MMN. Previous research has attempted to settle this question non-invasively, in favor of the memory hypothesis, through so called multi-standard (MS) control experiments. The current study re-examines these issues in the context of a computational model which is based on the anatomical structure of auditory cortex and includes short-term depression (adaptation) of excitatory connections. In simulations, the model replicates the responses elicited in the oddball and MS conditions without the presence of separate deviance-detection subsystems. Instead, the cortical columns of the model index stimulus-specific adaptation and respond to tone sequences in a highly selective way. These results show that it is doubtful whether MS control experiments can offer reliable non-invasive evidence for the memory hypothesis. Instead, the model supports the adaptation hypothesis, offering a parsimonious account of MMN as part of an adaptation-modulated N1 response. Novel predictions for single and multunit measurements which could falsify the adaptation hypothesis are offered.

A SINGLE-TRIAL ERP ANALYSIS OF PREDICTION ERRORS DURING VISUAL MISMATCH: A COMPUTATIONAL MODELING STUDY

Gabor Stefanics
University of Zurich & ETH Zurich

The predicting coding hypothesis postulates that the brain employs generative models to actively predict the environment while inferring the most likely causes of the sensory data. In this framework ERPs are often viewed as neural correlates of prediction errors (PE) and related model updating processes. In particular, the MMN component has been suggested as a correlate of automatic predictive processes. Here we used a computational model to demonstrate that the brain generates PEs in response to unexpected changes in visual stimuli. We used a novel visual ‘roving standard’ paradigm to elicit mismatch responses by rare changes in color or emotional expression of faces. This allowed us to study brain responses to physically identical stimuli violating predictions regarding color and emotion separately. We used the Hierarchical Gaussian Filter, a novel Bayesian model, to simulate belief trajectories wrt. stimulus occurrences. We generated PE traces for changes in color and emotion with separate models and conducted a general linear model (GLM) with PE estimates as trial-wise parametric regressors in SPM12. We found significant effects of parameter estimates both for color and emotion PEs. Their scalp distribution and time course were in agreement with those of MMN responses obtained with the traditional averaging and subtraction approach. Our results suggest that the interpretation of the visual MMN as a PE response is plausible, and that model-based computational quantities allow studying automatic perceptual predictive processes and their ERP correlates.

TEMPORALLY STRUCTURED SEQUENCES UNFOLDING ACROSS THE CORTICAL HIERARCHY - COMPUTATIONAL INSIGHTS FROM A NOVEL MISMATCH NEGATIVITY PARADIGM

Richard Rosch, Torsten Baldeweg & Karl Friston
University College London

Evidence from a variety of measurable brain responses suggests that the brain actively predicts its sensory inputs. Novel information appears to be encoded in prediction error signals that are passed along the cortical sensory processing hierarchy. The mismatch negativity (MMN) response to unexpected auditory signals has emerged as a powerful tool for investigating predictive processing in the human brain. Here we present a novel temporally structured roving oddball paradigm introducing expected and unexpected violations to auditory sequences, measured with EEG in a group of healthy young adults. The temporal structure aims to evoke spatiotemporally distinct cortical responses, reflecting distinct time scales at which prediction errors are evaluated along the auditory cortical hierarchy. Building on previous work examining the underlying network changes using dynamic causal modelling (DCM) we apply Bayesian inference to identify the distinct effects underlying the observed cortical responses. The results reveal a double-dissociation between early and late components of the typical MMN response. DCM analysis reveals independent modulations of the cortical forward-backward message passing underlying distinct MMN responses to expected vs unexpected oddballs and standard tones. These findings speak to the encoding of statistical structure at increasing temporal scales at increasing levels of the cortical hierarchy, further fine-tuning the neuroanatomical properties of predictive coding in the human brain.

MODELLING MISMATCH NEGATIVITY CONNECTIVITY IN DEMENTIA

Holly Phillips, Laura Hughes, Alexander Shaw & James Rowe
University of Cambridge

Patients with dementia show disruption of brain network connectivity. Established models of the mismatch negativity (MMN) can provide a measure of connectivity changes across different dementia groups and the effects of treatment. We used magnetoencephalography with dynamic causal modelling to model the hierarchical neural mechanisms of the MMN response. In healthy young participants, we found evidence for the hierarchical frontotemporal network across multiple auditory dimensions, evidence that converged across invasive and non-invasive electrophysiological recordings. We have also studied the changes in the MMN network in different types of dementia groups with different clinical phenotypes and distinct macroscopic anatomy of tissue loss. We show dementia patients recruit abnormally extensive and inefficient MMN networks. The patient groups also show impaired responses of the auditory cortex to unexpected deviant tones, despite normal responses to standard stimuli. We used machine learning techniques to classify patient groups by their intrinsic connectivity parameters within the frontotemporal network, achieving >90% accuracy from healthy controls. Finally, we studied the extrinsic connectivity parameters within a larger fronto-temporal-parietal network to classify dementia groups. These results demonstrate the potential of models of connectivity as biomarkers of disease and as measures of the effectiveness of treatments.
COMPUTATIONAL MODELS OF THE MMN: PAST, PRESENT AND FUTURE
Srivas Chennu
University of Kent and University of Cambridge

The hierarchical predictive coding account of neural information processing has taken root across current cognitive neuroscience. The research in this field has interpreted psychophysical effects, cognitive function and dysfunction as feedback predictions and feedforward prediction errors flowing through neural hierarchies. Dynamic causal modelling (DCM) has been used to model the mismatch negativity (MMN) as an example of cortical prediction error to deviations from predicted patterns of stimuli. These models can also explain neural responses to the complete absence of predicted stimuli, and the role of top-down attention in predictive coding. In my talk, I will highlight the value of computationally explicit models for testing hypotheses about the MMN and its generators. But I will also discuss some of the current shortcomings of popular models, and how these limit the extent to which dynamics of the MMN can be accurately modelled in terms of predictive coding. In particular, I will illustrate how this adversely affects the effectiveness of models for testing hypotheses about neural dysfunction in complex clinical populations. Recent advances in computational modelling, including novel cortical microcircuit architectures and stochastic dynamic models, shall deliver advances that address these limitations. I will propose that these advances could enable us to test more fine-grained hypotheses about predictive coding. My talk will conclude with challenges to be solved by the next generation of computational models of hierarchical prediction in cortex.

10:30 a.m. – 12:00 noon
Symposium 8
FROM BENCH TO BEDSIDE: ELECTROPHYSIOLOGICAL ADVANCEMENTS IN PSYCHIATRIC CARE
Chair: James Cavanagh
University of New Mexico
Discussant: John Allen, University of Arizona

Human electroencephalography (EEG) has been used as a biomedical diagnostic tool for nearly a century and has been in the limelight of cognitive neuroscience for over half a century. EEG is uniquely suited for rapid, inexpensive, and reliable identification of biomarkers for neurological and psychiatric diseases. However, the analytic procedures necessary for robust validation of candidate biomarkers are still evolving. In this symposium, we will first discuss the latest advances in understanding neural mechanisms that underlie specific disease states and risk factors. We will demonstrate that these candidate mechanisms are critical for informing effective discrimination of patient groups (i.e. identifying biomarkers). We will then demonstrate how these mechanisms can be used to predict disease progression and monitor treatment response. This symposium will conclude with a discussion on the future biomedical utility of EEG for varied disease states.

ERP STUDIES OF PREDICTIVE CODING DEFICITS IN PSYCHOsis
Judith Ford
University of California San Francisco

The brain is in the prediction business. Failures of predictive coding are thought to underlie the misinterpretation of sensations and aberrant salience that characterize psychosis. Predictions can be made in at least two ways: We predict specific sensations will follow from actions that produce them (“context-based” predictions), and we base predictions of sensations on the immediate past history (“context-based” predictions). There is an important distinction between them: context-based predictions depend on learning and remembering events while action-based predictions are innate or overlearned. Thus, action-based predictions have fewer free parameters, and consequently abnormalities can be interpreted more simply. In much of our work, we estimate context-based predictions from the amplitude of the event-related potential (ERP) mismatch negativity (MMN) to deviant sounds compared to standard ones. We estimate action-based predictions from the degree of suppression of the N1 ERP to speech sounds as they are being spoken compared to playback of those sounds. Both types of predictive coding are deficient across the illness course of schizophrenia: people at clinical high risk for schizophrenia, recent onset schizophrenia, and chronic schizophrenia. In spite of MMN and N1 suppression reflecting different processes, they were equivalently affected by chronic schizophrenia. Furthermore, they were correlated in the controls, but not in patients, suggesting the processes contributing to different types of predictive coding are affected differently by schizophrenia.

THE ERROR-RELATED NEGATIVITY AS A TRANSDIAGNOSTIC MARKER FOR ANXIETY
Anja Riesel, Julia Klawohn & Norbert Kathmann
Humboldt University Berlin

Overactive error-monitoring is thought to play a central role in the pathogenesis of anxiety disorders and to be associated with key symptoms of these disorders such as worry, uncertainty and overestimation of threat. The error-related negativity (ERN) serves as a neural indicator of error-monitoring. Overactive error-monitoring qualifies as an endophenotype for obsessive-compulsive disorder (OCD) as it has been suggested by data of unaffected relatives and longitudinal data. In this talk, data will be presented that further suggest that overactive error-monitoring represents a state-independent biomarker for OCD. To this end, data from a replication study with unaffected relatives of OCD patients will be shown. Furthermore, healthy individuals with high OC-symptoms also show ERN amplitudes comparable to those of OCD patients. In addition, we will present data indicating that enhanced ERN amplitudes are not specific for OCD but can also be seen in social and health anxiety. This suggests that overactive error-monitoring might be a transdiagnostic biomarker related to anxiety. There is an ongoing debate about the underlying phenotype associated with enhanced ERN amplitudes and we will show results from regression analyses in healthy individuals that indicate the strongest associations with conscientiousness and punishment sensitivity. Taken together, these results suggest that hyperactive error-monitoring is not limited to specific symptoms or disease states but rather reflects individual differences in the response style to errors and is related to vulnerability for anxiety.

OPEN TOOLS FOR EEG-BASED PATTERN CLASSIFICATION OF PSYCHIATRIC AND NEUROLOGICAL DISEASE
James Cavanagh
University of New Mexico

By quantifying the emergence of psychological operations at their source, EEG provides a rapid and inexpensive method to transcend descriptive, correlational, and non-parametric descriptions of disease. In this talk, I will discuss techniques for surmounting these major hurdles towards this goal of disease-specific biomarkers. First, the scale of data required to reliably identify a clinical biomarker transcends the abilities of most laboratories. I will discuss a new open-source resource; the Patient Repository of EEG Data (PREED) which will offer one-stop shopping for task standardization, data hosting and aggregation, and data mining techniques in the service of identifying candidate biomarkers. Second, I will detail novel procedures for pattern classification that have been specifically honed for moderately sized EEG datasets. The final hurdle I will address is by far the hardest: what information should be classified? That is, what neural process reliably discriminates each specific patient group? To address this issue, I will leverage candidate mechanisms advanced from clinical cognitive neuroscience. Evidence of effective discrimination of anxiety (using error signals), major depression (using reward signals), Parkinson's disease (using orienting signals) and Traumatic Brain Injury (using cognitive control signals) will be presented.
OPTIMIZING MULTI-MODAL NEUROIMAGING METHODS TO EXAMINE AND IMPROVE REWARD FUNCTIONING IN ADDICTION
Travis Baker
Rutgers University

Neurocognitive alterations to mesocorticolimbic reward function by drugs of abuse are thought to facilitate a progression towards excessive drug use. Despite efforts to identify methods to counteract such drug-induced neural alterations, brain-based treatments for this disorder remain underdeveloped and often ineffective. In this talk, I propose that the anterior cingulate cortex (ACC) putative function — selecting and motivating the execution of extended goal-directed behaviors — can be utilized as a biomarker for the abnormal reward processing underlying substance misuse. I will present support for this proposal utilizing the reward positivity as a quantifiable EEG metric of reward-related ACC function. First, people who abuse addictive substances produce a relatively small reward positivity to monetary incentives, and that this impairment is modulated by a genetic polymorphism that codes for the expression of dopamine D4 receptors. Second, drug rewards (puffs of a cigarette) elicit a relatively larger reward positivity than nondrug rewards (money) in abstinent smokers. Third, applying excitatory or inhibitory stimulation to a subject-specific frontal-cingulate reward pathway using real-time-guided tRMS can alter the amplitude of the reward positivity elicited by drug and non-drug rewards. In sum, our efforts point to a decisive role of integrating multimodal neuroimaging methods as an early stage in treatment development for substance use disorders, with a highly sensitive EEG-based biomarker of addiction severity and treatment efficacy.

3:00 p.m. – 4:30 p.m.
Symposium 9

BETA BAND MOTOR OSCILLATIONS AS A MARKER OF DECISION MAKING
Chairs: Adrian Fischer & Theo Gründler
Otto-von-Guericke-Universität Magdeburg

Oscillations in the beta band (13 – 30 Hz) have long been investigated in the brain’s motor system and have received wide attention from researchers, yet their dynamics and functional significance are heatedly debated. While a causal role of beta oscillations in clinical disorders such as Parkinson has been demonstrated, beta oscillations are not limited to the motor system and reflect various input signals relevant for decision making. Consequently, researchers began to exploit beta oscillations as a marker of decision processes and explored how beta oscillations can serve as a top-down control process. In this symposium, we combine data obtained from diverse analysis techniques including EEG and MEG in humans, ECoG and LFP recordings in monkeys as well as pharmacological interventions to characterize the functional role of beta oscillations. Firstly, Craig Richter will present data showing that top-down beta band signals enhance bottom-up processing in the monkey visual system. Thereafter, Saskia Haegens will demonstrate that beta power in the monkey premotor cortex reflects decision-relevant stimulus features and outcomes in a context-dependent manner. In the third talk, Adrian Fischer will present data suggesting that EEG beta band lateralization follows formal predictions of diffusion models. Theo Gründler will present MEG data from a pharmacological study showing that dopamine modulates value representations reflected in beta oscillations. Finally, Niels Kloosterman will present MEG data indicating that evidence accumulation can be modulated by noradrenaline.

TOP-DOWN MODULATION OF STIMULUS DRIVE VIA BETA-GAMMA CROSS-FREQUENCY INTERACTION
Craig Richter1, William Thompson2, Conrado Bosman3 & Pascal Fries1
1Ernst Strüngmann Institute (ESI) for Neuroscience in Cooperation with Max Planck Society, 2Karloinska Institute, 3Donders Institute for Brain, Cognition and Behaviour, Radboud University

Recently, several studies have demonstrated that visual stimulus routing is subserved by inter-areal gamma-band synchronization, whereas top-down influences are mediated by alpha-beta band synchronization. These processes may implement top-down control if top-down and bottom-up mediating rhythms are coupled via cross-frequency interaction. To test this possibility, we investigated Granger-causal influences among awake macaque primary visual area V1, higher visual area V4 and parietal control area 7a during attentional task performance. Top-down 7a-to-V1 beta-band influences enhanced visually driven V1-to-V4 gamma-band influences. This enhancement was spatially specific and largest when beta-band activity precedes gamma-band activity by ~100 ms, suggesting a causal effect of top-down activity on bottom-up activity. We propose that this cross-frequency interaction mechanistically subserves the attentional control of stimulus selection.

THE ROLE OF BETA OSCILLATIONS IN SUPRAMODAL PERCEPTUAL DECISION-MAKING
Saskia Haegens1, José Vergara2 & Ranulfo Romo2
1Columbia University Medical Center, 2Universidad Nacional Autónoma de México

We explored oscillatory dynamics in the medial premotor cortex (MPC) involved in supramodal perceptual decision-making. We recorded local field potentials (LFPs) and spikes in two monkeys trained to perform a tactile/acoustic frequency discrimination task. We studied the role of oscillatory activity as a function of stimulus properties (frequency and sensory modality) and decision outcome. We found that beta band power correlated with relevant stimulus properties: there was a significant modulation by stimulus frequency during the retention interval, as well as a modulation by stimulus modality — the latter was only observed in the case of a purely unimodal task, where modality information was relevant to prepare for the upcoming second stimulus, but not in a crossmodal paradigm. Furthermore, we found a significant modulation of beta power starting during presentation of the second stimulus, which was predictive of decision outcome. Finally, beta band spike-field coherence (SFC) matched these LFP observations. In conclusion, we demonstrate that beta power in MPC is reflective of stimulus features in a context-dependent manner, and additionally reflects the decision outcome. This information is coded in a supramodal manner — modality information is only retained when relevant for the task at hand.

BETA OSCILLATIONS REFLECT ESSENTIAL FEATURES OF DIFFUSION DECISION PROCESSES
Adrian Fischer1, Roland Nigbur1, Claudia Danielmeier2, Tilmann Klein1 & Markus Ulspenger1
1Otto-von-Guericke-Universität Magdeburg, 2University of Nottingham

The neural formation of mutually exclusive decisions is assumed to reflect noisy evidence accumulation in favor of one or another response. This process is formally described by sequential sampling models from which the drift diffusion model has been empirically well supported. In order to adapt to varying time horizons, it has been proposed that decision boundaries may dynamically change in the time-scale of hundreds of milliseconds, yet such neural signals have not been shown in humans. By measuring the lateralization of EEG beta band power desynchronization towards the motor cortex triggering a response in a speeded dual choice task in a large sample (n = 863) of healthy human individuals, we derive an online index of this decision formation using electroencephalography. We find that this beta signal correlates to various predictions of accumulator class decision models, including pre-lateralization before the evidence accumulation begins determining speed and accuracy of subsequent responses, as well as collapsing decision boundaries that terminate decision making under time pressure. We furthermore demonstrate that distracting information is represented in beta band as well which leads to incorrect responses. Consecutively, decision boundaries are increased to increase accuracy.

This indicates that mutually exclusive decisions adhere to fundamental principles of sequential sampling models and confirms lateralized beta power as a valid online marker of decision formation that can be employed in various tasks.
DOPAMINERGIC MODULATION OF CORTICAL BETA BAND VALUE REPRESENTATION
Theo Gründler¹, Adrian Fischer¹, Gareth Barnes², Laurence Hunt² & Gerhard Jocham³
¹Otto-von-Guericke-Universität Magdeburg, ²University College London
When making decisions between options of differing reward value, representa-
tions of the expected values are reflected in neural activity across the brain. When reward-guided choices are made in action space, beta band oscillations in
sensorimotor cortex carry representations of key value parameters, over and above preparatory activity related to the upcoming motor response. The neumo-
dulator dopamine had been implied in both value-guided choice and in the control of
beta oscillation. Here we tested whether dopamine modulates value representa-
tion in sensorimotor beta oscillations. Volunteers performed a sequential reward-
guided choice task under the influence of the dopamine D2 receptor antagonist
amisulpride (400 mg), the dopamine precursor L-DOPA (100 mg + 25 mg carbi-
dopa), or placebo while we recorded MEG.

Replicating previous studies, beta power correlated with the value of options
presented. This value correlate was diminished by L-DOPA and amplified by
amisulpride while the drugs did not affect overall beta power in the sensorimotor
cortex, or beta desynchronization associated with motor preparation. Thus our
data show that dopamine directly acts on motor cortical value representations in
the beta band. This may constitute a mechanism by which dopamine exerts its
motivational effects on instrumental behavior.

EFFECTS OF NORADRENALINE ON DYNAMICAL DECISION COMPUTATIONS IN HUMAN CORTEX
Niels Kloosterman¹, Jan Willem de Gee¹, Douglas Garrett², Roger Ratcliff³,
Cyriel Pennartz¹ & Tobias Donner⁴
¹University of Amsterdam, ²Max Planck Institute for Human Development,
³Ohio State University, ⁴University Medical Center Hamburg-Eppendorf
Perceptual decision-making entails the accumulation of sensory evidence towards
a threshold in cortical networks. Here, we investigated the influence of noradrena-
line (NA), a key neuromodulator sculpting the dynamics and variability of corti-
cal activity, on these cortical decision computations. We used atomoxetine to
boost NA levels in subjects performing an elementary visual choice task during
MEG. Perceptual choices were mapped onto button presses with the left or right
hand. We quantified the drug effects on choice behavior by means of drift diffu-
sion modeling. On average across subjects, atomoxetine increased beta-band
(~20 Hz) MEG power over posterior and frontal cortex, specifically during deci-
sion formation. Stronger individual drug-induced beta-power increases predicted
stronger increases in drift rate. To identify signals encoding subjects’ choices, we
extracted the power lateralization with respect to the choice-reporting hand. Indi-
vidual drug-induced changes in choice-specific lateralization over premotor and
prefrontal cortices predicted corresponding changes in drift rate. This effect was
expressed in a low-gamma (~40 Hz) band. We conclude that boosting central
NA levels phasically modulates cortical decision dynamics in both the beta and
gamma bands. The strength of this modulation varies across individuals (presum-
ably due to differences in their baseline arousal state) and predicts individual
changes in the efficiency of sensory evidence accumulation, as measured by drift
rate.

LIAR LIAR, PANTS ON FIRE?: PSYCHOPHYSIOLOGICAL DECEPTION DETECTION UNRAVELED
Chair: Linda Geven
University of Amsterdam
Polygraph testing became an influential tool in the justice system in the second
half of the 20th century, with a significant increase since the September 11 terror
attack in the United States of America. Several psychophysiological polygraph
techniques have been developed since and the study of detecting deception has
attracted a great deal of interest among researchers and practitioners. Especially
the Concealed Information Test (CIT), targeting concealed knowledge rather than
deception, has been extensively studied. The Concealed Information Test aims to
detect the possession of crime-related knowledge by presenting a series of ques-
tions while measuring several psychophysiological responses and/or reaction
times. When a suspect shows consistently different responses to the relevant
(crime-related) items compared to the neutral items, knowledge about the crime
is inferred. Various psychophysiological deception detection measures (such as
heart rate, skin conductance, respiration, P300 component of the event related
potential and eye-movement) will be presented and discussed, with a focus on the
Concealed Information Test. The theoretical background of the CIT will be pre-
sented, together with novel research directions focusing on factors that may affect
detection of deception in realistic settings.

DETECTING CONCEALED MEMORY OF PERSONALLY FAMILIAR FACES VIA EYE MOVEMENTS
Gershon Ben-Shakhar, Oryah Lancry, Tal Nahari & Yoni Pertzov
Hebrew University of Jerusalem
Can people conceal guilty knowledge? In two experiments, participants were
required to memorize four faces. Critically, in some of the trials one of the faces
was their personal friend. Even when participants were explicitly instructed to
conceal this familiarity, gaze was nevertheless inevitably attracted to the person-
ally familiar face, followed by a strong repulsion. Personally familiar faces also
incurred longer fixations. Similar results were obtained both under instructions to
conceal the familiar faces and when no such instructions were given. Exploiting
this behavioral pattern, a machine learning classification algorithm could detect
the familiar faces at an accuracy rate of above 91%. Detection efficiency using
eye movements was found to exceed detection efficiency of various autonomic
and ERP measures. These results shed novel light on the temporal aspects of
attention biases toward familiar items and provide a proof of concept for a highly
accurate method of detecting concealed information using simple eye tracking.
INFLUENCE OF MOTIVATIONAL FACTORS ON P300 IN THE COMPLEX TRIAL PROTOCOL VERSION OF THE CIT IN MALINGERING AND MOCK CRIME SCENARIOS

J. Peter Rosenfeld, Anne Ward, Elena Dasydova, Elena Labkovsky, Evan Sitar & Joshua Wasserman
Northwestern University

In much previous CIT research, the study of motivational effects involves comparison of a simply knowledgeable (SK) group with a knowledgeable group additionally rewarded financially for beating the test by following certain instructions. With SCR, this extra incentive usually makes the subject more detectable. There are actually 3 factors involved in this incentivization which may each separately contribute to observed effects: 1) Instructions to beat the test 2) offer of reward for success 3) instructions about how to beat the test. Rosenfeld et al. (2017) showed that with P300 as the recognition index, there was no difference between two groups differing only in the financial reward opportunity (Ps > .4, Bayes Factors > BF3 > 2.9 in favor of null). These results were groups simulating cognitive deficit as in malingering of head injury. Their instructions are different than those of mock crime perpetrators in the usual CIT. Thus, we have now completed a similar study on two groups of mock crime perpetrators: Again, there was no effect of the financial reward (p > .4, BF > 3.0). These results suggest that financial incentive by itself does not affect P300 in the CIT; the P300 is indexing only recognition. By the time of the SPR 2017 meeting, we will have run SK groups.

Toward a Psychophysiological Understanding of Anger- and Aggression-Related Processes

Chair: Eddie Harmon-Jones
The University of New South Wales

These talks review research aimed at understanding psychophysiological processes that contribute to anger and aggression. Jack van Honk will present research on the contributions of multiple regions of the amygdala to psychopathy. Individuals with Urbach-Wiethe disease have calcification of the basolateral amygdala (BLA) while the central-medial amygdala remains intact. These individuals are fear hyper-vigilant, highly empathic, and atypically generous. This research suggests that the BLA may underlie some psychopathic traits. Christoph Eisenegger will present research on the role of testosterone in competitiveness, a psychological process that contributes to aggression. His research assessed salivary testosterone levels and genotyped for the CAG repeat polymorphism of the androgen receptor gene. Results revealed that basal testosterone predicted competitiveness, and that fewer CAG repeats related to greater confidence in competitors. Birgit Rauchbauer will present research that examined an overlooked function of mimicry, which is the appeasement and soothing of potential intergroup conflict. Using multiple methods (fMRI, ERPs), her research on mimicry to angry outgroup members has found that neural processes related to behavior regulation are involved in appeasement. Douglas Angus will present research that created a novel incentive-delay-type task that permits trial-by-trial manipulation of anger and the examination of ERPs. Results indicated that the frustrating trials evoked self-reported anger and P3a responses, and that these two responses correlated positively.

The Human Basolateral Amygdala and Psychopathic Traits

Jack van Honk
Utrecht University

Amygdala dysfunction is thought to play an important role in the pathology of psychopathy. The leading theory suggests that amygdala impairments underlie many psychopathic traits (lack of fear, lack of empathy and greed). Accordingly, a structurally and functionally efficient amygdala should protect against these psychopathic traits. However, the amygdala is not a unified structure, but consists of structurally separate subdivisions with different -even antagonistic- functions. This is particularly true for the central-medial amygdala (CMA) and the basolateral amygdala (BLA). Rodent dual-process models suggest that the CMA subserves impulsive-emotional behavior, while, crucially, the BLA sub-serves calculative-instrumental behavior. Notably, calculative-instrumental behavior defines psychopathy, and BLA impairments should thus not protect from, but underlie psychopathic traits. To test this hypothesis, we used subjects with an extremely rare genetic syndrome (a variant of Urbach-Wiethe disease (UWD) in South Africa). We showed with combined fMRI/sMRI that UWD in South Africa leads to selective calcification of the BLA. Rodent dual-process models suggest that the CMA subserves impulsive-emotional behavior, while, crucially, the BLA sub-serves calculative-instrumental behavior. Notably, calculative-instrumental behavior defines psychopathy, and BLA impairments should thus not protect from, but underlie psychopathic traits. To test this hypothesis, we used subjects with an extremely rare genetic syndrome (a variant of Urbach-Wiethe disease (UWD) in South Africa). We showed with combined fMRI/sMRI that UWD in South Africa leads to selective calcification of the BLA, while the CMA remains structurally and functionally intact. Next in a line of experiments we showed that these BLA-damaged subjects compared to matched controls are fear hyper-vigilant, highly sensitive and empathic, and atypically generous. In sum, the BLA is the calculative instrumental motor of the brain, indispensable for goal directed behavior, however the BLA also underlies some nasty psychopathic traits.
Multimethod evidence of mimicry being used to appease anger

Birgit Rauchbauer & Claus Lamm
University of Vienna

Our research examined an overlooked function of mimicry (the unconscious alignment of postures to those of the interaction partner). That is, mimicry may cause appeasement and the soothing of potential intergroup conflict. Our research examined the modulation of mimicry of arbitrary finger lifting movements by emotional expressions (happy and angry) and ethnic group membership (White In-group, Black Out-group) using a multi-method approach. Study 1 investigated mimicry’s modulation by social-affective factors. Results revealed enhanced mimicry in response to angry out-group members. Study 2 used functional magnetic resonance imaging to elucidate the neural processes of the social-affective modulation of mimicry discovered in Study 1. Enhanced mimicry in response to out-group members was accompanied by activation in the left ventral premotor cortex and inferior parietal lobe, bilateral anterior insula, and mid-cingulate cortex. This suggests that processes related to behaviour regulation were involved in appeasement. Study 3 used event-related potentials to test the temporal neural dynamics of social-affective modulation of mimicry. Results revealed that the N2 component reflected the modulation of mimicry by potentially threatening, angry out-group stimuli. These results highlight the role of mimicry in appeasement of a potentially threatening out-group member. Overall, this suggests an extended view of mimicry’s affiliative function, from stabilizing cohesive relationships to the improvement of a conflicting intergroup situation.

The anger incentive delay task: a novel method for studying anger in EEG research

Douglas Angus & Eddie Harmon-Jones
The University of New South Wales

Unlike other basic emotions, anger is relatively difficult to produce in the lab, with the most reliable methods involving elaborate and time-consuming manipulations. These factors preclude the possibility of using them to study short-lived changes in neural activity that precede the subjective experience of anger. In this talk, I present the results of a study using a novel task that allows for the trial-by-trial manipulation of anger and the examination of associated event-related potentials. Participants completed an incentive delay task, in which accurate responses were rewarded with monetary gains or breaking-even and inaccurate responses were punished with monetary losses. In our task, participants received accuracy feedback, followed by stimuli indicating the amount of money they won or lost on that trial. On a majority of trials, this amount was consistent with the feedback stimuli, while on a minority of trials this amount was inconsistent. Results indicated that participants experienced the most anger after trials where they responded accurately but lost money rather than won money. P3b amplitudes were greater for inconsistent outcomes than consistent outcomes, regardless of whether these resulted in gains or losses. On angering trials, P3b amplitudes were positively correlated with self-reported anger. The same correlation was not observed for trials with inconsistent stimuli that signalled gains. The implications of this finding and potential applications are discussed.

Using oscillatory brain activity as a window into the neurophysiology of selective attention

Nathan Weisz, Anne Hauswald & Annekathrin Weise
University of Salzburg

Methodological progress in cognitive electrophysiology has increased our ability to relate human EEG studies to data derived from animal models of perception and attention. It is now increasingly possible to test predictions made by sophisticated computational models of brain neurophysiology and behavior. Measuring oscillatory brain activity in human participants is a particularly promising approach towards such an in-vivo neurophysiology. The present symposium examines how different indices of oscillatory brain activity based on noninvasive measurements contribute to the understanding of selective attention. Weisz et al. focus on the predictive role of pre-stimulus oscillatory states for subsequent detection of somatosensory events, comparing spatially attended and non-attended locations. The talk by Müller and colleagues examines the use of steady-state potential frequency tagging for studies into the temporal dynamics of feature-based competition and suppression. Jolicoeur et al. describe and validate the use of time-varying metrics of phase-locking and phase-amplitude coupling as complementary indices of electrocortical interaction during spatial attention. Keil and colleagues discuss the sensitivity and specificity of different inter-frequency and inter-site coupling measures as applied to intracranial (electrocorticography) recordings during a feature-based visual selective attention task. Presenters will identify common problems and future directions in the use of advanced metrics of oscillatory activity.

Pre-stimulus Alpha states as predispositions of conscious somato-sensory perception: More than just fluctuations of attention?

Christoph Eisenegger
University of Vienna

Our research investigated whether endogenous testosterone levels predict the decision to compete. In a laboratory experiment with real monetary incentives, 181 men solved arithmetic problems, first under a noncontestive condition, followed by a competitive condition. We assessed several parameters relevant to competition, such as risk taking, performance, and confidence in one’s own performance. Salivary testosterone levels were measured before and 20 minutes after the competition task. Participants were also genotyped for the CAG repeat polymorphism of the androgen receptor gene, known to influence the efficacy of testosterone signaling in a reciprocal relationship to the number of CAG repeats. Results revealed a positive association between basal testosterone levels and the decision to compete, and that higher testosterone levels were related to greater confidence in one’s own performance. Whereas the number of CAG repeats was not associated with the choice to compete, a lower number of CAG repeats was related to greater confidence in those who chose to compete, but this effect was attributable to the polymorphism’s effect on actual performance. An increase in testosterone levels was observed following the experiment, and this increase varied with self-reported high-school math grades. We expand upon the latest research by documenting effects of the androgen system in confidence in one’s own ability, and conclude that testosterone promotes competitiveness.

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Douglas Angus & Eddie Harmon-Jones
The University of New South Wales

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Pre-stimulus Alpha states as predispositions of conscious somato-sensory perception: More than just fluctuations of attention?

Nathan Weisz, Anne Hauswald & Annekathrin Weise
University of Salzburg

Studies investigating conscious perception have reported relative alpha power decreases prior to detection of near-threshold stimuli. However, activity in the alpha band is also associated to selective attention. Thus, alpha power modulations reported by conscious perception studies could be interpreted as reflecting fluctuations of attention. The first half of the talk will give an overview of some works on prestimulus alpha and conscious perception. The second half will then focus on a study, in which we investigated to what extent spontaneous alpha power fluctuations prior to conscious somatosensory perception are influenced by attention. We combined a spatial attention and a near threshold perception task in the somatosensory modality. Some regional alpha modulations were indicative of an upcoming conscious state without being influenced by cue validity. In the somatosensory cortices pre-target alpha power were sensitive to the attentional manipulation but also influenced upcoming conscious perception. Importantly these somatosensory pre-target patterns were highly dependent on the reliability of the spatial cue: Attention mainly modulated pre-target somatosensory alpha when the cue was fully informative. In contrast, the influence of “spontaneous” somatosensory alpha fluctuations was evident when the spatial cue was uninformative. Thus, depending on cue reliability, the same neural mechanism in the somatosensory cortices can be exploited by spatial attention but also influences upcoming somatosensory conscious detection when explicit spatial attention cues are lacking.

1. Deceased. Robert Kumsta, Ruhr University Bochum, will give the presentation instead.
NEURAL DYNAMICS OF SUSTAINED FEATURE-BASED ATTENTION IN EARLY VISUAL AREAS OF THE HUMAN BRAIN
Matthias Müller
University of Leipzig

In everyday life, shifting and focusing attention on a certain location, object or feature is a key element in the extraction of relevant information. This is particularly obvious when we search for a certain object in a cluttered scene, such as one person in a busy photograph. In these situations, feature-based attention plays a key role in solving the task. We investigated the neural dynamics of sustained feature-based visual attention in early visual cortex by means of electroencephalographic (EEG) recordings. To this end, we tagged stimuli at different frequencies, eliciting steady-state visual evoked potentials (SSVEPs), oscillatory signals with the same frequency as the respective driving stimulus. Generative models of SSVEPs have consistently been found in early visual cortex, leading to the idea that frequency-tagging stimulates neural networks that are linked to the processing of the respective stimulus. Given the ongoing nature of the signal it allows researchers to extract temporal dynamics of facilitation/suppression in near real time. We showed that feature selection needs not to be mediated by spatial attention. We discuss how these findings are at odds with the idea of attention being a strictly limited resource, because shifting resulted in an early facilitation of the to-be-attended followed by a suppression of the to-be-ignored feature stimulus. Shifting attention within—compared to between—feature dimensions resulted in different time courses, and seemed to occur in a mandatory fashion, even when it conflicted with other task demands.

DYNAMICS OF PHASE-LOCKING VALUE AND PHASE-AMPLITUDE COUPLING RELATED TO VISUAL-SPATIAL ATTENTION
Pierre Jolicoeur1, Brandi Lee Drisdelle1 & Jean-Marc Lina2
1Université de Montréal, 2École de technologie supérieure

We examined how values of oscillatory amplitude, phase synchrony (e.g., phase-locking value (PLV) in the alpha band) and alpha-gamma phase-amplitude coupling (PAC) change over time when observers deploy visual-spatial attention to lateral targets. While the dynamics of alpha amplitude and PAC are relatively slow, showing mainly event-related decreases in amplitude related to processing an attended stimulus, changes in patterns of PLV appear to track the evolution of processing in a more rapid, detailed, and potentially informative manner. We report exploratory analyses of these patterns and relate them to corresponding results from event-related averaging and models of attentional processing.

OSCILLATORY DYNAMICS IN WIDESPREAD CORTICAL NETWORKS DURING FEATURE-BASED ATTENTION - COUPLING ACROSS AND WITHIN FREQUENCIES
Andreas Keil, Nate Petro & Nina Thigpen
University of Florida

Major principles of the neural interactions mediating feature-based selective attention have been defined in the animal model, at different levels of observation, ranging from individual units to neural mass action. Recent work in this field has identified robust coupling phenomena—within and across frequency bands—that are closely tied to behavioral outcomes. An emerging literature has been building on these data, relating oscillatory phenomena to human performance in cognitive tasks. One difficulty in this endeavor has been the lack of validated, robust algorithms for quantifying the temporal evolution of complex oscillatory dynamics over time. Here, we use data collected in patients with implanted sensors arrays, electrode strips, and deep skewer sensors in conjunction with different measures for analyzing oscillatory interactions within and across different frequency bands, as observers perform a feature-based attention task. Findings with invasive recordings are compared with scalp EEG recordings in healthy observers performing the same task, and their predictive value is tested in simultaneous EEG-fMRI recordings. Preliminary findings of these ongoing analyses demonstrate that neural interactions account for fundamental principles of feature-based attention such as global facilitation and local suppressive interactions. They also support computational models emphasizing the role of oscillatory hierarchies, built around theta and alpha-range oscillations, for cognition and perception.

COGNITIVE BIASES IN HEALTH AND PSYCHIATRIC CONDITIONS - LINKING OPTIMISM AND NEGATIVE BIASES

Chair: Hadas Okon-Singer1 & Tatjana Aue2
1University of Haifa, 2University of Bern
Discussant: Nazanin Derakshan, Birkbeck University of London

Biased processing of negative information is a hallmark characteristic of anxiety and depression, thought to provoke and maintain these disorders. In contrast, healthy individuals are characterized by prioritizing rewarding information and optimistic expectancies regarding the future. The current symposium aims at achieving a better understanding of the neurocognitive mechanisms at the basis of biased processing. Speakers in the current symposium will present and discuss recent exciting findings from the fields of cognitive psychology, event related potentials and autonomic measurement. Christine Larson will present differences in the ability to gate threatening and rewarding distractors from entering working memory; Laura Kress will show causal relations between optimistic/pessimistic biased expectancies and orienting of attention; Lotte van Dillen will present how social cues and social anxiety affect attention deployment; Hadas Okon-Singer will discuss differences in cognitive biases between individuals with sub-clinical anxiety and depression; and Nazanin Derakshan will summarize and refer to shared cognitive mechanisms and neural networks that sub-serve biases in health and psychiatric conditions, as well as discuss future directions. These presentations are expected to provide a comprehensive and updated view of processing biases in health and disease states, and shed light on the neurophysiological systems underlying them. In the long term, knowledge developed in this symposium might lead the way to the development of efficient therapeutic interventions.

FILTERING OF AFFECTIVE DISTRACTORS FROM WORKING MEMORY: INEFFICIENT FILTERING OF THREAT, BUT NOT REWARD
Christine Larson1, Tara Miskovich1, Daniel Stout2 & Kenneth Bennett1
1University of Wisconsin-Milwaukee, 2VA San Diego Healthcare System

Affective information tends to be processed preferentially, biasing perception, attention, and memory. Recently, our group has shown using both behavioral and neural measures that threat information more readily gains access to working memory, even when task-irrelevant (Stout et al., 2013; 2015). Like threat, reward also impacts cognition; however, less is known about how task-irrelevant reward impacts working memory. In two studies we examined whether reward distracters similarly gain unnecessary access to working memory. We first trained participants that particular colors were associated with reward or no reward. We then assessed working memory performance and filtering using a change detection task that included two neutral targets along with either reward distracters, no-reward distracters, or no distracters at all. Both studies included behavioral measures of working memory storage. In Study 2 we also measured contralateral delay activity (CDA), an event-related potential that indexes the number of items stored in working memory. In contrast to threat, we found that reward distracters did not impair working memory performance for targets or result in a larger CDA. Thus, our results indicate that reward distracters are effectively gated from entering working memory. These findings are consistent with a small number of recent studies also highlighting the lack of impact on reward working memory. We will discuss the possible differential impact of threat and reward on working memory and the relevance of this for psychopathology.

LOOKING AT THE BRIGHT SIDE OF LIFE: HOW OPTIMISTIC EXPECTANCES AFFECT VISUAL ATTENTION
Laura Kress, Mirko Bristle & Tatjana Aue
University of Bern
Optimism bias and positive attention bias both have crucial implications for mental health. So far they have only been examined separately. To understand the mechanisms underlying both biases it is important to investigate causal relationships between them. In two experiments we tested the hypothesis that optimism expectancies causally influence attention deployment. In each trial optimistic or pessimistic expectancies regarding future rewards and punishments were induced, followed by a visual search task measuring participants’ attention to rewarding and punishing target stimuli. Reaction times, eye gaze behavior, and pupil diameter served as dependent variables. In both experiments manipulated optimistic expectancies biased participants’ attention toward reward and away from punishment. In Experiment 2 manipulated pessimistic expectancies also biased participants’ attention toward punishment and away from reward. However, even in this case optimistic expectancies had a stronger effect on attention deployment. Research has shown that people selectively update expectancies into an optimistic but not into a pessimistic direction – a key component in the maintenance of optimism bias. This updating asymmetry can be explained by our findings, which show that people selectively attend to rewarding versus punishing evidence when they are optimistic. The current data might therefore help to clarify why optimistic expectancies are hard to overcome. These mechanisms underlying optimism and attention bias might ultimately explain how both are related to benefits in mental health.

ANGRY FACE BIAS SOCIAL ANXIETY: HOW MORAL INTEGRITY SHAPES PROCESSING OF FACIAL EXPRESSIONS OF EMOTION
Lotte van Dillen1, Wilco van Dijk1, Mark van Rotteveel2 & Dorien Enter1
1Leiden University, 2University of Amsterdam, 3Radboud University
People derive their sense of belonging from perceptions of being a moral person. Using eye-tracking and EEG, we examined how moral integrity threats versus affirmations influence selective avoidance of social threat, and how this varies with individual differences in social anxiety. Participants retrieved a memory of a past immoral, moral, or neutral act and then viewed angry, happy, and neutral faces, while we recorded their pupil dilations (study 1, N = 82), late positive potentials (study 2, N = 62), and gaze behaviour (study 3, N = 59). In addition, we administered the Liebowitz Social Anxiety Scale (1987). When their moral integrity was threatened, participants displayed greater pupil dilations and enhanced late positive potentials to angry compared to neutral or happy faces, but at the same time fixated less on angry compared to happy or neutral eyes, thus displaying selective avoidance of social threat. This pattern was enhanced with increasing social anxiety. Following a moral affirmation, however, participants showed reduced pupil dilations, as well as smaller positive potentials, and no longer selectively avoided the eyes of angry faces, regardless of individual differences in social anxiety. These results suggest that both low and high socially anxious people rapidly adjust their social gaze behaviour in response to threats and affirmations of their moral integrity, pointing to the importance of the social context when considering affective processing biases.

SAME OR DIFFERENT? MAPPING COGNITIVE BIASES TO EMOTIONAL STIMULI IN ANXIETY AND DEPRESSION
Thalia Richter1, Andrey Markus1, Limor Lichtenstein-Vidne1, Tatjana Aue2, Gal Richter-Levin1 & Hadas Okon-Singer1
1University of Haifa, 2University of Bern
Anxiety and depression are distinct psychiatric diagnoses. However, significant overlap exists in terms of high comorbidity, shared symptoms and similar treatment. Recent evidence suggests that anxiety may be related to dysfunctions in automatic cognitive processes, while depression may be associated with dysfunctions in later and more elaborated stages of cognitive processing. The goal of the current project was to rigorously examine possible differences in cognitive biases using a comprehensive test battery and advanced non-linear analysis tools. We focused on attention, memory, interpretation, and expectancy biases, and their relations to cognitive control. Each bias was examined by a prevalent paradigm, with modifications allowing it to test both automatic and non-automatic reactions. Preliminary results with participants characterized by high/low sub-clinical levels of depression and/or anxiety replicated previous findings among controls. Importantly, they further show abnormal pattern of reactions among anxious and depressed participants, as manifested by differences between groups both in early stages of processing and in late stages. These differences include different implicit remembering of emotional content, enhanced expectancy to negative events and tendency to interpret ambiguous situations as negative. These findings are expected to shed light on deficient processes that differ between anxiety and depression, leading to more targeted therapies.

SOCIAL CUES IN HUMAN VOICES
Chairs: Romi Zäske1 & Sascha Frühholz2
1Jena University Hospital, 2University of Zürich
Social interactions are guided by the ability to extract speaker information from their voices, even beyond the linguistic content of speech. For instance, based merely on the sound of the voice healthy listeners form impressions about a speaker’s geographical background, recognize a speaker's identity or affective state across various utterances. Here we discuss recent neuroimaging research on the neural mechanisms that underlie the perception, learning and recognition of non-linguistic vocal information. Specifically, the symposium comprises four presentations, each covering a major domain of recognizing social information in voices, such as own and foreign accents (Where does the speaker come from?), speaker identity (Who is speaking?), speaker familiarity (Have I heard this voice before?), and emotional information about the speaker (Is this person angry at me?). The symposium includes scientific work from experiments both including healthy volunteers and from patient populations. Decoding and recognizing this non-linguistic information from voices is very important as it allows adapting our behavior in social interactions. In patients, by contrast, difficulties to selectively and accurately recognize this information can lead to social impairments. Overall, the symposium aims at demonstrating the diversity of social cognition from non-linguistic vocal cues and contributes to our understanding of the cognitive and neural mechanisms of the social brain.

LINGUISTIC "FIRST IMPRESSIONS": ACCENTS AS CUE TO PERSON PERCEPTION
Patricia Bestelmeyer
Bangor University
Accents provide information about the speaker’s geographical, socio-economic, and ethnic background. Qualitative research in applied psychology and sociolinguistics suggests that we generally prefer our own accent to other varieties of our native language and attribute more positive traits to it. Despite the widespread influence of accents on social interactions, educational and work settings the neural underpinnings of this social bias toward our own accent and, what may drive this bias, are unexplored. This talk will discuss recent neuroimaging results which provide support for a neural marker for the bias associated with accents and show that the neural response to speech is partly shaped by the geographical background of the listener. Furthermore, results from behavioral experiments employing the implicit association task suggest that the own-accent bias is an implicit preference of speakers who sound like us and that this bias is resistant to change even with extended exposure to the out-group accent.
FMRI CORRELATES OF VOICE LEARNING AND RECOGNITION INDEPENDENT OF SPEECH CONTENT

Romzi Zäske1, Bashar Hasan2 & Pascal Belin3
1Jena University Hospital, 2Newcastle University, 3University Aix Marseille

Listeners can recognize newly learned voices from previously unheard utterances, suggesting the acquisition of high-level speech-invariant voice representations during learning. Using fMRI we investigated the anatomical basis of speech-invariant voice learning and recognition. To this end listeners studied unfamiliar voices from short sentences and subsequently classified studied and novel voices as “old” or “new” in a recognition test. To disentangle stimulus-invariant and stimulus-dependent learning, during the test phase we contrasted a “same sentence” condition in which listeners heard speakers repeating the sentences from the preceding study phase, with a “different sentence” condition. Voice recognition performance was above chance in both conditions although, as expected, performance was higher for same than for different sentences. During study phases activity in the left inferior frontal gyrus (IFG) was related to subsequent voice recognition performance and sentence condition, suggesting an involvement of the left IFG in the interactive processing of speaker and speech information during learning. Importantly, at test reduced activation for voices correctly classified as “old” compared to “new” emerged in voice-sensitive areas of the right posterior superior temporal gyrus (STG), inferior/middle frontal gyri (IFG/MFG), medial frontal gyrus, and the left caudate, independent of sentence condition during learning. Importantly, at test reduced activation for voices correctly classified as “old” compared to “new” emerged in voice-sensitive areas of the right posterior superior temporal gyrus (STG), inferior/middle frontal gyri (IFG/MFG), medial frontal gyrus, and the left caudate, independent of sentence condition, suggesting a role of both temporal voice-selective areas and extra-temporal areas in the explicit recognition of learned voice identity independent of speech content.

BEHAVIORAL AND NEURAL MECHANISMS OF DEVELOPMENTAL PHONAGNOSIA

Claudia Roswandowitz & Katharina von Kriegstein
Max Planck Institute for Human Cognitive and Brain Sciences

Human voice recognition is critical for social communication. Recently, a rare disorder, developmental phonagnosia, which describes the inability to recognize a speaker’s voice, has been discovered. In this talk, I will present behavioural and neuroimaging studies on two well-defined cases of developmental phonagnosia, both 32 years old. AS’s behavioral profile suggested an apperceptive phonagnosia where the analysis and integration of acoustic voice features is impaired while the semantic association to a voice is intact. SP’s profile was indicative of an associative phonagnosia. His deficit is characterized by difficulties in associating semantic information to a voice, while acoustic voice analysis is intact. In line with their behavioral profiles, we found distinct malfunctioned brain mechanisms in AS and SP. In apperceptive phonagnosia, right-hemispheric auditory voice-sensitive regions showed lower responses for vocal versus non-vocal sounds and for speaker versus speech recognition. In associative phonagnosia, the connectivity between voice-sensitive and supramodal regions was reduced during speaker versus speech recognition. Our findings confirm the existence of developmental phonagnosia as a modality-specific disorder. They also show that there are two different behavioral subtypes of developmental phonagnosia, i.e. apperceptive and associative phonagnosia. Further, we identified distinct brain areas and networks, which were closely related to the behavioural profiles of apperceptive and associative phonagnosia.

RECOGNIZING EMOTIONS FROM NORMAL AND FROM WHISPERED VOICES

Sascha Frühholz
University of Zürich

Recognizing emotional signals in our environment is important for adaptive behavior. These emotional signals are recognized on many sensory channels, but specifically also in vocal signals. Recent studies identified a distributed network of brain areas underlying the perception of vocal emotions in normally phonated vocalizations. However, vocal emotions are sometimes and in certain contexts also expressed in a whispered tone, such as a fearful whisper in a threatening environment. Here, I will present new data about how the neural system recognizes emotions from whispered vocalizations. Whispered vocalizations are extremely impoverished in terms of their acoustic quality, thus challenging the human neural system to accurately perceive emotions expressed in this voices. Our data show, first, that emotions from normal voices are decoded in regions of the auditory cortex that mainly decode spectral voice information based on salient pitch information. Second, emotions from whispered voices seem to be decoded in a compensatory neural network largely outside the core auditory system in frontal brain regions and in higher-level auditory regions that mainly decode temporal voice information as the only available information in whispered voices. Third, based on a connectivity analysis we also have shown that recognizing emotions from whispered voices requires information exchange in a complex and large-scale neural network. Taken together, emotions can be recognized from whispered voices, although less accurate and only at the costs of considerably neural compensation mechanisms.

VASCULAR FACTORS IN HEALTH AND DISEASE: AN INTRODUCTION TO INNOVATIVE METHODS FOR PSYCHOPHYSIOLOGICAL RESEARCH

Chair: Julian Thayer
The Ohio State University

Vascular factors seem to play an important role in many cardiometabolic diseases such as hypertension and diabetes. Against this backdrop the present symposium seeks to provide an introduction to a diverse range of approaches to the measurement of vascular factors and their implications for health and disease. The first paper introduces a new approach to estimating the vascular branch of the baroreflex using impedance cardiography. This paper shows that the method is viable and that low fit persons show less vascular baroreflex sensitivity compared to high fit persons. The second paper used the hemodynamic profile-compensation deficit model to examine ethnic differences in vascular response to an orthostatic challenge. This paper shows that African Americans (AA) have greater vascular response that is not compensated by a commensurate decrease in cardiac output compared to European Americans (EA). The third paper examined the effects of discrimination and hostility on alpha- and beta-adrenergic receptor sensitivity in AAs. This paper found that discrimination and hostility interacted to predict beta-adrenergic but not alpha-adrenergic receptor sensitivity. The final paper examined ethnic differences in endothelial-dependent arterial dilation using reactive hyperemia. This paper reports that AAs have smaller nitric oxide-mediated vascular response compared to EAs. This unique set of papers provides an overview of a diverse set of techniques that can be used to illuminate the complex interplay between vascular function and important psychophysiological factors.

TIME DOMAIN MEASUREMENT OF THE VASCULAR AND MYOCARDIAL BRANCHES OF THE BAROREFLEX: A VALIDATION STUDY IN PHYSICALLY ACTIVE VERSUS SEDENTARY INDIVIDUALS

Gustavo Reyes del Paso1, Pablo Coba González2, Elisabeth Ruiz-Radial1, María Martín-Vázquez1, DeWayne Williams2 & Julian Thayer2
1University of Jaén, 2The Ohio State University

This study tests the spontaneous sequence method for the evaluation of the cardiac, vasomotor and myocardial branches of the baroreflex. Systolic blood pressure (SBP), inter-beat interval (IBI), stroke volume (SV), pre-ejection period (PEP), and Total Peripheral Resistance (TPR) were continuously recorded in 33 physically active and 25 sedentary participants at rest and during a mental arithmetic task. Sequences of spontaneous covariation between SBP and IBI (for the cardiac branch), SV and PEP (for the myocardial branch) and TPR (for the vasomotor branch) were located. Slope of the regression line between values in the sequences produced an estimate of baroreflex sensitivity (BRS) and the proportion of progressive SBP changes that elicited reflex-modulations yielded an estimate of baroreflex effectiveness (BEI). The fit group showed greater BRS in the three branches than the sedentary group. Cardiac and vasomotor BEI decreased during the arithmetic task in the sedentary group but not in the active one. Only cardiac BRS decreased during the arithmetic task. In conclusion, the method appears appropriate for the simultaneous assessment of the three baroreflex branches. The assessment of vascular branch of the baroreflex may have prognostic relevance in both psychophysiological research and the development of hypertension or arteriosclerosis diseases.
ETHNIC DIFFERENCES IN HEMODYNAMIC PROFILE AND COMPENSATION DEFICIT TO ORTHOSTATIC CHALLENGE: EVIDENCE FOR THE "CARDIOVASCULAR CONUNDRUM" IN AFRICAN AMERICANS

Cristina Ottaviani1, LaBarron Hill2, DeWayne Williams3 & Julian Thayer1
1Sapienza University of Rome, 2Duke University Medical Center, 3The Ohio State University

African Americans (AA) have higher rates of hypertension and hypertension-related disorders than European Americans (EA). A growing literature suggests that AAs may show a paradoxical pattern of elevated peripheral resistance and elevated vagally-mediated heart rate variability (vmHRV). In the present study we utilized the hemodynamic profile (HP)-compensation deficit (CD) model to examine ethnic differences in cardiovascular responses to orthostatic challenge in a sample of healthy, young AAs (n=24) and EAs (n=31). Hemodynamics [cardiac output (CO) and total peripheral resistance (TPR)] and heart rate were recorded continuously during a 5 minute seated baseline, a 5 minute stand, and a 5 minute seated recovery. HP (higher values indicate more vascular response) and CD (higher values indicate increased TPR that is not associated with compensatory decreased CO) as well as the log of high frequency HRV derived from spectral analysis were calculated for the stand and seated recovery conditions. During the stand condition, AAs had greater HP [t(52)=2.95, p=0.005] and CD [t(52)=2.01, p=0.05] as well as greater vmHRV [t(50)=2.36, p=0.02] compared to EAs. These results suggest that AAs have greater vascular responses to orthostasis that are not adequately compensated by either decreased CO or decreased vmHRV. These findings provide further support for the "cardiovascular conundrum" pattern that we have previously identified in AAs and help elucidate the physiological basis of the health disparity in hypertension and related disorders in AAs.

SYNERGISTIC IMPACT OF PERCEIVED DISCRIMINATION AND HOSTILITY ON ADRENERGIC RESPONSIVITY

LaBarron Hill1, Andrew Sherwood2, James Blumenthal1 & Alan Hinderliter3
1Duke University Medical Center, 2Department of Psychiatry and Behavioral Sciences Medicine, 3University of North Carolina

Racial discrimination is increasingly recognized as an important factor in cardiovascular disease risk among African Americans. There is significant overlap between perceived discrimination (PD) and hostility (HO), an established predictor of vascular dysfunction and CVD mortality. Amid growing evidence that discrimination also is associated with vascular impairment, the present study sought to examine the effects of PD and HO on adrenergic receptor responsiveness. In a sample (N=57) of African American adults, zα- and β-adrenergic receptor responsiveness were assessed via the requisite change in either blood pressure, or heart rate following consecutive bolus doses of phenylephrine and isoproterenol, respectively. Lifetime perceived discrimination was measured using the Perceived Discrimination Scale, and hostility was assessed using the Cook-Medley hostility scale. PD was correlated with HO (r =.50, p =.001), and both HO (r =.28, p =.033) and lifetime perceived discrimination (r =.33, p =.001) were significantly associated with β- but not α- adrenergic responsiveness. Additionally, PD emerged as a significant predictor of β- adrenergic receptor responsiveness and this effect remained robust after HO was included in the model. Moderation analysis further revealed that the association between PD and β-adrenergic receptor responsiveness was strongest among those with higher hostility. These findings suggest that the effects of PD on vascular function is due in part to blunted β-adrenergic receptor responsiveness and may be compounded by other negative psychosocial traits.

ETHNIC DIFFERENCES IN ENDOTHelial-DEPENDENT ARTERIAL DILATION: FURTHER UNRAVELING OF THE CARDIOVASCULAR CONUNDRUM

DeWayne Williams1, LaBarron Hill2, Julian Koenig1, Gaston Kapuku1 & Julian Thayer1
1The Ohio State University, 2Duke University Medical Center, 3Georgia Health Sciences University

African Americans (AAs) show early signs of vascular dysfunction, which leads to greater blood pressure (BP) mediated by total peripheral resistance (TPR) elevations, compared to European Americans (EAs). AAs also have higher frequency heart rate variability (HF-RRV) at rest in comparison to EAs. However physiological mechanisms underlying this counterintuitive pattern of findings called the Cardiovascular Conundrum, are not yet understood. Thus, the following study explores ethnic differences in endothelial-dependent arterial dilatation (EDAD), which represents nitric oxide mediated vasodilation, in a sample of 306 individuals (160 AAs). Baseline hemodynamics and heart rate were measured using an impedance cardiomogram while participants rested in the supine position for 15 minutes. Resting-state mean arterial pressure (index of BP), TPR, and HF-RRV (0.15-4 Hz) was calculated. Artery diameters were calculated via an automated border detection system. EDAD was expressed as percent change of brachial artery diameter to reactive hyperemia induced by pressure cuff constriction and release, with lower scores reflecting less EDAD. Directional t-tests showed that in comparison to EAs, AAs had higher resting TPR (p < .001), BP (p < .001), and HF-RRV (p = .002). AAs also had less EDAD (p = .042) compared to EAs. Our data fit the previously identified Cardiovascular Conundrum, and novel results showed AAs showed lesser EDAD compared to EAs. Therefore, NO may be a primary target in helping minimize the mortality rate from CVD and other related diseases amongst AAs.
Mechanistic approaches to connecting the biological and the psychological have gained much popularity in recent times. In this talk, I contend that in addition to mechanisms, what is needed for deeper understanding of psychological phenomena are causal theories and strong or risky tests of such theories. The risky test, is or approximates an experimental design and narrows the number of interpretive possibilities regarding causality. The ultimate risky test provides the opportunity to falsify and reject a theory. In recent years, despite an exponential increase in scientific literature that depict neuroscientific phenomena (e.g., biomarkers) in relation to psychology using a range of methodologies, statistical models, and sample sizes, much remains unknown about the relationship between these two domains. This is because (1) in studies involving humans, often true experimental manipulations to understand mechanisms cannot be performed due to ethical constraints, and (2) the mechanisms themselves are frequently incomplete or unknown. While mechanisms may provide a useful starting point, advancing further will require elegant study designs, strong theories, and risky tests. Indeed, these methods will provide a way to iterate and refine our understanding of the mechanisms and psychological phenomena being studied in the process. I will discuss two examples from psychopathology using psychophysiology – depression and substance use – using this way of thinking, and finish by suggesting potential ways for research frameworks to incorporate such methods.

THE PHILOSOPHY OF RDOC: CONSTRUCTS, UNITS OF ANALYSIS, AND PSYCHOPATHOLOGY

Bruce Cuthbert & Sarah Morris
National Institute of Mental Health

In the first issue of Psychophysiology, Editor Albert Ax wrote, “The union of classical physiology and psychology is handicapped by the failure of constructs of one discipline to be compatible with those of the other. Psychophysiology provides a method for bringing both physiological and psychological aspects of behavior into a single field of discourse by which truly organismic constructs may be created.” Despite remarkable advances in such areas as neuroimaging and genomics, his statement remains as pertinent today as it was 53 years ago.

Problems of reductionism and assumptions about 1:1 relationships between biological measures and behavior or mental events continue to pose problems both for basic science and psychopathology. However, recent advances in the philosophy of science provide important perspectives on how to integrate new technology with new ways of thinking about the scientific issues. Echong Ax’s seminal dictum, the NIMH Research Domain Criteria (RDoC) project was initiated in 2009 to provide a framework for evaluating psychophysiological constructs as they are translated to an understanding of psychopathology. This presentation outlines the essential features of the RDoC concept, with examples to illustrate the way in which RDoC constructs were conceived and designed; their dimensional aspects; and the emphasis upon developmental trajectories and environmental influences in studying constructs. The latter are particularly important in considering causal explanations and the relationships between psychological and biological phenomena.

MECHANISTIC SCIENCE: A NEW PHILOSOPHY OF SCIENCE TO LINK PSYCHOLOGICAL AND BIOLOGICAL PHENOMENA

Paul Sharp1 & Joel Thomas2
1University of North Carolina at Chapel Hill, 2University of Illinois at Urbana Champaign

The nomological network approach developed by Cronbach and Meehl in the 1950s has remained the status quo philosophy of science for psychology despite several lingering ambiguities regarding how to define constructs, how they differ from biological phenomena, and how findings across these areas may be linked. More recently, philosophers of science examining the process of scientific discovery in biology and cognitive neuroscience have advanced a mechanistic philosophy of science that both complements and diverges from the nomological network approach in significant ways. The mechanistic approach seeks to understand living systems as composed of mechanisms structures defined by their component parts, operations, and organization, whose orchestrated functioning is responsible for a given phenomenon. Strengths of the mechanistic approach include (1) the use of units of organization which, unlike levels of analysis, serve to parse the complexity of psychological phenomena in a principled way, (2) the ability to counter biological reductionism through a coherent articulation of the difference between psychological and biological perspectives of a unified mechanism and (3) the potential to serve as a common framework for multidisciplinary collaboration. These benefits of the mechanistic framework will be demonstrated through exemplars of extant mechanistic explanations, and how such explanations contrast with explanations that emanate from the nomological network approach.

8:30 a.m. – 10:00 a.m.
Symposium 17

GETTING SOCIAL – THE IMPACT OF SOCIAL PRESENCE ON OUR PERCEPTION, THOUGHTS AND BEHAVIOR

Chairs: Sebastian Schindler1 & Johanna Kissler2
1Ghent University, 2Bielefeld University

Humans, as social beings, are strongly influenced by their family, peers, and sometimes even by total strangers. Effects of social presence can be shaped by physical characteristics as well as mere beliefs about a communicative situation. In this symposium, studies utilizing behavioral measures and peripheral and central nervous physiology reveal how social meaning is constructed and how social attributions alter stimulus processing. First, attaching self-reference to words elicits a self-positivity bias, whereas an “other-orientation” amplifies reactions towards other-related positive words. Further, increased individual semantic interference reflects shared mental models in joint word production. In communicative scenarios, a sender’s physical or virtual presence induces earlier and more sustained emotional responses in a recipient. Moreover, the notion of being evaluated by another person leads to dramatically increased processing of language feedback, which is due to recruitment of an extensive “social brain” network and likely accounts for extremely accurate memory for social feedback. Finally, effects of self-presentation on EEG delta-beta phase-amplitude coupling occur in low - but not high - social anxious participants as a likely correlate of affective self-regulation in social situations. Together, results specify effects of social presence and social attributions on human physiology and behavior. They highlight how virtual and real others have multiple impacts on human information processing, as we seek affiliation and approval from others.

YOU-ME-WE: SELF-OTHER-REFERENCE AND ITS IMPACT ON THE APPRAISAL OF EMOTIONAL INFORMATION IN OFFLINE COMMUNICATION

Cornelia Herbert
University of Ulm

We rapidly discriminate emotional from neutral stimuli, quickly identify stimuli of relevance to the self and spontaneously respond to other people’s emotions to synchronize and empathize with our interaction partners. This series of studies addresses how self-reference and other-reference influence the appraisal of verbal stimuli. Other-reference was experimentally manipulated across studies by asking participants to think of either close or virtual others while appraising other-related emotion words in reference to own feelings. Behaviorally, a processing advantage for self-related positive stimuli is found, indicating facilitated access to own emotions particularly during evaluation of self-related stimuli. This self-positivity bias extends to other-related positive stimuli when passionately in love, whereas appraisal of other-related stimuli is basically unaffected when relating other-related stimuli to other close but also virtual others. Crucially however, regarding bodily peripheral-physiological signals, facial muscle activity appears more pronounced during the evaluation of other-related positive stimuli supporting sociality effects even in situations where others are only imagined. Similarly, inhibiting facial expressions or increasing bodily awareness and physiological arousal have little effects on the evaluation of self-related stimuli but affect appraisal of emotional stimuli describing other people’s emotions. Taken together, the present results have implications for understanding emotional communication in situations without direct face to face contact.
Prehension and emotional processing, underlining the importance of social-com-remotely located partner was naming pictures, suggesting that lexicalization pro-

In language comprehension experiments we compared communicative situations in which videos of a speaker were presented with isolated word processing. When the speaker was seemingly addressing the participant electrophysiological re-

In the age of virtual communication, the source of a message is often not directly perceived but rather implied. Still, effects of the supposed communicative partner on the neural mechanisms of processing language content are poorly characterized. Therefore, the present research investigates how attributed sender identity and expertise impacts the cortical processing of evaluative feedback. In a series of ERP studies, participants expected to receive written evaluative feedback from different senders. These senders were either humans or computers, both varying in their ascribed competence to give social feedback. Putatively, senders gave online written positive, negative, or neutral personality feedback while high-density EEG was recorded. In reality, all conditions contained random but counterbalanced feedback. ERP results consistently showed rapid sender effects, starting with the P2 and sustaining until the LPP. Putative human-generated feedback was substantially amplified, and this amplification was larger for emotional feedback. Emotion main effects started after sender effects. Source estimations revealed sender differences in visual, temporal and frontal regions, as well as the posterior cingulum. These findings show that attributed sender identity dramatically enhances feedback-processing and specifies the cortical dynamics. Our brains differen-

Social motivation is a cornerstone of being human. Its importance can be seen in communicative situations, where who is communicating can be more important than what is said. Recent ERP studies revealed that an attributed ‘human’ sender dramatically amplifies processing of evaluative word feedback. Still, little is known about the brain regions activated by this scenario or its cognitive conse-

There is a burgeoning interest in unravelling the biological mechanisms impli-

Inhibitory control refers to the ability to suppress or modulate behavioral responses and impulses based on task demands. This symposium will provide an integrative overview on inhibitory control as a key biobehavioral process by including presentations reflecting differing perspectives on this construct. First, Wessel will provide an overview of neural circuitry and neurophysiological markers of motor inhibition, engagement of these systems in novelty processing, and discuss inhibition mechanisms in the context of broader theories of cognitive control. Beuachaine will describe a neurodevelopmental model of disinhibition mechanisms, including interactions between inhibitory and affective processes, as related to externalizing psychopathology. Wilson will present data from a longitudi-

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In language comprehension experiments we compared communicative situations in which videos of a speaker were presented with isolated word processing. When the speaker was seemingly addressing the participant electrophysiological re-

In the age of virtual communication, the source of a message is often not directly perceived but rather implied. Still, effects of the supposed communicative partner on the neural mechanisms of processing language content are poorly characterized. Therefore, the present research investigates how attributed sender identity and expertise impacts the cortical processing of evaluative feedback. In a series of ERP studies, participants expected to receive written evaluative feedback from different senders. These senders were either humans or computers, both varying in their ascribed competence to give social feedback. Putatively, senders gave online written positive, negative, or neutral personality feedback while high-density EEG was recorded. In reality, all conditions contained random but counterbalanced feedback. ERP results consistently showed rapid sender effects, starting with the P2 and sustaining until the LPP. Putative human-generated feedback was substantially amplified, and this amplification was larger for emotional feedback. Emotion main effects started after sender effects. Source estimations revealed sender differences in visual, temporal and frontal regions, as well as the posterior cingulum. These findings show that attributed sender identity dramatically enhances feedback-processing and specifies the cortical dynamics. Our brains differen-
THE BRAIN’S MOTOR INHIBITION NETWORK AND ITS ROLE IN SURPRISE PROCESSING

Jan Wessel
University of Iowa

The neural circuitry underlying motor inhibition is one of the best-characterized mechanisms of cognitive control. Motor inhibition, e.g., in the stop-signal task, involves the pre-supplementary motor area (preSMA), the rostral inferior frontal cortex (rIFC), and the subthalamic nucleus (STN). In the first half of this talk, I will describe established neurophysiological markers of motor inhibition. First, I will outline how the extracranial P3 ERP to stop-signals indexes the speed of motor inhibition between and within subjects, across two large samples. Then, I will describe how STN beta-band activity relates to suppression of the cortico-motor system during stopping. Finally, I will provide causal evidence for the involvement of the rIFC in motor inhibition from an intracranial direct-electrical stimulation study. In the second half of the talk, I will then describe how this same neural circuitry is activated by surprising perceptual events. Such events do not always necessitate stopping, yet they lead to a ubiquitous slowing of response times. I will review evidence showing that this motoric slowing is mediated by the motor inhibition circuitry, and will present data from two new studies: 1) an intracranial stereotactic EEG study showing that surprising events and stop-signals activate overlapping areas of preSMA and rIFC; 2) behavioral study showing that surprising perceptual events can benefit motor inhibition. Taken together, these findings place the neural circuit for motor inhibition at the center of a wider, overarching theory of cognitive control.

NEURAL MECHANISMS OF DISINHIBITION AND LINKS TO EXTERNALIZING BEHAVIOR ACROSS DEVELOPMENT

Theodore Beauchaine
Ohio State University

In this talk, I present neuroimaging evidence from our lab and others that trait impulsivity—expressed early in life as the hyperactive and combined presentations of ADHD—arises from multifactorially-determined deficiencies in subcortical dopamine responding in anticipation of incentives. This pattern of neural responding imbues psychological states (irritability, discontentment) that motivate disinhibited behavior (hyperactivity, impulsivity). Through complex interactions with (a) aversive motivational states (e.g., fear, anxiety) that arise from largely independent subcortical systems, (b) emotion-dysregulatory mechanisms that arise from poor top-down, cortical modulation of subcortical neural function, and (c) environmental risk factors that shape and maintain emotion dysregulation, trait impulsivity confers vulnerability to increasingly severe externalizing behaviors across development. Different maturational time courses for subcortical vs. cortical structures result in shifts in neural substrates of disinhibition across development, with subcortical dysfunction playing a larger role in childhood, and cortical dysfunction playing a larger role in adolescence/adulthood. Thus, cortically-mediated deficits in inhibitory control take on increasing importance in the expression of externalizing behavior across development. This model highlights the importance of identifying transdiagnostic neural vulnerabilities to psychopathology, and suggests that progression along the externalizing spectrum is a complex ontogenic process.

RISK FOR AND CONSEQUENCES OF SUBSTANCE USE DISORDERS ON MULTIMODAL INDICATORS OF INHIBITORY CONTROL ASSESSED FROM PREADOLESCENCE INTO EARLY ADULTHOOD

Sylia Wilson, Stephen Malone, Noah Venables, Matt McGue & William Iacono
University of Minnesota

Substance use disorders (SUDs) are characterized by deficits in inhibitory control. In the present study, we examined developmental trajectories of multiple indicators of inhibitory control, including psychophysiological, neurocognitive, and behavioral deviations, among individuals with versus without alcohol, cannabis, and other drug disorders, and nicotine dependence. Participants were a population-based sample of 1512 male and female twins from the Minnesota Twin Family Study, prospectively assessed at ages 11, 14, 17, 20, and 24. Indicators of inhibitory control included antisaccade task performance assessed using eye-tracking recordings (infrared and electrooculogram), visuospatial working memory accuracy, and self-reported behavioral (dis)constraint. Multilevel modeling analyses that accounted for the repeated measures and nested nature of the family data were used to examine premorbid (age 11) inhibitory control, as well as changes in inhibitory control from ages 11 to 24. Premorbid inhibitory control deviations, reflected in antisaccade and working memory errors, and behavioral constraint, were evident at age 11 and predicted the subsequent development of SUDs. In addition, individuals with SUDs failed to show developmentally normative improvements in inhibitory control, and/or showed decrements in inhibitory control over time. Thus, deviations in inhibitory control processes precede the onset of SUDs and may confer risk for their development, but SUDs also exacerbate preexisting deficits in inhibitory control and have deleterious consequences on functioning.

A CROSS-DOMAIN NEUROCLINICAL ASSESSMENT OF INHIBITORY CONTROL AS RELEVANT TO EXTERNALIZING PROBLEMS

Noah Venables1 & Christopher Patrick2
1University of Minnesota, 2Florida State University

Inhibitory control, the ability to resist or modulate impulses, is hypothesized to reflect an underlying (latent) trait liability that has important clinical implications. Poor inhibitory control (dissinhibition) is a hallmark feature of antisocial and substance use disorders, and is a risk factor for other mental and physical health problems as well. The current study further advances an integrative neuroclinical assessment of inhibition-dissinhibition through the use of indicators that span multiple domains of measurement including carefully selected self-report psychometric scales, behavioral performance measures from lab-based inhibitory control tasks (antisaccade, stop-signal, no-nogo, Stroop), and neurophysiological functioning indicators as assessed by P3 brain response amplitude across multiple cognitive task procedures. As predicted, variables from each distinctive measurement domain cohered to form domain-specific factors. Further, a three-factor model with one higher-order factor was fit to the data, with the higher-order bio-behavioral factor reflecting the systematic covariance across domain-specific inhibition-disinhibition factors. The biobehavioral operationalization of inhibition-dissinhibition effectively predicted externalizing problems (substance use and antisocial behavior) at levels exceeding behavioral or brain factors. Implications of a new, cross-domain conception of inhibitory control capacity as a referent for research on neurobiological mechanisms and clinical problems associated with poor inhibitory control are discussed.

8:30 a.m. – 10:00 a.m.
Symposium 19
TIME-FREQUENCY, SOURCE, AND CONNECTIVITY APPROACHES TO STUDY DYNAMIC RELATIONS BETWEEN MONITORING, CONTROL AND ANXIETY ACROSS DEVELOPMENT

Chair: Nathan Fox
University of Maryland - College Park

The ability to monitor internally or externally generated feedback and dynamically adapt one’s behavior is a cornerstone of human cognition. Research increasingly demonstrates that perturbations in performance monitoring and cognitive control are linked to the development and expression of anxiety. However, the exact relations between monitoring and anxiety across development and context remain unclear. This symposium presents cutting-edge research employing a variety of electrophysiological approaches to studying monitoring and control across development and as they relate to anxiety. Classic analyses of the error-related negativity (ERN) and theta power, as well as more advanced approaches employing connectivity-based measures, source localization, and single-trial relations between EEG and behavior will be presented. The relations between monitoring, control and anxiety will be discussed across development, with data from adults and children as young as 3 being presented. Additionally, the influence of social context on the performance-monitoring system will be offered as a unique experimental manipulation for studying both the development of anxiety in children and the expression of anxiety in adults. Collectively, the talks from this symposium illustrate the importance of studying relations between monitoring and anxiety from a variety of electrophysiological approaches and across development. Together, the papers from this symposium will reveal an emerging picture of the dynamic relations between monitoring, control and anxiety across development and context.
HEIGHTENED ERROR MONITORING WITHIN A SOCIAL CONTEXT MEDIATES LONGITUDINAL RELATIONS BETWEEN BEHAVIORAL INHIBITION AND ADOLESCENT SOCIAL ANXIETY

George Buzzell, Sonya Troller-Renfré, Heather Henderson, Daniel Pine & Nathan Fox
1University of Maryland - College Park, 2University of Waterloo, 3National Institute of Mental Health

The temperamental profile of behavioral inhibition (BI), characterized in infancy as increased reactivity and negative affect in response to novel situations, is linked to the development of social anxiety. However, not all children that are characterized as high in BI go on to develop anxiety. Increased sensitivity of the error monitoring system, as measured by the error-related negativity (ERN), has been shown to moderate the relations between BI and anxiety. However, the social context within which error monitoring occurs has not previously been considered. In the current investigation, we examined data from a longitudinal study of BI children by assessing children at an age-12 time point. These children had previously been characterized as high or low BI using laboratory assessments at ages 2 and 3. At 12 years, children performed a flanker task under two conditions, once while believing they were being observed by peers, the “social” condition, and once while not being observed. Child and parent assessments of social anxiety were assessed. Childhood BI was predictive of increased ERN amplitude for the social, compared to the non-social, condition. Further, changes in the ERN based on social context were found to partially mediate the relations between BI and social anxiety, but only insofar as increases in the social-ERN were associated with slowed responses following error trials (post-error slowing). The results suggest a novel mechanism linking childhood temperament, heightened error monitoring, and the development of social anxiety.

WHAT DO ERROR MONITORING BRAIN POTENTIALS TELL US ABOUT ANXIETY IN CHILDREN?

Jason Moser, Sharon Lo, Hans Schroder, Megan Fisher, Calli Jagoe & Catherine Durbin
Michigan State University

Interest in the relationship between anxiety and error monitoring brain potentials in children stems from robust associations observed between the two in adults and the possibility that error monitoring abnormalities might serve as risk markers for anxiety early in development. Indeed, some suggest that rapid error monitoring functions, as indexed by the amplitude of the error-related negativity (ERN), reflect anxiety risk whereas we have suggested that the ERN reflects the impact of anxiety on cognitive control-related error monitoring. In this talk, we present findings from three studies demonstrating that parent-reported childhood anxiety symptoms and physiological markers of anxiety (e.g., startle eye blink) generally relate to reduced error monitoring brain activity, as indexed by a smaller ERN, in young children ages 3–7 years. Interestingly, however, children ages 8 years and older tend to show the reverse association — greater anxiety related to larger ERN — but it is dependent on the type of anxiety symptoms and task. Finally, preliminary data from our family study further indicate that the ERN is not likely to serve as a familial risk marker for anxiety, but rather that parental anxiety symptoms might play a role in the anxiety-ERN relationship in children as they age. Together, the current findings paint a complex developmental picture of the nature of the relationship between anxiety and error monitoring such that age, type of anxiety symptoms, task and parental anxiety all contribute to shaping the impact of anxiety on cognitive control in children.

ERROR-SPECIFIC COGNITIVE CONTROL ALTERATIONS IN GENERAL ANXIETY DISORDER

James Cavanaugh, Alexandria Meyer & Greg Hajcak
1University of New Mexico, 2Florida State University, 3Stony Brook University

Trait anxiety is reliably associated with enhanced neural responses following errors. The Error-Related Negativity (ERN) has been related to a broader class of control signals, particularly via a common theta band denominator, but it is unknown whether worry relates to these alternative medial frontal metrics. Moreover, it is unclear if increased ERN in anxiety relates to altered cognitive control. Here we examined EEG activities in Generalized Anxiety Disorder (GAD, N = 39) and control (CTL: N = 52) participants during an executive control task. We leveraged a previously defined theta-band network to examine if an altered connectivity pattern in GAD underlies a differential implementation of cognitive control. GAD and CTL groups were reliably dissociated by both error- and conflict-related neural activity, in both the time and frequency (i.e. theta band) domains. Moreover, we demonstrate that ERN, error-related theta power, and the single trial correlation between theta and response time were unique predictors of GAD status. Overall, we were able to account for nearly 1/4 of the group variance and successfully classify GAD from control participants with 2/3 accuracy. Collectively, these findings suggest that multiple neural metrics of error processing may uniquely distinguish clinical anxiety from healthy individuals, and that mechanisms of control also differ in GAD; finally, these error-related neural measures have the potential to be sensitive and specific bio-heritabilities of anxiety.

MIDFRONTAL THETA POWER IN RESPONSE TO SOCIAL EVALUATIVE FEEDBACK: A CANDIDATE MARKER OF REJECTION SENSITIVITY?

Melle van der Molen
Leiden University

Recent evidence suggests that midfrontal theta oscillatory activity — originating from the midcingulate cortex — reflects a common mechanism implicated in the adaptive control of behavior. However, the role of theta oscillations in affective control processes (e.g., feelings of anxiety) remains largely under explored. In this talk, I will present a series of studies that have used the Social Judgment Paradigm to examine whether midfrontal theta power is a candidate neural marker of rejection sensitivity, a hallmark feature of a wide range of internalizing disorders (e.g., social anxiety, depression). In these studies, participants were led to believe that they had been evaluated by peers based on a first impression evaluation of their portrait photograph (evaluation: like/dislike) and during the experiment the participants were shown feedback from this peer evaluation. At the group-level we observed that theta power was highest when participants received unexpected rejection feedback. This increase in theta power could be source-localized to neural substrates that are part of the saliency and cognitive control networks (e.g., insula, dorsal anterior cingulate cortex). During this talk, I will show how this neural response is modulated by individual differences in social anxiety, fear of negative evaluation, and self-esteem. These findings should contribute to our understanding of midfrontal theta oscillations in the control of negative affect.
models from machine learning they allow clinically relevant predictions to be made with only a partial understanding of the underlying processes.

10:30 a.m. – 12:00 noon
**Invited Symposium**

**RECENT PROGRESS IN COMPARATIVE SOCIAL PSYCHOPHYSIOLOGY**

Chair: Claus Lamm  
University of Vienna

Recent years have brought increasing efforts in uncovering whether non-human animals possess social skills similar to those in humans, using a variety of behavioral, psychophysiological, and neuroscientific methods. The goal of this local co-organizer’s symposium is to highlight some of the recent advances in this domain. Thomas Bugnyar from the Department of Cognitive Biology of the University of Vienna will talk about his work on social emotions in common ravens (Corvus corax), a species now known for its extensive social skills. He will show how hormone sampling methods can be used to better understand the complex social behaviors of these animals. Ludwig Huber from the Comparative Cognition Unit of the Messeri Research Institute will showcase psychophysiological social cognition studies performed with dogs (Canis familiaris), another species known for highly advanced social skills, including the discrimination of emotions in humans. Leonida Fusani from the Department of Cognitive Biology and the Konrad Lorenz Institute of Ethology will demonstrate how heart rate telemetry and high-speed videography can be used to understand which components of the courtship displays of manakins are important for mate choice. Finally, Claus Lamm from the Social, Cognitive and Affective Neuroscience Unit of the University of Vienna will demonstrate recent progress on how combining behavioral investigations with ERP, fMRI and psychopharmacological approaches provides more mechanistic insights into human empathy, and how this may advance our understanding of empathy in non-human animals.

**TESTING RAVEN EMOTIONS: FROM BEHAVIOURAL AND HORMONAL CORRELATES TO COGNITIVE BIAS**

Thomas Bugnyar  
University of Vienna

Interest in animal emotions has recently gained momentum, going along with conceptual and methodological advancements. Operationalyzed as valenced arousal states, basic emotions such as distress, anger or anticipation are measured non-invasively via a combination of behavioral and physiological correlates. We here report on experiments on ravens, in which we combine such measures in ecologically meaningful contexts; additionally, we incorporate cognitive bias tests, i.e. how animals respond to ambiguous stimuli in discrimination tasks before and after an emotional event. In the first experiment, we tested whether non-breeding ravens - that tend to form groups around food sources – would express separation distress when temporarily removed from conspecifics. Results show that CORT levels increase in response to separation but only in those ravens that have ‘friends’ in the group. In the second experiment, we tested whether ravens seeing one of their ‘friends’ in anticipation of food would show behavioural and/or emotional contagion. Results indicate that witnessing a friend’s anticipation of food does not lead to behavioural contagion but positively affects the observers’ response to ambiguous stimuli, i.e. leads to optimistic judgments. Witnessing a friend’s expectation being violated, however, does not lead to ‘pessimistic’ judgments. Taken together, these findings illustrate the birds’ plasticity in emotional responses within the same paradigm. Ravens thus make a good candidate species to investigate emotional reactivity and selectivity, notably in the social domain.

**USING COMPUTATIONAL MODELLING TO LINK ACROSS LEVELS OF DESCRIPTION IN ADDICTION**

Quentin Huys  
University of Zurich/ETH Zurich

Computational Psychiatry reflects the increasing understanding that the complexity of issues in mental health require powerful analytical tools. Paralleling RDoC, the first insight arises from the partial independence between different levels of description: just as certain circuits are involved in multiple behaviour, algorithms can help achieve different computational goals. Computational models allow these levels to be related to each other and the consequences of dysfunctions at one level for function at another level to be inferred. As such, they are one path towards integrating the units of analysis. This has been most prominently achieved for the role of phasic dopaminergic signals in learning, and has allowed a wealth of insights into disorders including addictions and mood disorders. Computational models, however, also have highly practical applications in terms of processing the increasingly complex datasets arising in mental health research. The talk will informed models that link across levels of description can be used to extract the key underlying dimensions efficiently. In combination with agnostic
CARDIAC RESPONSES TOWARDS HUMAN FACIAL
EXPRESSIONS IN PET AND LAB DOGS
Ludwig Huber & Anjuli Barber
Messerli Research Institute

It has been hypothesized that dogs have developed specialized skills for decoding human communicative cues as a result of a long domestication process. However, individual experience collected during the years of living in the human household may have tuned and extended these skills. An important question in this regard is, if dogs only learned to exploit the sensory information provided by human faces or if they recognize and even share the expressed emotions. The ability to adaptively react to emotional expressions of group members is accompanied by specific neurophysiological processes, for example the activation of the limbic system via the stimulation of the amygdala. One method to measure such processes is heart rate (HR), which has been successfully used in various studies by now. The current study examined the cardiac responses of domestic dogs upon seeing faces of humans that differed with respect to emotional valence and arousal (angry, happy, sad, neutral). In addition, comparing lab and pet dogs we investigated the influence of experience with human faces on the cardiac response. We found that experience is a factor strongly influencing the cardiac response but that there is also habituation in the processing of different emotional expressions. We are discussing the results with respect to social development and responses but that there is also habituation in the processing of different emotional expressions. In addition, by comparing lab and pet dogs seeing faces of humans that differed with respect to emotional valence and arousal, we investigated the influence of experience with human faces on the cardiac response. We found that experience is a factor strongly influencing the cardiac response but that there is also habituation in the processing of different emotional expressions. We are discussing the results with respect to social development and consequences for social cognition and with the background that a better understanding of the cognitive and emotional processes of dogs is necessary for ensuring functional human-dog bonds and facilitate their well-being in the human environment.

THE COSTS OF SEXUAL ATTRACTIVITY: ENERGETICS OF THE ACRIBATIC COURTSHIP DISPLAYS OF MANAKINS
Leonida Fusani
University of Vienna

In a number of species, males perform elaborate and physically demanding displays to attract females and increase their reproductive success. Despite intense research on sexual selection in the last decades, the mechanisms behind the evolution of such complex displays are little understood. Golden-collared manakins (Manacus vitellinus) are small tropical passerine birds that are known for their acrobatic courtship displays. We studied the courtship behaviour of male manakins using a combination of methods from high-speed videography to heart-rate telemetry to understand which components of the display are important for mate choice and if females may be looking at physiological traits that indicate male quality. We found that manakins have extraordinary physiological and anatomical adaptations that allow them to perform their acrobatic displays, and that females prefer males that perform at times of millisecond faster than other males. We also showed that the acrobatic display is very costly in term of metabolic rate, and bring the males to the extreme limits of physiological capacities among vertebrates. Our results suggest that the courtship displays of male manakins indicate to females the overall quality of males in term of motor skills, neuromuscular coordination, and cardiovascular condition. However, recent data also suggest that the displays have an aesthetic value, opening a new perspective on the evolution of animal dances.

THE NEURAL MECHANISMS OF EMPATHY FOR PAIN – FROM SHARED ACTIVATIONS TO SHARED REPRESENTATIONS?
Claus Lamm
University of Vienna

Accumulating evidence from neuroimaging studies suggests that empathy for pain activates neural networks overlapping with those engaged during the first-hand experience of pain. This suggests that empathy is underpinned by neurocognitive functions equivalent to those involved in first-hand pain. However, since the relationship between brain activations and mental representations is not straightforward for methods such as fMRI, shared activations are insufficient to infer the presence of shared representations. I will report the results of a large-scale research program adopting a multi-level multi-method approach to gain a more detailed understanding of the neural mechanisms of affect sharing and empathy in humans. More precisely, we performed a series of experiments combining methods such as event-related potentials (ERPs), functional magnetic resonance imaging (fMRI) and psychopharmacological manipulations. The experimental design of these experiments entailed causal psychopharmacological manipulations of the first-hand experience of pain, by means of placebo analgesia and administration of the opioid antagonist. In order to investigate whether this also results in reduced empathy for pain. The results provide converging evidence that pain analgesia also reduces empathy, that this is supported by modulation of neural responses related to the affective-motivational component of pain, and that these effects may be linked to the endogenous opioid system. The implications of this finding for empathic responding in human as well as in non-human animals will be discussed.

3:00 p.m. – 4:30 p.m.
Symposium 20
NEW COMPUTATIONAL APPROACHES TO P300 RESEARCH IN HUMANS

Chairs: Bruno Kopp1 & Francisco Barcelo2
1Hannover Medical School, University of the Balearic Islands
2University of the Balearic Islands

The computational modeling of brain function using probability laws holds great promise in psychophysiology, yet its application to scalp recorded EEGs of cognition is still scarce. One prominent example is the late positive complex (LPC, P300) of the event-related brain potential (ERP), which has been linked to many cognitive domains (from perception to memory and decision-making) for over four decades of intensive research. Traditionally, the P300 is decomposed in two anatomically and functionally distinct sub-components: one with an anterior scalp distribution (P3a), followed by a second centro-parietally distributed one (P3b) at variably delayed latencies. Currently, the so-called ‘context updating’ model is the most widely accepted cognitive hypothesis on P300 function. However, this model mostly accounts for P3a data as related to strategic processes, whereas P3a results are described as the brain’s orienting response to novel or salient, mostly task-irrelevant, stimuli. While these two P300 sub-components have been variously linked to stimulus uncertainty, contextual surprise, and perceptual decision-making, to date there have been relatively few attempts to mathematically operationalize these constructs within an overarching computational theory. Here we present some remarkable insights derived from four computational models inspired in neuroimaging research on sexual selection in the last decades, the mechanisms behind the evolution of such complex displays are little understood. Golden-collared manakins (Manacus vitellinus) are small tropical passerine birds that are known for their acrobatic courtship displays. We studied the courtship behaviour of male manakins using a combination of methods from high-speed videography to heart-rate telemetry to understand which components of the display are important for mate choice and if females may be looking at physiological traits that indicate male quality. We found that manakins have extraordinary physiological and anatomical adaptations that allow them to perform their acrobatic displays, and that females prefer males that perform at times of millisecond faster than other males. We also showed that the acrobatic display is very costly in term of metabolic rate, and bring the males to the extreme limits of physiological capacities among vertebrates. Our results suggest that the courtship displays of male manakins indicate to females the overall quality of males in term of motor skills, neuromuscular coordination, and cardiovascular condition. However, recent data also suggest that the displays have an aesthetic value, opening a new perspective on the evolution of animal dances.

THE P300 AS A MODALITY-INDEPENDENT EVIDENCE ACCUMULATION PROCESS

Redmond O’Connell1 & Simon Kelly2
1Trinity College, 2City College of New York

Since its discovery in 1965, the classic P300 or ‘P3b’ has been strongly linked to the decision making process: it is evoked exclusively by task relevant events requiring decisions; it predicts signal detection on a trial-to-trial basis and its latency varies closely with reaction time under conditions where accuracy is emphasized as well as with factors affecting the duration of stimulus evaluation such as visual ‘noise’. However, there has been considerable disagreement regarding the precise functional role of the P3b. We have argued that part of this uncertainty arises from the problem of global signal summation in typical discrete ERP paradigms in which functionally discrete signals overlap and therefore cannot be readily disentangled. In our recent work we adopted the simple approach of eliminating sudden intensity transients in a target detection task and observed a gradually building centro-parietal positivity that exhibited precisely the same integrative threshold dynamics as the ‘decision variable’ signals previously reported in monkeys and predicted by computational models. We conducted a variety of empirical manipulations of this signal which have revealed that it is in fact functionally equivalent to the P3b. The current findings call for a novel view of the P3b component as a dynamically evolving decision process and a reinterpretation of some key findings pertaining to this signal including its relationship to response times, speed emphasis and prior information.
P300 AND THE BAYESIAN BRAIN HYPOTHESIS
Bruno Kopp1 & Antonio Kolossa2
1Hannover Medical School, 2Technische Universität Braunschweig

Empirical support for the Bayesian brain hypothesis, although of major theoretical importance for cognitive neuroscience, is surprisingly scarce. This hypothesis postulates that neural activities code and compute Bayesian probabilities. Here, we introduce an urn-ball paradigm to relate event-related potentials (ERPs) such as the P300 wave to Bayesian inference. Bayesian model comparison was conducted to compare various models in terms of their ability to explain trial-by-trial variations in ERP amplitudes at different points in time and over different regions of the scalp. Specifically, we were interested in dissociating specific ERP responses in terms of Bayesian updating and predictive surprise. Bayesian updating refers to changes in probability distributions given new observations, while predictive surprise equals the surprise about observations under current probability distributions. Components of the late positive complex (P3a, P3b, Slow Wave) provided dissociable measures of Bayesian updating and predictive surprise. Specifically, Bayesian updating yielded the best fit for the anteriorly distributed P3a. The updating of observational predictions accounted best for the posteriorly distributed Slow Wave. In addition, parietally distributed P3b responses were best fit by predictive surprise. These results indicate that the three components of the late positive complex reflect distinct neural computations. As such they are consistent with the Bayesian brain hypothesis, but all of these neural computations seem to be subject to non-linear probability weighting.

CENTROPARIETAL P300 AMPLITUDE PREDICTS LEARNING RATE IN A DYNAMIC ENVIRONMENT
Mareike Jepma & Sander Nieuwenhuis
Leiden University

Making accurate predictions in a changing world requires flexibly adapting one’s rate of learning to the rate of environmental change, but the brain mechanisms involved in this process are largely unknown. Recent studies have shown that more unexpected events trigger stronger belief updating (i.e., a higher learning rate). In addition, it is well-known that more unexpected events elicit a larger P300. However, previous studies have not empirically demonstrated whether P300 amplitude also predicts learning rate. To address this issue, we examined the relationships between trial-to-trial variation in prediction error, P300 amplitude and learning rate, using multilevel mediation. In two studies, the centroparietal P300 predicted learning rate, and mediated the effect of prediction-error magnitude on learning rate. P300 amplitude also mediated the effects of two computational variables, capturing the unexpectedness of outcomes and the uncertainty of preexisting beliefs, on learning rate. As the centroparietal P300 is an electrophysiological index of stimulus-evoked catecholamine release in the cortex, these findings are consistent with a role of the catecholamine systems in learning rate regulation. Corroborating this idea, we found that pharmacological manipulations of catecholamine activity affected learning rate following unsignaled task changes, in a way that depended on participants’ baseline learning rate. Together, our findings provide converging evidence for a causal role of the human catecholamine systems in belief updating following environmental change.

AN INFORMATION THEORY ACCOUNT OF P300 IN COGNITIVE CONTROL
Francisco Barceló1 & Patrick Cooper2
1University of the Balearic Islands, 2University of Newcastle

The endogenous P300 ERP component is thought to index “context updating” operations in working memory triggered by a mismatch between a stimulus and its perceptual context. However, task switching of stimulus-response (S-R) mappings also elicits P3-like latency (300–900 ms) potentials. To date, it remains unclear whether such “switch positivities” show similar scalp topography and index context-updating mechanisms akin to those posited for classic P300. To examine this, ERPs were measured while participants were intermittently cued to switch or repeat their categorization of Gabors gratings varying in color and thickness (switch task), or else they performed two visually identical control tasks (go-nogo and oddball) albeit with distinct cognitive demands each. A simple information theory model defined cognitive demands in terms of low-level S-R updating and higher-order task rule updating operations. Topographic scalp analyses confirmed significant split-second changes in the configuration of neural sources for both domain-general and switch positivities as a function of the task and temporal (predictable vs. unpredictable) contexts, rather than on their perceptual context alone. However, switch positivities showed a centroparietal distribution compatible with a family of P3-like potentials in many task domains. Findings partly met information theory predictions, and are compatible with a family of P3-like potentials involved in a variety of cognitive operations within fronto-parietal cortices during the preparation and execution of simple sensorimotor rules.

3:00 p.m. – 4:30 p.m.
Symposium 21

FACE AND PERSON PERCEPTION AS A FUNCTION OF SOCIAL LEARNING
Chair: Florian Bublatzky
University of Mannheim

The human face conveys information about the identity, emotional states, and intentions of other people, which are essential cues that help discriminate friendly and hostile social situations. Building upon this information, humans readily learn about fellow human beings to predict potential actions and consequences; this is particularly true for threat and safety contingencies. Effective learning about such associations is based on direct experiences (e.g. Pavlovian conditioning), verbal communications (instructional learning), and/or through observing the actions of others (observational learning). This symposium comprises research on how various sources of information (visual, olfactory, verbal-auditory) and different means of learning jointly modulate face and person perception. Stefan Schweinberger reports on the role of multimodal information and familiarity for face and voice recognition. Markus Junghöfer shows that olfactory face conditioning impacts person perception outside of awareness. Florian Bublatzky focuses on how threat and safety instructions selectively enhance face identity and emotion processing. Regarding long-term learning effects, Pedro Guerra will discuss psychophysiological responding to pictures of beloved ones that cue safety and/or threat. Finally, Jan Haaker extends the view to observational learning and the neuro-pharmacological mechanisms involved in social aversive learning. Taken together, this symposium takes an integrative perspective to approach person perception from basic facial features to high-level social communication and behavior.

AUDIOVISUAL INTEGRATION (AVI) IN FAMILIAR FACE AND VOICE RECOGNITION
Stefan Schweinberger & David Robertson
University of Jena

Interpersonal communication is a multimodal experience. Perceptual integration of information from voice and face has previously been demonstrated for speech comprehension and speaker localisation. However, researchers only recently began to consider the role of AVI for person recognition. In Exp. 1, we demonstrate systematic benefits and costs for the recognition of familiar voices when combined with time-synchronized articulating faces of corresponding or noncorresponding speaker identity, respectively. By contrast, no costs (relative to auditory only presentation) occurred when voices were combined with static noncorresponding faces. Moreover, this pattern was clear for familiar but not unfamiliar voices. In Exp. 2, smaller benefits and costs for familiar voices when combined with time-reversed (as compared to time-synchronized) facial articulations suggest a role of synchrony for AVI, over and above effects of facial motion per se. Exp. 3 demonstrated benefits as well as a trend for costs to familiar face recognition when faces were presented with voices of corresponding or noncorresponding identity. Finally, an ERP experiment suggests remarkably early (50–80 ms) and mandatory mechanisms of audiovisual processing, although discrepancies in audiovisual speaker identity may only be computed ~200 msec later. Overall, these results suggest that AVI is an important factor in the recognition of people, depends on familiarity with a speaker, shows sensitivity to temporal synchronization of the facial and vocal articulation, and can occur in a bidirectional manner.
PREFERENTIAL PROCESSING OF ANXIETY SWEAT ASSOCIATED FACES: MAGNETOENEPHELOGRAPHIC CORRELATES

Isabelle Klinkenberg & Markus Junghöfer
University of Münster

There is growing evidence for humans to express and perceive anxiety olfactorily via chemosignals contained within anxiety sweat. Here, we used Multi-CS conditioning, a challenging learning paradigm, to investigate olfactory communication of anxiety. We paired 104 neutral faces (conditioned stimuli, CS) three times with either anxiety or control sweat (unconditioned stimuli, UCS). Before and after conditioning, we measured magneto-encephalographic brain responses to CS faces as well as behavioral ratings and self-report. Faces paired with anxiety sweat compared to faces paired with control sweat provoked very early and long-lasting neural correlates of enhanced emotional processing after relative to before conditioning. Specifically, a frontal component between 90 and 110 ms and a long-lasting EPN-m between 170 and 540 ms were found. Estimation of neural sources revealed the right parieto-temporal cortex and the PFC to be involved in generation of the later neural field deviations. These effects occurred although participants were unable to report face-odor contingencies above chance level and were not even able to differentiate between anxiety and control odor. The results suggest that olfactory anxiety information - even though perceived outside of awareness - can modulate early and later stages of visual processing and speak to the notion that significant others may serve as evolutionary prepared safety stimuli.

ENDOGENOUS OPIOIDS REGULATE SOCIAL THREAT LEARNING IN HUMANS

Jan Haaker, Jonathan Yi, Predrag Petrovic & Andreas Olsson
Karolinska Institute

The expressions of pain and fear in individuals in our proximity can serve as visual cues to learn about dangers in the environment through observation. The neurochemistry that transforms the perception of others’ expressions of pain into our own threat responses remains unknown. Research on learning from direct pain experiences (Pavlovian conditioning) shows that this learning is centrally regulated by the release of endogenous opioids. Here, we examined if endogenous opioids similarly are involved in learning from others painful experiences, and if blockade of the opioidergic transmission enhances responses towards pain in others. Participants observed a demonstrator that received painful outcomes (observational US), to a conditioned stimulus (CS+), and never to a control CS-. We found that blockade of opioid transmission (50mg Naltrexone) enhanced coding of the observed aversive outcomes to other within the amygdala, midline thalamus and the periaqueductal gray (PAG). Moreover, the enhanced amygdala responses towards the observational US correlated with the stronger expression of threat responses when exposed to the CS+ 72 hours after learning. Multivariate pattern analysis revealed an opioidergic circuit that regulates social learning of threats from observed aversive outcomes to others. Our results suggest a functional overlap in neuropharmacological mechanisms between direct and social aversive learning in humans.
ELECTROPHYSIOLOGICAL AND HEMODYNAMIC CORRELATES OF MULTI-CS CONDITIONING

Dean Sabatinelli1, Christian Steinberg2 & Markus Junghöfer3
1University of Georgia, 2University of Munich

During MultiCS conditioning, multiple CS+ stimuli (faces, objects, tones etc.) get paired with either one or multiple aversive or appetitive unconditioned stimuli (US; electric or auditory shocks, aversive or appetitive sounds or odors, etc.), while an equal number of multiple CS− remains either unpaired or gets paired with one or multiple neutral US (neutral sound, neutral odors etc.). MultiCS conditioning offers several valuable features extending the scope of traditional conditioning paradigms and has now been used in a variety of electrophysiological studies. However, hemodynamic correlates of MultiCS conditioning have not yet been provided. In a combined EEG-fMRI study, 28 different neutral faces were presented four times each, while half of them were paired with either an auditory shock (partial reinforcement) or were left unpaired. Before and after this associative learning, all faces were presented four times each. CS+ faces were rated as more aversive compared to CS− faces after learning while CS-US contingency did not exceed chance level. Inverse source estimations of event related electrophysiological reactions revealed enhanced CS+ processing in left temporal and right occipito-temporo-parietal cortex regions as well as in the right inferior frontal cortex after learning. Importantly, event related hemodynamic correlates showed amplified CS+ processing in the post learning session in corresponding cortical regions. Thus, MultiCS conditioning recommends itself as novel paradigm for electrophysiological but also hemodynamic measures of affective learning.

THE DLPPC AND EMOTION REGULATION: MAGNETOENCEPHALOGRAPHIC CORRELATES

Markus Junghöfer, Katharina Keuper & Isabelle Klinkenberg
University of Münster

The dorsolateral prefrontal cortex (dlPFC) is involved in the regulation of emotional processes. Previous research revealed that the inhibition of aversive stimulus processing via the predominately right-hemispheric dlPFC is reduced in MDD patients and anxiety-disordered children. In addition, temporary inhibition of the right dlPFC via rTMS in healthy controls resulted in enhanced processing of negative stimuli, while dlPFC excitation led to opposite effects. Further, regulatory processes mediated via the right dlPFC differed between conditions of sustained fear, phasic fear and safety; dlPFC activity increased with increasing unpredictability of threat. Comparing effects of threat predictability between phobic and panic patients and healthy controls, we could link distorted emotion regulation in panic patients to the right ventromedial PFC - a region partly controlled by the dlPFC. Accordingly, we predicted that inhibitory/excitatory rTMS stimulation of the right dlPFC should differentially affect adaptive stimulus evaluation during sustained fear. Preliminary MEG results based on 36 healthy controls confirm our previous findings: inhibitory/excitatory stimulation results in enhanced/reduced processing of negative stimuli. Further, increased regulative processes mediated by the right dlPFC were observed during conditions of sustained fear vs. safety. The predicted impact of rTMS-dlPFC stimulation (inhibitory, excitatory) on stimulus evaluation (negative, neutral) during threat induction (sustained fear, safety) will be discussed based on data from the final sample.

REJECTING EMOTIONAL DISTRACTORS: NOVELTY AND LEARNING

Maurizio Codispoti
University of Bologna

Research has shown that emotional distractors disrupt performance (i.e., elongate reaction time) in concurrent tasks. This presentation reviews recent studies that investigated how novelty and learning affect the processing of task-irrelevant emotional distractors as reflected in both behavioral interference and neural activity. In a first series of studies, our goal was to examine the extent to which stimulus repetition and probability affected behavioral interference of task-irrelevant emotional pictures. Can we shield ourselves from task irrelevant emotional distractions? Though learning can lead to improved performance in many domains, it is less clear how learning affects the filtering of distracting information. In a second series of studies we investigated how learning leads to improvements in information filtering mechanisms that generalize beyond the training regimen. After a training phase, with a repeated exposure to novel distractors, we assessed whether learned distractor rejection of neutral stimuli transfers to novel emotional distractors. Taken together the findings suggest that novelty and learning differentially affect the processing of emotional and neutral distractors. Emotional interference was enhanced when distractor probability was low (unexpectedness), and disappeared with stimulus repetition, while in both contexts the affective modulation of the late positive potential was preserved, consistent with the idea that evaluative processing, and the engagement of the motivational systems, may occur independently of attentive processes.

EMOTION-GUIDED ATTENTION: FROM BIOLOGICAL TO SOCIAL MOTIVATIONAL RELEVANCE

Johanna Kissler1 & Sebastian Schindler2
1University of Bielefeld, 2University of Gent

Many previous studies have demonstrated the attention-grabbing function of emotional stimuli. During passive perception, emotional stimuli elicit similar cortical responses as do targets in active attention tasks with intrinsically neutral stimuli. Furthermore, at late processing stages, the effects of emotional significance are selectively amplified by explicit attention. While this has been first demonstrated for biologically prepared stimuli, thereby revealing fundamental mechanisms of biological motivational systems, subsequent studies have found similar effects for associatively learned symbolic stimuli, such as written words that map onto emotionally relevant concepts. More recently, these findings have been further complemented by evidence that social context manipulations likewise amplify early (P2/EPN) and late cortical processing stages (P3/LPP). Again, particularly at late processing stages, relevance induced by variations of communicative context acts upon emotional stimuli in a multiplicative fashion. Together, these findings reveal how evolutionarily old mechanisms of biological motivational systems are conserved in the processing of symbolic representations of emotion and further extended to social motivational relevance that plays a prominent role in humans as a group-living species, reflecting mechanisms of neural parsimony.

BACK TO THE FUTURE: A NETWORK PERSPECTIVE ON EMOTIONAL STIMULUS PERCEPTION

Harald Schupp & Ursula Kirmse
University of Konstanz

Beginning with Helmholtz’s notion of perception as unconscious inference, the relevance of emotion for attention and action has been addressed. Recently, the role of attention for emotion perception has been furthered to demonstrate that emotional stimuli are selectively amplified by explicit attention. Emotional stimuli encountered in the external word become meaningful to the individual by activating a corresponding memory representation including sensory-perceptual-meaning-response elements. Building upon these insights, a series of five studies recorded event-related potentials for a set of emotional stimuli drawn from survival- and procreation-related behavior domains. Indicating the strength of emotional networks, strong compared to weak emotional stimuli are characterized by an early posterior negative potential between 150 and 350 ms and a late positive potential between 350 and 700 ms after stimulus onset. Back to the future, these findings are discussed with respect to the (1) idiographic-nomothetic research orientation, (2) the concept of a neural biomarker of emotion processing, and (3) its implication for the RDoC framework.
CURRENT ATTEMPTS AT UNDERSTANDING P3B’S FUNCTION

Chair: Rolf Verleger
University of Lübeck

Discussant: Emanuel Donchin, University of South Florida

The P3 component of event-related potentials ERP is prominent and ever-present in ERP research. Its functional meaning appears obvious to many but might prove hard to pinpoint. This symposium aims at highlighting some current efforts in making progress towards this goal. Twomey et al. summarize their recent developments in modeling P3 as a reflection of decision processes, based on random-walk functions. Rac-Lubashovsky and Kessler report on their efforts in operation-alizing context-updating within and outside working memory, and in examining its effect on the P3b and on spontaneous eye-blink rate. Walsh et al. have applied a new method of measuring P3 in single trials which enables them to detail the relationships between P3 latencies and response times in different tasks. Verleger and Smigasewicz report about their attempts in applying their S-R link hypothesis to prediction tasks, where P3s are evoked without any overt response, and find simple but not easily explainable effects. Yu et al. will show that the disappearance of P300 with difficult response selection may be reversed by applying single-trial latency correction, thereby keeping with the predictions of context-updating hypothesis. Finally, Emanuel Donchin, as a discussant, will comment on the presented data from the viewpoint of context-updating hypothesis. By putting together these building blocks, this symposium will provide new elements for arriving at a new theoretical synthesis about understanding P3b’s behavior and function.

THE P3 AS A BUILD-TO-THRESHOLD DECISION VARIABLE SIGNAL

Deirdre Twomey1, Peter Murphy2, Simon Kelly3 & Redmond O’Connell1
1Trinity College Dublin, 2Leiden University, 3University College Dublin

The P3 component of the human event-related potential has been the subject of intensive experimental investigation across a five-decade period, due to its apparent relevance to a wide array of cognitive functions and its sensitivity to a number of brain disorders, yet its exact contribution to cognition remains unresolved. We carry out key analyses of the P3 elicited by transient auditory and visual targets to examine its potential role as a ‘decision variable’ signal that accumulates evidence to a decision bound. Consistent with a neural decision variable signal, we find that the P3 reaches a stereotyped zenith immediately prior to response execution and that its rate of rise scales with target detection difficulty and accounts for trial-to-trial variance in RT. Computational simulations of an accumulation-to-bound decision process faithfully captured P3 dynamics when its parameters were set by model fits to the RT distributions. Thus, where the prevailing explanatory accounts have conceived of the P3 as a unitary neural event, our data reveal it to be a dynamically evolving neural signature of decision formation.

SEARCHING FOR THE NEUROPHYSIOLOGICAL CORRELATES OF CONTEXT UPDATING

Rachel Rac-Lubashovsky & Yoav Kessler
Ben-Gurion University of the Negev

Effective working memory (WM) functioning depends on a gating process which regulates maintenance and updating. Our aim was to characterize the behavioral and neural correlates of updating and gating. First, we investigated the relationship between WM updating and the P3b component. The Context Updating Model suggests that the P3b should increase with changes in the internal schema, namely when WM is being updated. We examined this hypothesis in the 1-back task, which requires WM updating, and in a two-alternative forced choice (2AFC) task, which involves updating that presumably occurs outside WM. Stimulus alternation only had an effect in 1-back, but not in the 2AFC, however in the opposite direction than expected. Specifically, the P3b amplitude was smaller in alternation than in repetition trials, although alternation (rather than repetition) requires updating. Next, we will introduce a new paradigm: the reference-back task. This paradigm enables to empirically distinguish between the set of processes involved in typical n-back tasks: WM updating, comparison, gating and automatic updating. The ERP results from this task replicated the pattern observed in 1-back task, and suggest that the P3b might be related to a categorization process rather than WM updating. Finally, we show that event-based eye-blink rate (eBEBR), which presumably reflects phasic striatal dopamine activity, is correlated with WM updating and gating in the reference-back task. The implications of these findings for understanding the P3 will be discussed.

RELATIONSHIP OF P3B SINGLE-TRIAL LATENCIES AND RESPONSE TIMES IN ONE, TWO, AND THREE-STIMULUS ODDBALL TASKS

Matthew Walsh1, Glenn Gunzelmann2 & John Anderson2
1TiER1 Performance Solutions, 2The Air Force Research Laboratory, 3Carnegie Mellon University

According to a longstanding view, the P3b posterior subcomponent of the P300 is driven by stimulus categorization. Whether the P3b relates to tactical processes involved in immediate responding or strategic processes that affect future behavior remains controversial, however. One prediction of the tactical account is that the P3b should precede responses in tasks that require stimulus categorization, and that variability in its latency should relate to variability in response times. This prediction is difficult to test, however, because of limitations in the methods currently available to quantify P3b latencies during single trials. In this talk, we report results from the Psychomotor Vigilance Task (PVT), the Hitchcock Radar Task, and a 3-Stimulus Oddball Task. The PVT requires simple detection, whereas the Hitchcock Radar Task and the 3-Stimulus Task require detection and categorization. We apply a novel technique that combines hidden semi-Markov models and multi-voxel pattern analysis (HSMM-MVPA) to data from the experiments. HSMM-MVPA revealed a processing stage in each task corresponding to the P3b. Trial-by-trial variability in the latency of the processing stage correlated with response times in the Hitchcock Radar Task and the 3-Stimulus Task, but not the PVT. These results indicate that the P3b reflects a stimulus categorization process, and that its latency is strongly associated with response times when the stimulus must be categorized before responding.

IN SEARCH FOR THE REASONS FOR P3’S OCCURRENCE IN PREDICTION TASKS

Rolf Verleger & Kamila Smigasewicz
University of Lübeck

It has been suggested that the P3b component of event-related ERP potentials reflects processes of deciding about tasks that are to be predicted (or to feedback stimuli) which are not linked to any overt responses. Possibly, by being compared to the preceding predictions, these target events may evoke implicit responses. This seems similar to comparison tasks where responses are made depending on whether a stimulus is the same as the preceding one. Based on this idea, this study compared P3s evoked in prediction and comparison tasks, making the tasks as similar as possible. Indeed, probabilities both of targets and of first-events (predictions or first stimuli) had identical effects across tasks, with larger P3s both after rare first events and rare targets. These effects were additive, i.e., the feature of the first event affecting the P3b was its frequency rather than its being correct (prediction task) or its being the same (comparison task). Target-evoked P3s were constantly larger in the prediction than in the comparison tasks. It will be outlined how these simple but not easily understandable effects fit into current concepts on P3.
THE IMPACT OF LATENCY JITTER ON THE INTERPRETATION OF P300 IN THE ASSESSMENT OF COGNITIVE FUNCTION

Xiaoquan Yu, Chad Dubé & Emanuel Donchin
University of South Florida

The P300 has been assumed to reflect stimulus evaluation processes. Time variation of the evaluation process would produce varying latencies in the P300. Averaging the P300 across trials without eliminating the latency jitter would result in a decrease of P300 amplitudes. Verleger et al. (2014) reported that P300 amplitudes were reduced when subjects had to choose among different responses. However, an examination of the waveforms suggests that this reduction might have been due to considerable latency jitter in that particular condition, caused by the varying difficulty of judgments, which might be eliminated by applying latency jitter adjustment to the P300 (Kutas et al., 1977). The current study replicated experiment 1 of Verleger et al. (2014) to investigate the existence of latency jitter. In the oddball task, ancillary stimuli (a blue or yellow frame) were added to the frequent and rare targets (either letter X or U). In the easy condition, subjects evaluated either letter or frame color to respond; in the hard condition, both letter and frame color had to be evaluated in order to respond correctly. With latency jitter correction (Woody filter) in the data obtained from 16 subjects, we observed a significant increase in the P300 amplitude of the hard condition, suggesting that the diminished P300 is due to latency jitter. This confirms that the P300 reflects the stimulus evaluation processes, that its latency is sensitive to the time it takes to evaluate the stimuli and, as a result, the time it takes to respond to the stimuli.

4:40 p.m. — 6:10 p.m.
Symposium 24

MORE THAN JUST NOISE: INDIVIDUAL DIFFERENCES IN FEAR ACQUISITION AND EXTINCTION

Chairs: Tina Lonsdorf & Jan Richter
1University Medical Center Hamburg-Eppendorf, 2University of Greifswald

Why do only some individuals develop pathology following trauma or profit from treatment? Similarly, in experimental fear conditioning, pronounced individual differences are observed despite identical procedures. Traditionally, individual differences were regarded as ‘noise’ when interested in basic learning principles. Treating variance in data as ‘noise’ rather than data, however, deprives us from crucial insights into processes beyond the average. This symposium brings together results from a series of studies focusing on individual differences in fear acquisition and extinction as well as their clinical implications. M. Andreatta reports an impact of trait anxiety on safety learning via threat absence but not threat termination. This is complemented by T. Lonsdorf reporting a mediation of the impact of trait anxiety on individual differences in discriminating threat and safety via amygdala activation and a specificity of findings to trait anxiety beyond other measures of negative affect. J. Richter then presents results of a pilot study in healthy individuals and first data in patients from a paradigm generating high variance during extinction (e.g., depending on trait anxiety) but low variance during fear acquisition. Finally, J. Wendt reports participants with low (as opposed to high) heart rate variability to show deficits in extinction learning and discusses implications for exposure-based treatment. In sum, we tell a story from noise steadily developing into a meaningful tune and converges into shape (reliefCS) followed the US, and one shape (absenceCS) became never associated with US) than the other cues, and it elicited startle potentiation as well as SCR. Interestingly, an increase in trait OFF response was associated with a decrease in the differences between absenceCS and threatCS responses reflected in contingency ratings during test. In sum, physiologically but not verbal responses triggered by a relief signal compared to a threat—absence signal indicated that the former is more appetitive than the latter. Strikingly, trait anxiety specifically modulated learning of threat absence, but not of threat termination, indicating that high trait anxious individuals experience relief normally, but have deficits in experiencing safety.

DISCRIMINATING THREAT AND SAFETY SIGNALS DURING FEAR ACQUISITION - DIFFERENTIAL IMPACT OF TRAIT ANXIETY, INTOLERANCE OF UNCERTAINTY AND NEUROTICISM AS WELL AS MEDIATION VIA THE AMYGDALA

Rachel Sjouwerman, Robert Scharfenort & Tina Lonsdorf
University Medical Center Hamburg-Eppendorf

Individual differences in fear learning are considered core mechanisms in the development/maintenance of affective disorders. Previous work linking measures of negative affect and fear conditioning provides evidence for a role of trait anxiety (TA), neuroticism (N) and intolerance of uncertainty (IUS) but the role of shared variance across these measures has not yet been investigated. Previous work investigating the role of TA on neural activation linked to fear conditioning is further limited by the investigation of neural activation without corresponding autonomic/behavioral findings precluding mechanistic analyses. To fill these gaps, we present data from two independent studies. In study 1 (N=278), higher scores in TA, N and IUS were associated with reduced discrimination between threat and safety cues in skin conductance responses (SCRs) during fear acquisition in separate analyses. Path analyses considering all three measures however reveal a significant impact of TA only. In the second study (N=116), higher TA scores were again linked to reduced SCRs discrimination during fear learning. Path analyses and IMR analyses link TA additionally to activation in brain regions critically involved in fear processing (amygdala, putamen, thalamus, primarily CS+-related). Moreover, a significant mediation effect of the impact of TA on SCR discrimination via the amygdala was observed. Our results suggest that trait anxiety is linked to discriminating threat and danger on an autonomic level during fear learning and that amygdala activation partly mediates this link.

INDIVIDUAL DIFFERENCES IN EXTINCTION LEARNING IN PATIENTS WITH ANXIETY DISORDERS - ASSOCIATIONS TO PATHOLOGICAL CHARACTERISTICS AND EFFICACY OF EXPOSURE THERAPY

Jan Richter, Maike Hollandt, Anne Pietzner & Alfons Hamm
University of Greifswald

Extinction learning is supposed to be a central mechanism of change during exposure-based therapy in patients with anxiety disorders. Previous research identified individual differences in extinction learning and associated moderators in non-clinical populations. In contrast, knowledge about the variance in patients’ samples is still lacking. However, to foster individualized therapy research it is essential to proof whether differences in extinction learning might indeed be associated with exposure therapy efficacy as suggested by the theoretical model. Therefore, as part of the German wide research network protect-AD the ongoing study aims to compare the individual learning curves of N=300 anxiety disordered patients during extinction using an optimized design (e.g. differential conditioning, instructed acquisition, 24h consolidation before non-instructed extinction) and linked them to pathology characteristics and the efficacy of a following exposure based RCT; learning is recorded multimodally (on-line shock expectancies, fear potentiated startle, electrodermal activity). The talk presents the results of a pilot study with N=30 non-affected students showing that the paradigm is able to map extinction learning with – as requested - low variance during fear acquisition, but high variance during extinction, e.g. depending on trait anxiety. First results of the clinical study are summarized and discussed.
HEART RATE VARIABILITY AND THE EXTINCTION OF CONDITIONED FEAR
Julia Wendt, Jörg Neubert & Alfonso Hamm
University of Greifswald

Extinction of conditioned fear serves as a laboratory model for the mechanism of action underlying exposure therapy with anxiety patients. Thus, an enhanced understanding of individual differences in extinction learning may help to improve exposure therapies by tailoring treatment plans to the specific needs of the patient. Cardiac vagal tone as indexed by resting heart rate variability (HRV) seems to be an ideal candidate to investigate individual differences in extinction learning because vagal tone is influenced by an inhibitory prefrontal-amygdala network which is similarly implicated in extinction learning. Moreover, cardiac vagal tone differs widely between individuals but can be influenced by various training methods as well as health behavior, which makes this factor particularly interesting from a therapeutic perspective. Here, we report on a series of studies in which we applied differential conditioning paradigms and revealed that participants with low HRV show a deficit in extinction learning compared to participants with high HRV. The observed deficit appears to be most pronounced during the early stages of extinction learning and under conditions of instructed extinction. We will discuss implications of these findings for exposure therapies with respect to methods which are eligible to increase cardiac vagal tone such as physical exercise and meditation.

EXPLORING COVERT AND OVERT PROCESSING OF FAMILIAR FACES IN PROSOPAGNOSIA USING MULTIVOXEL PATTERN ANALYSIS (MVPA)
Maria Bobes2, Marlis Ontiveiro2, Yusnuel Santos2, Augustin Lage2, Elizabeth Huis1, Miene Zhan1, Beatrice deGelder1 & Mitchell Valdes-Sosa3
1Maastricht University, 2Cuben Center of Neuroscience

Acquired prosopagnosia is a failure to recognize previously familiar faces due to brain lesion, although indirect measures indicate that covert recognition is sometimes present. In certain cases, prosopagnosia spares some identities, and comparing brain activity related to recognized and unrecognized familiar faces could help to identify mechanisms associated with overt and covert recognition. Here we studied EP, a case of mild prosopagnosia, with a small lesion in the posterior fusiform gyrus. He recognized some, but failed to recognize other, previously familiar faces. We presented EP and 16 matched controls with a block fMRI paradigm in which we recognized familiar faces, unrecognized familiar faces, unfamiliar faces, and houses were alternated. MVPA was used to identify cortical regions where information discriminating these stimuli was present. In controls, analysis evoked patches in right posterior FFA and STS, bilateral CP, AC and insula where familiar and unfamiliar faces were discriminated accurately. In EP, we found patches with a high accuracy for discrimination between familiar recognized and unfamiliar faces in right pSTS, bilateral insula, AC and PC, which could be involved in both covert and overt recognition. We also found patches that discriminated familiar unrecognized faces from unfamiliar, located in right pSTS, bilateral insula, AC and Mid C, probably involved in covert recognition. Only PC was selectively involved in overt but not covert recognition. Thus, posterior cingulate could be a key area in the network involved in overt face recognition.

UNUSUAL PATTERNS IN BOTH EARLY AND LATE ERPS ELICITED BY THE PROCESSING OF UNKNOWN FACES IN PROSOPAGNOSIC INDIVIDUALS
Ela Olivares, A. Urraca, A. Álvarez, L. Viczaino & Jaime Iglesias
Universidad Autónoma de Madrid

The present study investigates neurophysiological differences between healthy people and (acquired and developmental) prosopagnosic individuals in the processing of unfamiliar (line-drawings) faces. A three-stimuli-per-trial task was presented in which both internal and external facial features were delivered consecutively and then followed by a complete face. The complete face, acting as the target, could be a correct combination or not of those features presented previously. According to a previous study, we analyzed late ERPs suggestive of an adequate integration of partial information for the construction of face representations, as well as those ERPs reflecting initial structural processing of features, acting as primes. We found, in the case of our acquired prosopagnosic patient, an anomalous ERP pattern of P1 and N170 responses, in contrast with more typical ERPs. We also found that our patients do not make an optimal use of relevant information in the initial processing of facial features as reflected by a lack of a late positivity (P3-like) component for both external and internal features at the beginning of the trial. Accordingly and, in contrast with healthy people, our patients did not reflect a conspicuous mismatch effect in the form of a late negativity component when external and then internal features were presented, suggesting an insufficient detection of structural incongruences in face gestalts.

A NEW LOOK AT THE FACIAL FEEDBACK HYPOTHESIS: ENCODING OF FACES IN PATIENTS SUFFERING FROM FACIAL PALSY
Christian Dobel1, Jessica Komes 2, Helene Kreysa 2, Fabian Volk 3, Holger Wiese4, Orlando Guntinas-Lichius 3 & Stefan Schweinberger2
1University Hospital Jena, 2Friedrich Schiller University of Jena, 3Jena University Hospital, 4Durham University

Unilateral chronic facial palsy is a neuromuscular disorder impairing facial movement. This concerns not only movements such as eating and drinking, but also the expression of emotions. In line with the facial feedback hypothesis we assumed that perception of faces is altered as well. To this end, we tested twenty patients suffering from chronic peripheral facial palsy, (patients with central neurological defects were excluded) and an age- and gender-matched control group. Pictures of faces displaying happy, surprised, angry, sad and neutral expressions were presented as stimuli (with morphed emotion intensities of 50 and 100%). Pictures of butterflies served as rare items which had to be detected. Analyses of early responses in our developmental prosopagnosic. Also, we found that our patients do not make an optimal use of relevant information in the initial processing of facial features as reflected by a lack of a late positivity (P3-like) component for both external and internal features at the beginning of the trial. Accordingly and, in contrast with healthy people, our patients did not reflect a conspicuous mismatch effect in the form of a late negativity component when external and then internal features were presented, suggestive of an inefficient detection of structural incongruences in face gestalts.
This study is based on recent findings (Kaufmann, Schulz, & Schweinberger, 2013, Neuropsychologia) that during acquisition of stable representations for newly learned faces, high performers utilize salient texture information in faces whereas persistent use of shape was more characteristic of participants with poor face recognition skills. Assuming that texture is particularly important for successful recognition, we trained 48 young adults with poor face recognition skills (pre-screened to score at least 1 SD below the mean in at least 2/5 screening tests: CFMT, GFMT, and BFFT) to utilize either shape or texture. Participants were pseudorandomly assigned to one of three groups (N = 16 each), who either participated in texture caricature training, shape caricature training (6 training sessions within 3 weeks), or a no-treatment control condition. Additional sessions before and after training/waiting comprised EEG experiments on face learning and famous face recognition, as well as various diagnostic tests. Results suggested small training-induced improvements in face matching (GFMT) and face learning (CFMT), though the latter were seen following texture caricature training only. Preliminary analyses show training-induced changes in face-sensitive ERPs, encompassing larger N170 and N250 responses following both texture and shape caricature training, as compared to control. Thus, training with texture-caricatured faces may be efficient to improve performance in people with poor face recognition skills.

A common cognitive problem reported by older people is compromised face processing, which is often paralleled by age-related changes in face-sensitive and memory-related components in event-related brain potentials (ERPs). Although there is limited evidence that face recognition can be improved via training, young adults with relatively poor face recognition abilities can benefit from spatial caricaturing of faces in a learning task. Caricaturing might thus help people recognize to encode identity-specific information. Accordingly, we developed a new training program using photorealistic caricatures. Twenty-four older participants (62-75 yrs, 13 female) completed 12 training sessions (3 per week, 60 min each) and 24 older participants (61-76 yrs, 12 female) acted as no-treatment controls. Before and after training/waiting, participants took part in a diagnostic screening for face processing abilities, and in ERP experiments on face learning and recognition. Although our training had no measurable effects on behavior, ERPs showed substantial training-related changes in face-sensitive ERPs. Specifically, we found a marked training-induced increase of the N170, which could indicate enhanced detection of faces at the categorical level, and an increase of the subsequent N250, which may indicate training-induced effects on identity-specific face processing. These findings demonstrate a substantial degree of cortical plasticity in face processing mechanisms even in older age, and suggest that caricature training may be a promising approach for intervention.
Differential Response Pattern to Reward and Punishment Anticipation and Consumption in Depression

Kerstin Brinkmann & Jessica Franzen
University of Geneva

Depression is characterized by blunted responsiveness to rewards, whereas the response pattern to punishment is less consistent. Recent studies demonstrated that subclinically depressed individuals show reduced effort-related cardiovascular reactivity in anticipation of rewards and punishments. Moreover, they show blunted facial expressions of positive affect during the receipt of rewards but unchanged facial expressions of negative affect during the receipt of punishments. The present study (N = 40) replicates this pattern in a clinically depressed sample. Patients with major depression (MDD) and healthy control participants worked on a Sternberg memory task under neutral, monetary reward, and monetary punishment instructions (within-persons). Effort mobilization was operationalized by participants’ beta-adrenergic sympathetic cardiac activity during the task. Facial expressions were operationalized by facial electromyography during consumption. Compared to control participants, MDD participants showed reduced pre-presentation period (PEP) reactivity and blunted self-reported motivation to obtain the reward compared to control participants. MDD participants showed reduced pre-presentation period (PEP) reactivity and blunted self-reported motivation to obtain the reward.

Differential Sensitivity to Monetary Versus Social Rewards in Depression

Dan Foti & Belel Ait Oumeziane
Purdue University

Depression is characterized by reduced neural sensitivity to rewards. A limitation to this literature is that most studies have only considered responses to monetary rewards, whereas the most frequent type of rewards in daily life are social in nature. Thus, it is unclear whether reduced reward sensitivity in depression represents a generalized deficit, or if it instead varies across reward type. In an initial study, we adapted a common monetary reward paradigm to evaluate social reward processing. We administered both monetary and social versions of the task (N = 33), and we considered event-related potentials elicited by reward cues (cue-P3), approach behavior (contingent negative variation, or CNV), anticipation (stimulus preceding negativity, or SPN) and outcomes (reward positivity, or RewP; feedback-P3, or fb-P3). Both tasks elicited qualitatively similar ERPs that were sensitive to the reward conditions. Significant cross-task associations were observed for the cue-P3, SPN, RewP, and fb-P3, indicating latent as well as task-specific variance. In a second study, we administered the same tasks along with a comprehensive battery of internalizing psychopathology measures (N = 100). Preliminary analyses indicate that current depressive symptoms are associated with increased cue-P3 and reduced CNV and fb-P3 amplitudes specifically on the social reward task; these effects were not observed on the monetary reward task. Overall, this pattern supports the notion that the nature of abnormal reward processing in depression may systematically vary by reward type.

BARORECEPTOR INFLUENCES ON AFFECTIVE AND NOCICEPTIVE PROCESSING

Chair: Hugo Critchley
University of Sussex

The state of the body influences the processing of external stimuli. Understanding these psychophysiological mechanisms has translational importance. Baroreceptor afferent activity, encoding the strength and timing of each heartbeat via vagus and glossopharyngeal afferents, informs the brain about dynamic state of the heart. This mechanism supports the central representation of cardiovascular arousal and influences ascending neuromodulator systems guiding emotional and motivational behaviour. Interoceptive effects on psychological processes can be explored by timing the brief presentation of stimuli to different phases of the cardiac cycle (Critchley). We observed that the processing of specific categories of stimuli is enhanced or attenuated when presented during systole versus diastole. Our symposium describes the application of this experimental approach to the individualization of potential influences of heart-to-brain signals on brain, perception, cognition and behaviour, including: 1) Neural and behavioural correlates of pain perception during fluctuations in arterial baroreceptor activity (Ottaviani); 2) The impact of artificial lateralized stimulation of baroreceptor discharge on emotion processing (Makovac); 3) The effect of cardiac afferent signals on fear conditioning and extinction (Garfinkel); 4) Individual differences in the interoceptive channel (Tsa-kins); 5) Augmentation of exposure therapy for phobia by time-locking stimulus presentation to distinct points in the cardiac cycle (Critchley).
SPR Abstracts

BRAIN-HEART PATHWAYS TO BLOOD PRESSURE-RELATED HYPOALGESIA
Cristina Ottaviani1, Sabrina Fagioli1, Eugenio Mattei2, Federica Censi2, Louisa Edwards3, Emiliano Macaluso1, Marco Bozzali1, Hugo Critchley4 & Giovanni Calcagnini2
1Santa Lucia Foundation, 2Italian Institute of Health, 3Birmingham University, 4University of Sussex

High blood pressure (BP) is characterized by reduced pain sensitivity, known as BP-related hypoalgesia. The cause of such phenomenon has not been clarified, yet existing studies point to a key role of the arterial baroreceptors. We studied the neural correlates of pain perception during discharge of baroreceptors, activated naturally at systole by phasic ejection of blood from the heart. After determining individual pain thresholds, normotensive participants underwent an event-related fMRI design in which unpredictable painful and non-painful electric shocks timed to occur either at systole or diastole were delivered. Participant also underwent a 1-week home BP monitoring. At behavioral level, mixed models showed the least pain perception when painful stimuli were administered at systole compared to diastole. When the group was divided into high and low systolic BP based on the median split, a main effect of BP status emerged with the high-BP group having overall lower pain perception. Neuroimaging data revealed a main effect of Stimulus in a) right calcarine cortex, extending ventrally to the cerebellum, b) right postcentral gyrus, extending anteriorly to the right precentral gyrus and encompassing the right supplementary motor area; c) right insula. For the effect of Cardiac phase, a cluster located in the right postcentral gyrus emerged. Results support that the negative association between BP and pain perception is stronger during baroreceptor discharge and highlight the right postcentral gyrus as a common brain area for pain perception and baroreceptor functioning.

HEART TO HEART: TOWARDS AN IMPLICIT MEASURE OF INTEROCEPTIVE SENSITIVITY
Ruben Azevedo & Manos Tsakiris
University of London

Implicit measures of perception have shown that conscious perception can be the combined outcome of bottom-up sensory signals and top-down beliefs. We applied this theoretical insight to the case of interoception and developed a novel Implicit Measure of Interoceptive Sensitivity (IMIS). In this test, participants view stimuli, presented side-by-side, flashing on the screen. One of the two stimuli is flashing in synchrony with the participant’s own heartbeat (time-locked to 200ms after the R-wave, to coincide with the period of maximum subjective perception of heartbeats), while the other stimulus flashes in synchrony with the pre-recorded heartbeat of another individual. A difference in the preference for the self-flashing stimulus versus the preference for the other stimulus reflects implicit interoceptive sensitivity, arguably, an indirect demonstration of some level of awareness. We validated this task with established measures of cardiac accuracy and extended the paradigm to investigate how such interoceptive signals influence other cognitive processes such as judgments of perceived trustworthiness of faces. We discuss the mechanisms underlying these effects in terms of interoceptive predictive coding. The conceptual and methodological innovations of IMIS afford greater and more flexible experimental control (e.g. present a range of self-related and/or social stimuli), with therefore potentially large impact in interoceptive research.

EFFECTS OF CARDIAC TIMING AND INTEROCEPTIVE ABILITY ON SUBJECTIVE AND BEHAVIOURAL OUTCOMES OF EXPOSURE THERAPY FOR SPIDER PHOBIA
Hugo Critchley, David Watson, Daniel Wilmott, Frances Meeten, Cassandra Gould van Praag & Sarah Garfinkel
University of Sussex

Spider phobia is expressed as marked uncontrolled psychological and physiological fear reactions to spiders. Exposure therapy is an effective treatment which modifies the evoked fear response to the phobic stimulus. People with spider phobia (N=53) completed a computerised exposure protocol (four sessions) to test if baroreceptor signalling could augment therapy benefits. Participants were assigned to one of three timing groups where 140 spider images (100 msec) were shown at: Systole (during baroreceptor firing); Diastole (during baroreceptor quiescent interval); Random (not locked to cycle). Each participant was scored on measures of interoceptive accuracy. The Spider Phobia Questionnaire (SPQ) and Behavioural Avoidance Task (BAT) assessed the effects of exposure therapy. Self-report (SPQ score) was greater in the systolic group (F(2,44)=5.252, p=0.009). Behavioural improvement was greater for cardiac-contingent (systolic and diastolic) exposure than the non-contingent group (F(2,44)=5.156, p=0.010). Electrodermal responses were greater for stimuli presented at systole (F(1,44)=4.556, p=0.038). Interoceptive processes influence outcomes of exposure therapy. The differential effects of cardiac timing on efficacy suggest cognitive aspects of phobia extinction are facilitated by effects of baroreceptor afferent signals, while behavioural improvement appears to depend on predictive representation of self-related processes, in this case heart rhythm. Individual interoceptive differences moderate these effects suggesting a means for personalising therapeutic approaches.

3:40 p.m. – 5:10 p.m.
Panel Discussion 28

BRAIN, MIND, AND CONSCIOUSNESS: PROGRESS AND PITFALLS
Chair: Boris Kotchoubey
University of Tübingen, Germany
Discussant: Felix Tretter, Berthauny Society

The proposed Structured Panel Discussion aims at jolting a free conversation about empirical, logical and methodological issues concerning the relationship between the brain, consciousness, and unconscious mental processes. Four 15-min impulse talks are planned. Northoff (Ottawa, Canada) will present a novel spatiotemporal model of the self, based on his numerous experiments about the differences between the mechanisms of self-related vs. non-self-related information processing. Tewes (Heidelberg, Germany) will discuss theoretical problems arising on psychophysiological study of implicit memory. The topic of implicit (not clearly presented in conscious awareness) mental activity will be continued in the talk of Czigler et al. (Budapest, Hungary) about the psychophysiological investigations of visual processing (including, in particular, visual memory) outside the focus of attention. Finally, Kotchoubey (Tübingen, Germany) addresses a hot topic of “detection” (or “diagnostics”) of consciousness using physiological measures in individuals unable to give a report on their subjective experience. This last talk will mark a transition to a discussion, for which 3Om time will be reserved. The following questions will be set for the discussion: Can a psychophysiological approach to consciousness and to conscious/unconscious distinction be followed in a stringent way? What have been the typical errors or neglects on this way to be avoided in future studies? What are possible clinical applications of the psychophysiological studies of consciousness?
THE BRAIN AND ITS MENTAL FEATURES - A SPATIOTEMPORAL APPROACH?

Georg Northoff
University of Ottawa

Various mental features like consciousness and self are hotly discussed these days in neuroscience. However, despite plenty of data and theories, the exact neuronal mechanisms that allow to yield consciousness remain unclear yet. I suggest a central role for the brain’s spontaneous activity and specifically its spatiotemporal structure in yielding mental features like self and consciousness. I will present various empirical data on the basis of which I will suggest a “spatiotemporal model” of consciousness.

EXPLORATION OF IMPLICIT MEMORY CAPACITIES IN PSYCHOPHYSIOLOGICAL RESEARCH

Christian Tewes
University of Heidelberg

There is an ongoing debate in theory of science as how one can integrate the subjective (first-person) dimension of experiences more thoroughgoing into psychophysiological research. For instance, cognitive psychology of memory starts with the (methodological) separation of the act of recollection from the context in which it happens; this separation makes memory processes suitable for the experimental design. In the present talk I suggest that the challenge does not merely consist in the (possible) loss of meaning by transforming interconnected psychological experiences into single functional concepts. Rather, the experiential basis of the entire research procedure frequently is not elaborated well enough and hence in danger of neglecting or misrepresenting significant dimensions of the phenomena in question. This can be demonstrated with regard to the category of implicit or procedural memory. Explorations based on the paradigm of embodied cognition have shown that procedural memory-based skills can be part of an extended habitual body memory system. Additionally, these skills are not necessarily confined to sub-personal (unconscious) processing mechanisms. In the last part of my talk, I shall delineate some consequences of these insights for the further research of implicit memory at the empirical and theoretical level of investigation/explanation.

DETECTION OF NONCONSCIOUS PROCESSING: VISUAL MISMATCH NEGATIVITY

István Czigler
Centre for Natural Sciences, HAS

Psychophysiological methods not only reveal brain mechanisms underlying cognitive processes (e.g. the layout of attentional networks), but can also provide data of direct relevance for theoretical psychology. One of such issues is that of nonconscious processing whose results, by definition, do not manifest themselves in subjective reports. While such processes can be investigated by traditional psychological methods (e.g. priming), psychophysiological methods provide direct tools for research on nonconscious information processing. This can be illustrated by the paradigm of the visual mismatch negativity (vMMN). The vMMN is a visual homologue of the MMN that has been used for studying automatic auditory processing. Contrary to this view, the vMMN data disclosed a memory mechanism that registers non-attended sequential processing but has additional theoretically important features. Conscious detection of visual changes outside the focus of attention is rather poor (change blindness). According to influential theories, the reason is the absence of a visual homologue of the MMN that has been used for studying automatic auditory processing. Contrary to this view, the vMMN data disclosed a memory mechanism that registers non-attended sequential processing but has additional theoretically important features. Conscious detection of visual changes outside the focus of attention is rather poor (change blindness). According to influential theories, the reason is the absence of a visual homologue of the MMN that has been used for studying automatic auditory processing.

WHAT “CONSCIOUSNESS” CAN MEAN WHEN NO FIRST-PERSON DATA ARE POSSIBLE

Boris Kotchoubey
University of Tübingen

Several research groups have recently reported detection of consciousness in behaviourally non-responsive individuals (NRI) unable to present any first-person data of their experience. These reports created an impression (unfortunately, not only in the broad public) that using physiological data we can directly look into a human brain and spot the presence or absence of subjective awareness there. The analysis of the corresponding studies reveals that there are three different meanings in which the term “consciousness” is used: (i) the data of an NRI agree with some neurophysiological model of consciousness (i.e., theoretical validation); (ii) the data of an NRI agree with subjective reports obtained in other studies with conscious humans (i.e., empirical validation); (iii) the data of an NRI agree with culturally accepted criteria of consciousness (i.e., cultural validation). Each of these kinds of validation has its partial justification but also its problems. As will be shown on the basis of empirical cases, the three definitions of the “third-person consciousness” do not completely agree with each other. The confusion can be a result of the inability to clearly distinguish between necessary and sufficient conditions of consciousness.

USING PHYSIOLOGICAL METHODS TO ASSESS THE EFFECTS OF SOCIALIZATION AGENTS AND PROCESSES ON CHILD DEVELOPMENT

Children are exposed to a wide range of socialization agents that inform how they navigate through life, but the interplay of psychophysiological and socialization processes in child development is not fully understood. The goal of this symposium is to present empirical work from three different laboratories that focuses on using physiological methods to examine how various socialization agents can influence children’s adjustment. The papers describe examination of socialization agents across proximal (i.e., parents, other people’s facial expressions of emotion) and distal (i.e., Hurricane Sandy) contexts of children’s social environments. The four papers in this symposium employ methods spanning cutting-edge psychophysiological approaches to studying children’s development, including cardiac psychophysiological measures of emotion regulation (respiratory sinus arrhythmia: RSA), eye tracking measures of an emotion recognition intervention, and assessment of event-related potentials measuring sensitivity to reward and threat. These varied techniques for examining socialization agents and processes in childhood provide complementary information about how socialization shapes children’s adjustment, in everyday and traumatic contexts. These papers provide important clarity about socialization processes in child development that will serve to inform interventions targeted toward improving children’s regulatory abilities and reactions to stress that can protect them from maladaptive outcomes (e.g., psychopathology, criminal behavior).

PARENTS’ USE AND PROVISION OF REAPPRAISAL INFLUENCES CHILDREN’S PHYSIOLOGICAL ADJUSTMENT TO DISAPPOINTMENT

Emily Shih & Elizabeth Davis
University of California, Riverside

Parenting shapes children’s developing emotion regulation (ER), which can be measured by respiratory sinus arrhythmia (an index of parasympathetic activity). RSA augmentation may indicate an adaptive reaction during active regulation tasks. The goal of this study was to examine how parental socialization practices influenced children’s physiological adjustment, and whether parents’ own strategy use and physiological profile moderated this relation. 184 3- to 11-year-olds (M = 7.67 years; 91 boys), participated with one parent in a study of children’s emotional development. We employed a disappointment task, where children unexpectedly received an undesirable gift. Parents’ and children’s RSA was acquired continuously during a resting baseline and during the disappointment task (reactivity = task RSA – baseline RSA). Parents’ suggestions for what their child could do to cope with disappointment were coded for specific ER strategies (e.g., cognitive reappraisal: CR), and the Emotion Regulation Questionnaire was used to assess parents’ use of reappraisal strategies. Regressions revealed a 3-way interaction among parents’ physiology, use of CR, and provision of CR in predicting children’s physiological reactivity (beta = .232, p = .011). For parents who suggested CR to their child and used reappraisal more often themselves, resting physiology was positively associated with children’s physiologically augmentation, suggesting more effective physiological regulation when coping with a disappointment in childhood.

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PARENTAL SOCIALIZATION OF EMOTIONAL DISENGAGEMENT PROMOTES CHILDREN’S USE OF DISTRACTION

Elizabeth Davis, Emily Shih, Laura Quinones-Camacho & Parisa Parsafar
University of California, Riverside

The ability to use emotion regulation (ER) strategies increases in childhood, but little work has examined how parental emotion socialization relates to children’s use of specific ER strategies. Our goal was to examine whether differences in parental socialization would relate to physiological patterns associated with the use of ER strategies in childhood. 184 children (3–11 years; M_age = 7.67 years; 93 girls) were randomly assigned to use distraction, reappraisal, or no strategy while they viewed an emotional film clip. Parents completed the Coping with Children’s Negative Emotions Scale and we examined minimizing and punitive subscales. Ambulatory physiology data were collected during the emotional film and a subsequent neutral film. A residualized change measure of the difference in average RSA from the emotional film to the neutral film indexed physiological recovery. Regressions examined parents’ minimizing or punitive reactions and children’s age in predicting RSA recovery. Models for the No Strategy and Reappraisal conditions were not significant. For Distraction, age and socialization interacted to predict physiological recovery from the emotional challenge (Punitive: beta = .290, p = .040; Minimizing: beta = .436, p = .002). In both models, older children showed greater RSA recovery as parents’ emotional disengagement reactions increased. For younger children, there was no association between parents’ use of punitive reactions and physiological recovery, and younger children showed greater RSA recovery as parents used less minimizing.

THE MODERATING EFFECT OF PARENTING STYLE ON THE IMPACT OF ENVIRONMENTAL STRESS ON DEVELOPMENT OF THREAT AND REWARD PROCESSING IN CHILDREN

Ellen Kessel1, Brady Nelson1, Megan Finsaas2, Greg Hajcak1, Autumn Kujawa3, Alexandra Meyer3, Evelyn Bromet6, Gabrielle Carlson8 & Daniel Klein1
1Stony Brook University, 2Pennsylvania State Hershey Medical Center, 3Florida State University, 4Stony Brook University Medical Center

The current study examined the impact of exposure to stressors associated with Hurricane Sandy on the development of neural systems associated with threat and reward processing, and whether parenting styles that promote reward/approach and avoidance/threat sensitivity influence these associations. An average of 8 months before and 9 months after Hurricane Sandy, 83 children experiencing high and low levels of hurricane-related stress exposure completed tasks in which the reward positivity and error-related negativity, event-related potentials indexing sensitivity to reward and threat were elicited. At the post-Hurricane Sandy assessment children completed a self-report questionnaire to measure approach/reward- and avoidance/threat-focused parenting styles. Among children exposed to high levels of hurricane-related stress, we found that lower levels of approach-focused, but not avoidance-focused parenting, were associated with a reduced reward positivity after Hurricane Sandy. We also found that higher levels of avoidance-focused, but not approach-focused parenting, were associated with a larger error-related negativity after Hurricane Sandy. These findings highlight the need to consider the social context, like parenting, when examining how exposure to stress and adversity alters the development of threat and reward processing in youth.

AUTOMATIC PROCESSING OF FACIAL EMOTION EXPRESSIONS BEFORE AND AFTER AN EMOTION RECOGNITION INTERVENTION: AN EYE-TRACKING STUDY

Jac Airdrie, Zoe Williams, Laura Hunnikin, Amy Wells, Kate Langley, Anita Thapar & Stephanie van Goozen
Cardiff University

Recognizing facial expressions of negative emotions is compromised in those displaying antisocial behavior (ASB). This reduced ability may be an important mechanism explaining why individuals commit antisocial and violent acts. An individual who is unable to correctly process another’s distress is more likely to continue with violent behavior. We investigated conscious emotion recognition deficits in children with conduct disorder (CD) while also measuring automatic attentional emotion processing via eye-tracking. We also explored whether both conscious recognition and automatic processing of emotions can be improved through an emotion recognition intervention. Experiment 1 found that CD participants had deficits in recognizing fear and neutral faces. However, against our predictions, these deficits could not be explained by a lack of attention given to the eye-region of the face. Interestingly though, CD participants spent significantly longer looking away from the face as a whole and also took longer to direct their attention towards the face. Experiment 2 demonstrated the effectiveness of an emotion recognition intervention in improving emotion recognition in a group of children at risk of future antisocial behavior. The training also increased attention to emotions as measured via eye-tracking and a novel pictorial emotional stroop task. These findings demonstrate that children with CD not only have problems with emotion recognition and automatic emotion processing but also that such issues are susceptible to improvement via experimental interventions.

3:40 p.m.—5:10 p.m.
Symposium 30

HIDDEN SECRETS WITHIN THE AVERAGED ERP WAVEFORM: MEANINGFUL TRIAL-BY-BEHAVIOR VARIANCE

Chairs: Colin Sauder1 & Dan Foti2
1UT Health San Antonio, 2Purdue University

A majority of published ERP studies rely on multi-trial averages, in part to address the relatively low SNR of ERPs for small number of trials/single-trial designs. However, inter-trial variation in ERPs’—whether associated with differences in subject behavior (e.g., RT) or trial-by-trial relationships (e.g., post-error slowing)—often contains meaningful variance. Interestingly, inter-trial variation is often distinct from multi-trial averages. For example, interindividual differences in post-error slowing are unrelated to ERN (Ullsperger et al. 2016 [SPR Abstract]). Likewise, inter-trial variance in P300 may be more strongly associated with ADHD and treatment effects than difference in average P300 (Lazzaro et al., 1997). This symposium will examine the influence of single-trial subject factors (e.g., trial RT) and trial-by-trial relationships (e.g., trial order effects) on the late positive potential (LPP), contingent negative variation (CNV) and reward positivity (RewP). The speakers will present compelling evidence of trial-wise shifts in arousal and motivation that are reflected in the physiological response, and are dependent on participant behavior. We will show that this variance is meaningfully associated with interindividual differences, and results will be incorporated in predominant models of motivation and emotional response. The overarching goal of this symposium is to motivate a movement toward more nuanced analyses of within-subject variance, which may inform interindividual differences work, and potentially have occluding effects on grand averages.

ASSESSING TRIAL-WISE VARIANCE OF THE LATE POSITIVE POTENTIAL

Kaylin Hill, Alison Haney, Kate Thomas & Dan Foti
Purdue University

Event-related potentials are traditionally assessed with mean scores across conditions and individuals, yet averaging all available trials may smooth over important information. A more nuanced approach includes the use of single-trial observations, but measurement error and reliability of this time-sensitive approach have not yet been established. In the current study, the dependability of single-trial observations of the late positive potential (LPP) was assessed via Generalizability Theory (G Theory). Unlike classical test theory, G Theory is able to estimate the effects of multiple scores of error in a repeated-measures design. Participants (N = 88) passively viewed 180 affective images. The LPP was scored from 400–1000ms after image onset at centro-parietal sites. As expected, arousal (11.08%) but not valence (0%) accounted for a portion of the variance. The large majority of trial-wise variability, however, was explained by an interaction of between-person differences and time nested within block (78.40%). Separate between-person differences, outside of this interaction, also accounted for a portion of variance (8.42%), but there was no effect of time across persons (0.01%). This research provides support for the use of single-trial LPP data to assess the time course of emotional reactivity during a task, and it offers insight into the sources of variance and error in such an approach. Reliability estimates of the single-trial LPP across and within blocks, as well as the aggregate LPP, will also be discussed along with recommendations for future use.
HIDDEN CONTINGENCIES: REACTION TIME AND THE MONETARY INCENTIVE DELAY TASK

Colin Sauder1, Max Salazar1, Keisha Novak2 & Dan Foti2
1UT Health San Antonio, 2Purdue University

In the MID task certainty of outcome is dependent on participant response, such that atypically fast or slow responses have more predictable outcomes. As demonstrated by Holroyd & Krigolson (2007), expectancy has significant effects on reward positivity (RewP), which in turn correlates with changes in task performance. Likewise the contingent negative variation (CNV), a marker of motor preparation associated with motivation and attention, may be predictive behavioral response (reaction time) and reflective of participant arousal (Irwin et al., 1966; Hillyard, 1969). Collapsing across trials in the MID task may therefore occlude expected relationships between trial-wise behavior, and anticipatory and feedback ERPs. A total of 231 participants completed a modified version of the MID task, and the CNV and RewP were compared based on trial reaction time via a simple median split. Contrary to previous findings with this sample, we found that both reaction time and subsequent feedback (gain, loss, no-feedback) significantly impacted the CNV, with the fastest gain trials having significantly larger (more negative) CNV than either neutral or loss. However, RewP was not related to reaction time in this simple median split analysis. These findings suggest the importance of assessing associations between trial-wise behavior and ERPs in reaction time-locked feedback paradigms. Reliability estimates and follow-up trial-wise data will be presented, and relationships between intertrial variance and interindividual difference measures will be discussed.

DO REINFORCEMENT LEARNING SIGNALS ACTUALLY INFLUENCE TRIAL TO TRIAL BEHAVIOR?

Olav Krigolson
University of Victoria

Our ability to optimize behavior is central to our ability to learn. From a reinforcement learning perspective, our optimization of behavior is dependent on the computation of prediction errors – discrepancies between expected and actual outcomes (Sutton & Barto, 1998). Importantly, these prediction errors are used to modify choice values such that one can learn to select options that maximize reward. Over the past 15 years, a growing body of evidence suggests that the optimization of human behavior is at least in part dependent upon a neural system within the medial-frontal cortex (Holroyd & Coles, 2002). Studies using electroencephalography (EEG) have found that neural responses evoked by response errors and performance feedback scale to expectancy (e.g., Holroyd & Krigolson, 2007), and as such, provide support for the notion that the medial-frontal learning system follows reinforcement learning principles. However, what is less clear is whether the EEG responses (e.g., reward positivity) are yoked to subsequent changes in behavior. Here, the results from a series of studies are presented in which the relationship between reward signals and subsequent changes in behavior are closely examined. Overall, results demonstrate that on average, grand average changes in the magnitude of the reward positivity are paralleled by changes in behavior. However, the results of an analysis at the trial level are less compelling and the relationship between single trial EEG reward responses and next trial changes in behavior are not consistent and thus warrant further investigation.

CHEESECAKE, CHOCOLATE, AND CHOICES: INTERTRIAL VARIABILITY IN EMOTIVE REACTIONS TO HIGH APPROACH-MOTIVATED POSITIVE PICTURES PREDICTS NARROWED ATTENTIONAL SCOPE

Philip Gable & A. Hunter Threadgill
University of Alabama

Past research has found that high approach-motivated positive emotions narrow attention. Other research demonstrates that late positive potential (LPP) amplitudes are an index of motivated attentional engagement. Average LPP amplitudes to high approach-motivated positive pictures relate to a narrowed attentional processing, suggesting that greater motivated attentional processing relates to narrowed cognitive scope at the group level. However, past studies have only examined these effects averaging across trials, without accounting for an individual’s variability within trials. We predicted that trial-wise analysis of LPP amplitudes to high approach-motivated positive pictures would relate to individual response variability in the LPP to high approach-motivated positive pictures relates to a narrowed attentional scope immediately after picture viewing. Results indicated that intertrial variability in the LPP to high approach-motivated positive pictures predicted attentional narrowing following that picture. Assessing an individual's motivation and attentional variability within trials may map on to individual variations in behavior. Analyses will examine how individual differences in approach sensitivity and impulsivity moderate LPP amplitude and narrowed attentional scope. These experiments suggest that interindividual differences in affective responding influence emotion-cognition interactions and their relationship to neurophysiological activity.
Amplitude fluctuations of ongoing alpha oscillatory activity are considered critical for task performance. Amplitude decreases after stimulus presentation typically index cortical support for attention and memory processes. However, reports in non-human primates also relate saccades to amplitude modulations of alpha activity. Human electrophysiology suggests a relationship between saccade direction and attended hemifield during spatial attention tasks, in principle providing a physiological (saccade-related) rather than psychological (attention-related) explanation of alpha amplitude fluctuations. The present study evaluated whether alpha amplitude fluctuations are triggered by a saccade (only its onset, not its offset) or physical stimulation (e.g., related to attention processes, which offset could prompt as much as onset). Fifteen healthy volunteers participated in a prosaccade task during EEG. Analysis epochs were aligned offline to saccade onset or offset, respectively. Following saccade onset but not offset, a stereotypical decrease in alpha followed by a beta increase was observed. Post-saccade source analysis identified posterior parietal cortex as a primary source of the alpha effect and primary motor cortex as generators of the beta effect. In contrast, pre-saccade preparation was associated with alpha activity in frontal eye fields. Present findings suggest that saccade onset is associated with substantial modulation of ongoing oscillatory activity. This potentially facilitates subsequent input sampling. Supported by the Deutsche Forschungsgemeinschaft (Ro805/17)

Descriptors: brain stimulation, MEG/EEG, emotional faces

Affective processing is strongly influenced by top-down streams of cortical areas like the ventromedial prefrontal cortex (vmPFC). Previously, we could show that an excitatory transcranial direct current stimulation (tDCS) of the vmPFC enhances processing of appetitive compared to aversive scenes, while inhibitory tDCS yields the opposite pattern. Here, we tested the influence of vmPFC stimulation via tDCS on emotional face processing. During three measurement blocks (baseline, post-excitatory tDCS, post-inhibitory tDCS) processing of faces with happy or fearful expression was recorded by means of magnetoencephalography (MEG). Following both post-tDCS measurements, behavioral data were assessed in an emotion discrimination task. In this task, morphed faces of individuals with happy and fearful expressions were presented and participants were asked to categorize morphs as either happy or fearful. For the MEG data, analysis of estimated neural activity revealed clusters with stronger activation for appetitive compared to aversive stimuli after excitatory stimulation and an inverted pattern after inhibitory stimulation. Convergent to the neural results, emotion discrimination was significantly shifted towards happy faces after excitatory compared to inhibitory stimulation. These findings support the hypothesis that the vmPFC is specifically active during states of 'positive affect'. They further support our previous finding that the affect modulating impact of this region can be tuned by means of non-invasive tDCS.
ABOLISHMENT OF THE LOCKED-IN STATE WITH A BRAIN-MACHINE-INTERFACE (BMI)
Ujwal Chaudhary, Aygal Rakhimkulova, Azim Malekshahi & Niels Birbaumer
Institute of Medical Psychology and Behavioral Neurobiology, University of Tübingen

Descriptors: brain machine interface, amyotrophic lateral sclerosis, communication

Completely locked-in patients (CLIS) cannot communicate with any motor response despite intact cognitive and emotional response systems. Four ALS (amyotrophic lateral sclerosis) patients in CLIS learned to respond with a brain oxygenation and deoxygenation change of frontal brain areas using portable NIRs (near infrared spectroscopy) to short questions requiring a yes or no response presented auditorily within 15 seconds. CLIS duration in the four patients has lasted from 4 months to eight years and was validated with EEG measurement during all sessions. Questions with known answers were used to train a support vector machine classifier (SVM). After achieving 70% correct answers open questions were asked and feedback of the classified answer was provided to the patients. EEG from 6 electrodes served to control sleep and vigilance decrement: questions were interrupted if sleep-like patterns appeared. 16 to 60 sessions over several months assured stability of communication with an average correct response rate of more than 70% to known and 90% correct answers to open questions. Among open questions quality of life questions were asked on a weekly basis to three of the patients with longer CLIS duration, all patients report good quality of life as previously reported by our group. Open questions answers are validated by stability over time, information of family and care takers, sentences with semantic errors and face validity. These results suggest that brain machine interfaces using metabolic brain signals may end the unbearable silence of CLIS.

WHAT DOES THE DOT-PROBE TASK MEASURE?
A REVERSE CORRELATION ANALYSIS OF ELECTROCORTICAL ACTIVITY
Nina Thigpen1, Laura Gruss1, Steven Garcia1, David Herrin2 & Andreas Keil3
1University of Florida, 2Pennsylvania State University

Descriptors: dot-probe, selective attention, EEG

The dot-probe task is considered a gold standard for assessing the intrinsic attentive selection of one of two lateralized visual cues, measured by the response time to a subsequent, lateralized probe stimulus. Here, we used a reverse correlation approach in combination with frequency-tagged steady-state visual potentials (ssVEPs) to examine the assumption that fast probe responses index heightened selection of a preceding lateralized cue. Twenty-one participants completed a version of the dot-probe task in which ssVEPs were evoked by each member of a pair of lateralized faces varying in emotional expression: On each of 160 trials, participants viewed two face cues (angry-angry, neutral-angry, or neutral-neutral) for 2000 ms, each flickering at a different frequency (12 or 15 Hz), to elicit ssVEPs. One cue was then replaced by an oriented grating probe (Gabor patch), and participants indicated whether the probe was oriented at 0° or 90°. We then examined the extent to which fast probe responses reflected selective visuo-cortical processing (assessed with ssVEPs) of the cue preceding at the same location. Results showed opposite patterns for left and right visual fields: Faster responses to left visual field probes were associated with heightened visuo-cortical selection of the preceding right visual field cue. By contrast, faster responses to right visual field probes were associated with diminished visuo-cortical selection of the preceding right visual field cue. These findings challenge the use of response time in the dot-probe task as an index of covert attention.

ANTERIOR PREFRONTAL REPRESENTATION OF LOW-LEVEL STIMULUS FEATURES IN ATTENTIONAL REALLOCATION
Ninja Horr, Stefan Pollmann & Markus Ullsperger
Otto-von-Guericke-Universität Magdeburg

Descriptors: attentional reallocation, anterior prefrontal cortex, multivariate pattern analysis

Anterior prefrontal areas are involved in cognitive tasks that require flexible exploration of response alternatives. This may be because the frontopolar cortex (FPC) maintains reallocation of attention in under-defined situations without a clear rule of when to shift attention. Interestingly, complex explicit decision-making does not seem to be a precondition for FPC involvement. A couple of both neuroimaging and patient studies show a relationship between FPC activation and implicit attentional reallocation. The latter seem to require a representation of low-level stimulus features in anterior frontal areas. Here, we test the characteristics of this representation using a simple discrimination task involving flexible attentional switches between visual feature dimensions. We find increased reaction times and increased BOLD activation in frontopolar and superior frontal regions (BA9 and BA10) for trials in which the to be attended feature dimension changes from the previous trial. Using multivariate pattern analysis on EEG data we then investigated the time course of the stimulus feature representations these switches are based on. We find an early (starting at 100ms) above-chance classification performance between stimulus features, not only, as expectable, for occipital, but also for frontal EEG components. Classification performance in frontal areas differs between trials with and without a need for attentional switches. Implications for the mechanisms underlying implicit attentional processing in anterior frontal areas are discussed.
REWARD AND PUNISHMENT MOTIVATION DEMONSTRATE OPPONENCY IN DORSAL ANTERIOR CINGULATE DESPITE SALIENCE-ENCODING ACTIVATION

Jessica Lake¹, Jeffrey Spielberg², Zachary Infantolino³, Laura Crocker⁴, Cindy Yee¹, Wendy Heller⁵ & Gregory A. Miller¹

¹University of California, Los Angeles, ²University of Delaware, ³Stony Brook University, ⁴VA San Diego Healthcare System, ⁵University of Illinois at Urbana-Champaign

Descriptors: reward, punishment, functional connectivity

fMRI investigations have examined the extent to which neural activation associated with reward and punishment motivation is consistent with the encoding of valence vs. salience. However, the possibility of intermixed but distinct populations of neurons encoding reward and punishment has limited the extent to which regions can be regarded as exclusively encoding salience using fMRI. To circumvent this limitation, the present study examined the interaction of reward and punishment motivation and the functional connectivity of classically-defined salience-encoding regions. Participants completed a modified monetary incentive delay task, making a speeded response after each target. In a factorial design, cues presented prior to the target indicated whether monetary reward and/or loss could be expected if the response was or was not fast enough to the target, respectively. Evidence of behavioral and neural interactions of reward and punishment motivation involving dorsal anterior cingulate (dACC) indicates that these processes do not contribute only additively to behavioral performance and therefore do not support a simple salience-encoding account. Additionally, despite exhibiting classically-defined salience-encoding activation (increased activation during both reward and punishment motivation), dACC showed differential connectivity between these conditions, supporting differential neural communication according to motivational valence. These findings support the opponency of reward and punishment and demonstrate a novel fMRI method for specifying regional functionality.
Poster Session Abstracts

**Poster 1-001**

**AGE RELATED DIFFERENCES IN EEG DELTA PHASE LOCKING DURING FACIAL EXPRESS ON RECOGNITION TASK**

Tuba Akıtırlık, Ummihaan Işıl Gula-Alkaç, Dilan Güner, Lütfü Hanoğlu & Bahar Güntekin

1Istanbul University - Istanbul, 2Istanbul Medipol University

Descriptors: facial expression, EEG, aging

There are limited studies investigating the effect of age on the recognition of facial expressions. In the present study, we aimed to investigate effect of age on facial expression recognition by EEG. Inter Trail Coherence Analysis. 12 healthy young subjects and 12 healthy elderly subjects were included in the study. EEG was recorded with BrainAmp 32-Channel DC System. Nine photographs from Ekman and Friesen (1976) series were selected with three different facial expressions (angry, happy, neutral) of three different faces. After each EEG recording session, subjects were asked to identify the each facial expression that was presented. Delta (1–3Hz) frequency phase locking (Inter Trail Coherence) were analyzed with EEGlab toolbox. Repeated measures of ANOVA was used for statistical analysis. There were statistically significant results for faceXgroupXlocation (F = 5.436, p=0.011) and faceXgroupXlocationXhemisphere (F = 2.542, p=0.016) comparisons. Elderly subjects had reduced delta phase locking in comparison to younger adults over occipital (O1, O2) and parietal (P3, P4) locations especially during “angry” face expression perception. In the literature facial expression recognition were reported be related with increased delta responses over occipital areas. In the present study, elderly adults showed decreased delta responses during identification of facial expression. This decline was especially evident for the parietal and occipital lobes. Decrease of delta responses in the elderly subjects could be due to their impairment in recognizing facial expressions.

**Poster 1-002**

**DOES AGE INFLUENCE BRAIN POTENTIALS DURING AFFECTIVE PICTURE PROCESSING IN MIDDLE-AGED WOMEN?**

Janine Wirken, Andreas Löw, Anne-Marie Struck, Alfons Hamm & Mathias Weymar

1University of Greifswald, 2University of the Federal Armed Forces Hamburg, 3University of Potsdam

Descriptors: aging, emotion, ERPs

Prior research focusing on age groups of 60 years and older found an attentional shift towards positive information (“positivity effect”), compared to younger participants. Here we examined, whether such age-related changes in emotion processing can already be observed in middle-aged participants. Twenty-one younger (M age = 21.0 years; SD = 2.5) and 21 middle-aged (M age = 53.3; SD = 4.5) healthy women underwent neuropsychological testing and viewed 30 unpleasant, 30 neutral, and 30 pleasant pictures while brain potentials were recorded. As expected, younger, compared to older women showed faster response times during attention testing. All results, however, were within the age norms. In both groups, viewing of emotional, relative to neutral pictures, evoked later early posterior negativity (EPN; 200–300 ms) and enhanced late positive potentials (LPP; 500–800 ms), indicating enhanced attention allocation to these stimuli. A positivity effect, however, was not found for middle-aged women. Our results suggest that affective picture processing is not biased in this age group.

**Poster 1-003**

**ATTENTION TO SOUND FEATURES SELECTIVELY MODULATES THE ASSR AND THE FFR**

Jordi Costa-Faidella, Oscar Bedford & Carles Escera

1Brainlab-Cognitive Neuroscience Research Group & Institute of Neurosciences, University of Barcelona, 2Institut de Recerca Sant Joan de Déu (IRSJD)

Descriptors: auditory, steady-state response, selective attention

Endogenous attention shifting to different sounds within the auditory landscape can alter the neural encoding of acoustic features via top-down modulatory influence. How selective this influence is and the extent to which it affects the different hierarchical levels of auditory processing is a matter of debate. While task-dependent modulation of the Auditory Steady State Response (ASSR), a cortical response reflecting neural synchronization to periodic modulations of the sound envelope, is an established finding, evidence for attentional modulation of the Frequency Following Response (FFR), of presumably subcortical origin, is controversial. Nevertheless, studies have traditionally implemented inter-modal and inter-stimulus designs and tracked ASSR and FFR separately, rendering impossible to distinguish attentional effects on the encoding of different sound features by different levels of the processing hierarchy. We recorded EEG from healthy participants actively listening to an ambiguous sequence of amplitude modulated (AM) sinusoidal tones arranged in mutually exclusive rhythmic patterns. We analyzed ASSR and FFR to a tone that constituted the downbeat in both patterns, therefore disentangling the effects of feature attention from those of temporal attention. Our results indicate higher oscillatory power in ASSR and FFR when the participants attended to AM and pitch modulations respectively, suggesting that attention selectively enhances the representation of the target sound feature at the hierarchical level of the auditory pathway where that feature is best computed.

**Poster 1-004**

**VALUE LEARNING AND EARLY VISUAL PROCESSING**

Jaclyn Dell, Constanza di Dios, Carlene Horner, Rebecca Martinez & Jennifer O'Brien

1University of South Florida St. Petersburg, 2University of South Florida, 3Tufts University, 4Teacher’s College Columbia University

Descriptors: attention, motivation

The current study examined the influence of expected value on early sensory and perceptual processing using ERPs. Early sensory processing of visual stimuli is indexed by the C1, generated from primary visual cortex (V1) and assumed to be invariant to top-down influences such as expected value; however, recent evidence suggests the contrary. The N1 indexes the extraction of the perceptual representation, being larger to stimuli that require more effortful discrimination and thus sensitive to top-down influences such as attention. We investigated how top-down stimulus associations of valence (reward, loss) and outcome probability (high, low) would alter the subsequent early processing of it when value associations were no longer task-relevant. We did this by imbuing novel face stimuli with value varying in valence and probability of occurrence in a choice task involving winning and losing money to acquire expected values. Learned faces were then presented in a perceptual discrimination task where participants judged the direction of tilt (45 degrees right or left). C1 elicited to the face in the right visual field was impacted by valence and probability independently, being smallest to gain-related faces and to high-probability faces. The N1 showed an interaction of valence and probability, being smallest to high-probability rewarding faces. Results suggest that learned valence and probability modulate early sensory and perceptual processing, possibly with an advantage for stimuli previously associated with reward.
Posters

Poster 1-005
THE RELATIONSHIP BETWEEN ADHD SYMPTOMATOLOGY AND PHOTOPHOBIA
Joseph Baschnagel & Jeffrey Miller
Rochester Institute of Technology

Descriptors: ADHD, photophobia
ADHD has been associated with many vision related issues particularly photophobia (light sensitivity; Kooij & Bijlenga, 2014). This study examines the empirical evidence for the prevalence of photophobia in college students with ADHD symptoms. Over five trials participants viewed full spectrum white light while manually increasing the brightness. Discomfort ratings, squinting (measured with electromyography), arousal level measured by skin conductance levels (SCL) and brightness were recorded. The discomfort ratings, squinting, SCL, and brightness (Lux) were averaged across the five trials. Participants completed the ADSA, an ADHD symptoms questionnaire, and were included in analyses if they fell at or 1 SD from the mean (moderate/severe, n = 30) and > 1 SD from the mean (non-clinical, n = 5). It was hypothesized that those with higher ADHD symptomology would have higher discomfort ratings, squint more, have higher SCL, and lower thresholds for brightness. Mean scores were analyzed using UNINOVAs. There was a trend for high ADHD symptom group to rate the light as more discomforting, F(1, 58) = 2.9, p = .09, η²p = .05. There were no significant differences between groups for the other measures, all Fs < 1. These findings suggest that contrary to self-report studies there are no behavioral differences in photophobia between those with high and low ADHD symptoms.

Poster 1-006
EFFECTS OF PRIOR MENTAL EFFORT ON ATTENTION TO EMOTIONAL IMAGES: AN ERP INVESTIGATION
Brandon Schmeichel¹, Anna Finley¹, Adrienne Crowell² & Katie Garrison¹
¹Texas A&M University, ²Hendrix College

Descriptors: mental effort, ERPs, attention
The current study examined the aftereffects of mental effort on the processing of emotional stimuli using neural measures. Ninety-seven healthy young adults were randomly assigned to exercise more versus less mental effort on a writing task. Then participants viewed positive, negative, and neutral affective images while P1, N1, P2, N2, P3, and late positive potential (LPP) magnitudes to the images were assessed. We observed a main effect of emotional content on the P2, N2, P3, and LPP components such that emotional versus neutral images elicited more positive amplitudes. In addition, participants who exerted more (versus less) effort on the writing task showed more negative N2 amplitudes to all images. These findings reveal that mental effort alters neural responses to subsequent visual stimuli, specifically the N2, which suggests novel implications for understanding the behavioral aftereffects of mental effort and self-control.

Poster 1-007
AVERAGING EMOTION FROM MULTIPLE FACIAL EXPRESSIONS: EFFECTS OF OVERT VS. COVERT SPATIAL ATTENTION ON BEHAVIOR AND LATERALIZED EVOKED POTENTIALS
Luyan Ji & Gilles Pourtois
Ghent University

Descriptors: emotion from facial expressions, spatial cueing task, lateralized ERPs
Whether averaging multiple facial expressions shown simultaneously requires attention or not remains debated in the literature. In this ERP study, we addressed this question by using a standard spatial cueing task during which participants had to report the average emotion of four individual faces shown in the periphery (without overt eye movements) at an attended (75%) or unattended (25%) location. EEG with 64 channels was recorded concurrently. Eye movements were carefully monitored using (horizontal) electrooculogram (EOG). Out of 36 participants, 17 (clear-saccade group) turned out to have a substantial amount of eye movements (on average 62%) in response to the symbolic cue, detected by a step-like function on the HEOG channel. The remaining 19 participants (no-saccade group) had a low rate of saccade (on average 2%). We compared behavioral and EEG data between these two groups. At the behavioral level, we found that overt attention enlarged the validity effect, but notably, extracting average emotion could take place using covert attention only, and even in the invalid condition. At the ERP level, the N2pc and the SPCN were only elicited for valid trials for the no-clear-saccade group exclusively. These results underscore the importance of monitoring eye movements when exploring (covert) shifts of spatial attention towards lateralized spatial locations. Importantly, when experimental conditions corresponding to the use of covert attention are met, they suggest that averaging multiple facial expressions can operate with limited attention.

Poster 1-008
VISUAL MISMATCH NEGATIVITY AND REPRESENTATIONAL MOMENTUM: ELECTROPHYSIOLOGICAL AND BEHAVIORAL MANIFESTATIONS OF THE SAME PREDICTIVE PROCESSES
Motohiro Kimura
National Institute of Advanced Industrial Science and Technology (AIST)

Descriptors: prediction, representational momentum, visual mismatch negativity
Visual objects dynamically change their spatial locations and features over time. Whether averaging multiple facial expressions shown simultaneously requires attention or not remains debated in the literature. In this ERP study, we addressed this question by using a standard spatial cueing task during which participants had to report the average emotion of four individual faces shown in the periphery (without overt eye movements) at an attended (75%) or unattended (25%) location. EEG with 64 channels was recorded concurrently. Eye movements were carefully monitored using (horizontal) electrooculogram (EOG). Out of 36 participants, 17 (clear-saccade group) turned out to have a substantial amount of eye movements (on average 62%) in response to the symbolic cue, detected by a step-like function on the HEOG channel. The remaining 19 participants (no-saccade group) had a low rate of saccade (on average 2%). We compared behavioral and EEG data between these two groups. At the behavioral level, we found that overt attention enlarged the validity effect, but notably, extracting average emotion could take place using covert attention only, and even in the invalid condition. At the ERP level, the N2pc and the SPCN were only elicited for valid trials for the no-clear-saccade group exclusively. These results underscore the importance of monitoring eye movements when exploring (covert) shifts of spatial attention towards lateralized spatial locations. Importantly, when experimental conditions corresponding to the use of covert attention are met, they suggest that averaging multiple facial expressions can operate with limited attention.

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Poster 1-009
PATTERNS IN ATTENTION BIASES AND PHYSIOLOGICAL RESPONSES TO THREAT VARY AS A FUNCTION OF EXPOSURE TO CHILDHOOD TRAUMA
Claudius von Schroder, Sarah Herzog & Wendy D’Andrea
The New School

Descriptors: polyvictimization, attention biases, heart rate

There is need for further work clarifying attention-physiology interactions by degree of exposure to early victimization, as it is clear that cumulative trauma in childhood, i.e., polyvictimization, may have lasting effects on the stress response that differ from those of acute traumatization. The present study examined relationships between baseline and task-related physiology (indexed by respiratory sinus arrhythmia [RSA], and heart rate [HR], respectively), and attention biases (via the dot probe task), in 63 community-dwelling adult women stratified on the basis of self-reported exposure to multiple types of childhood interpersonal vic-
timization (i.e., sexual, physical, and emotional abuse). Consistent with hypothe-
ses, a pattern of threat hypervigilance was found in the single victimization

group, while threat avoidance was found in the polyvictimization group. Addi-
tionally, avoidance of threat in the polyvictimized group was associated with

Poster 1-010
PUPILLARY RESPONSE TO EMOTIONAL FACES IMPACTS SUBSEQUENT ATTENTION IN ANXIOUS CHILDREN
Sara Haas1, Laurel Gordon2, David Pagliaccio1,
Daniel Pine3 & Nathan Fox2
1National Institute of Mental Health, 2University of Maryland, College Park

Descriptors: pupillometry, visual search, anxiety

The sympathetic pupillary dilation response has been examined as a proxy for
neural activity related to both cognitive effort, and regulation of emotion informa-
tion processing. Pupils dilate to stimuli with high emotional intensity, and this
dilation co-occurs with activity in related emotion processing regions such as the
amygdala (Siegle, et al., 2003). Researchers have found that anxious children
exhibit different patterns of pupillary responses to negative faces compared to

Poster 1-011
SELECTIVE ATTENTION TO TARGETS IS ACCOMPANIED BY CORTICAL SYNCHRONY IN THE THETA-BAND AND INCREASES IN GAMMA POWER IN FRONTAL AND TEMPORAL REGIONS
Nina Thagpen1, Amy Trongnetpunya2, Jean Cibula1, Aysegul Gunduz2,
Laura Gruss3, Ke Bo1, Enrico Opril1 & Andreas Keil1
1University of Florida, 2The Henry M Jackson Foundation for the
Advancement of Military Medicine

Descriptors: electrocorticogram, gamma, selective attention

Selective attention to targets in a temporal stream is essential for quickly and
accurately identifying stimuli that are important to us. The animal model has pro-
vided a strong understanding of which neural correlates are associated with
behavioral outcomes in feature-based selective attention task, from the level of
single-cell recordings to large-scale networks. Here, we attempt to translate these
findings from the animal model to human findings, via electrocorticogram (ECoG)
data collected from five epilepsy patients, directly from the left frontal,
orbitofrontal, and anterior and posterior temporal grids. Participants completed a
feature-based selective attention task, where they were given a grating target
defined by three features: color, shape, and orientation. Participants were then
shown a series of distractor gratings that could differ from the target by 0, 1, 2, or
3 features. Results suggest that within the frontal and posterior temporal lobes,
selective attention to target features is associated with a robust increase in theta
(4-8 Hz) phase synchrony in the first 500 ms post-stimulus onset. We also observed
pronounced decreases in beta (12-30 Hz) power from 300-500 ms after
grating onset, and increased broadband gamma (30-120 Hz) power from 400-
1000 ms. These results converge with the animal model, to suggest slow-wave
synchrony and high-frequency power are important neural interactions underlying
feature integration and target selection.

Poster 1-012
THE EFFECT OF TASK DIFFICULTY AND RESPONSE TYPE FOR DURATION DISCRIMINATION ON DISTRACTION
Sanae Naka & Jun’ichi Katayama
Kwansei Gakuin University

Descriptors: distraction, P3

Task irrelevant environmental changes attract attention and sometimes impair the
ongoing cognitive processes. It is also known that irrelevant information is fil-
tered out from subsequent processes when task is difficult. Our previous research
showed that distraction of short duration stimulus was smaller than that of long
one in duration discrimination task. There is a possibility that participants treated
the short stimulus as standard for the duration discrimination. Because the
standard-duration can be manipulated by response type, we investigated whether
difficulty and response type affect the distraction of the both durations. Stimuli
appeared once every 1200 ms with short (100 ms in easy and 200 ms in difficult
condition) or long (400 ms in both conditions) duration equiprobably. Each stim-
ulus consisted of a small blue circle and a large gray square. The circle appeared
at either the center (90%), lower left quadrant (5%), or upper right quadrant (5%)
on the square presented at the center of display, although the circle position was
irrelevant. ERP was recorded during three types of duration discrimination tasks;
a choice task requiring a response to both durations and two go/no-go tasks to
short or long stimuli. Response type did not affect RT and ERP. For short stimuli
in both difficulties, RT distraction decreased, but the P3 for the deviant was not
affected. The results suggest that standard-duration did not affect the attentional
capture by irrelevant deviants and that the stimulus duration effect on distraction
is not caused by the amount of captured attention.
TESTING THE PROTECTION-OF-PROCESSING HYPOTHESIS BY ASSESSING THE EFFECT OF PREPULSE NOVELTY: DO OLD AND NEW PREPULSES RECEIVE EQUIVALENT PROTECTION?

Bryan Fox, Jessica Gettleman, Aaron Howard & Diane Filion
University of Missouri - Kansas City

Descriptors: PPI, filtering, attention

Prepulse inhibition (PPI) is believed to index sensory filtering and an increased ability to ignore distracting stimuli. The "protection-of-processing hypothesis" (Graham, 1975) suggests that detection of a novel stimulus triggers a momentary inhibitory process that allows protected time for the significance of a prepulse stimulus to be assessed. One prediction of this hypothesis is that the amount of inhibition produced by a prepulse should be proportional to the familiarity and/or processing demands of the prepulse. To test this hypothesis, we assessed PPI in healthy volunteers (N=50) under one of two conditions. All participants heard a single 3s tone presented 46 times with a mean ITI of 7.5s. Beginning with the 47th trial, either the same tone or a novel tone was presented 5 times. On 3 of those final 5 trials, the tone served as a prepulse for an acoustic startle probe presented 120ms after tone onset. We recorded skin conductance responses to each tone and eyelink EMG to each startle probe. Based on the protection-of-processing view, we predicted that the novel-tone prepulse would produce more PPI than the familiar-tone prepulse, given the increased processing required of a novel stimulus. Preliminary results indicate reduced PPI produced by the novel prepulse, although differences in baseline startle appear to partially drive this effect, suggesting that patterns of skin conductance responses across groups and over trials may help to clarify the PPI results. Overall the results suggest a complex interplay between prepulse processing demands and prepulse inhibition.

EFFECTS OF ATTENTION ON P50 SENSORY GATING

Jewel Mascarenhas, William Gavin & Patricia Davies
Colorado State University

Descriptors: sensory gating, attention, P50 suppression

Sensory gating is a neurological process that filters out irrelevant stimuli, and prevents sensory overload of higher brain functions. One method to assess gating is the P50 ERP amplitude-reduction to the second click (C2) relative to the first click (C1). Research examining the influence of attention on gating is mixed. This study examined the effects of attention on P50 sensory gating. Sixty neurotypical adults (18–30 years) were randomly assigned to a distraction (movie-watching) group or a no-distraction (no-movie) group. All participants were presented with two conditions of 80 pairs of click stimuli with 40 randomly interspersed single clicks while EEG data were recorded. During the first condition (passive), participants were presented with the clicks. For the second condition (active), participants were asked to press a button only following the single clicks but not paired clicks. Gating was assessed using the P50 ratio (C2/C1). A 2 (condition) × 2 (group) ANOVA using P50 ratio revealed a main effect of condition (F1, 59 = 4.9, p = .03), indicating that participants in the active condition had significantly less robust gating than the passive condition, regardless of the group. There were no significant differences in P50 gating between the distraction and no-distraction groups. Results from this study indicate that directing attention towards the click stimuli significantly reduces sensory gating at the early P50 ERP component in neurotypical adults. Future studies will apply these findings to clinical groups with attention deficits.

ATTENTIONAL MODULATION OF THE C1 COMPONENT OF THE VISUAL EVOKED POTENTIAL

Kieran Mohr1, Redmond O’Connell2 & Simon Kelly3
University College Dublin, 3Trinity College Dublin

Descriptors: attention, electroencephalography, visual processing

Although a convincing demonstration of attentional modulation of the earliest visual evoked potential component (C1) has been provided (Kelly et al. 2008), a large number of ostensibly similar attempts to observe such modulation have been unsuccessful. This suggests that attentional modulation of the C1 component is restricted to specific circumstances, but what exactly the determining factors are remains a mystery. We present results demonstrating that C1 modulation by attention depends systematically on task demands, specifically the stimuli features (orientation and contrast) that render the perceptual discrimination difficult. We also present ongoing efforts to test other factors including background luminance, predictability of stimulus position and response deadline. One potential reason for some, but not all, previous null results is the difficulty in measuring the C1. In order to obtain a robust measure of the C1 we tailor stimulus positioning to each participant using a multifocal mapping procedure (Kelly et al. 2008; James, 2003). Given that we observed attentional modulation of the C1 selectively for specific feature sets, we speculate that a further reason that attentional modulation of the C1 has remained elusive is that the modulation is deployed strategically and not universally. Thus, we predict that attentional modulation of the C1 will be maximal when background luminance is low, stimulus positioning is predictable and the response deadline is tight.

AN HRV-MULTI-FEATURE APPROACH FOR ASSESSING DEPRESSIVE SYMPTOMS IN CARDIOSURGICAL PATIENTS

Simone Messerotti Benvenuti1, Alberto Greco2, Claudio Gentili1, Gaetano Valenza1, Enzo Scilingo2 & Daniela Palomba1
1University of Padua, 2University of Pisa

Descriptors: depression, heart rate variability, cardiovascular disease

Heart rate variability (HRV) is reduced in depression and coronary heart disease (CHD) suggesting common pathophysiological mechanisms for the two disorders. Within CHD, cardiac surgery patients (CSP) affected by postoperative depression are at greater risk of adverse cardiac events. In this study we tested whether HRV multi-feature analysis could discriminate CSP with or without depressive symptoms and provide an effective estimation of symptoms severity. Thirty-one patients admitted to rehabilitation after cardiac surgery were recruited. Depressive symptoms were assessed with the Center for Epidemiologic Studies Depression Scale (CES-D). HRV features in time, frequency, and nonlinear domains were extracted from 5-min-ECG recordings at rest and used as predictors of “least absolute shrinkage and selection” (LASSO) operator regression model to estimate patients’ CES-D score and to predict their depressive state. The model significantly predicted the CES-D score in all subjects as the mean square error (total explained variance of CES-D score was 89.93%). The model also discriminated depressed and non-depressed CSP with 86.75% overall accuracy. Seven of the ten most informative metrics belonged to nonlinear-domain. To our knowledge this is the first study using a multi-feature approach to evaluate depression in CSP. The high informative power of HRV nonlinear metrics suggests their possible pathophysiological role both in depression and in CHD. The high-accuracy of the algorithm at single-subject level opens to its translational use as screening tool in clinical practice.
ONE NEGATIVITY TO REFLECT THEM ALL! FRN AMPLITUDE CODES THE ADDITIVE INTEGRATION OF MULTIPLE OUTCOME ASPECTS

Roman Osinsky, Kristina Holst & Natalie Ulrich
University of Osnabrück

Descriptors: feedback-related negativity, reward positivity

Prior research repeatedly indicated that the Feedback-Related Negativity (FRN) reflects a binary distinction between optimal and non-optimal action outcomes by the posterior midcingulate cortex. In most previous studies on the FRN, however, behavioral outcomes only referred to a single consequence category (e.g., mone-

tary win versus loss). It is therefore unclear, whether the mechanisms underlying the FRN effect are also involved in the integration of multiple (i.e., more than one) outcome aspects. In the presented study we used a gambling task in each trial of which participants (N = 35 healthy students) could choose between nine options and then received a visual decision feedback. Importantly, the feedback indicated two independent outcome aspects at once, one referring to an immedi-
ate monetary consequence and the other referring to the long-term value of the decision. During task-completion an electroencephalogram was recorded at 64 scalp sites. Analyses of the frontomedial FRN revealed large main-effects of the two outcome aspects, with FRN amplitude being more positive for optimal com-
pared to non-optimal consequences for both aspects. The additive combination of these two main-effects resulted in a rather continuous FRN amplitude pattern, which corresponds with the additive value of the two outcome aspects. Our find-

ings therefore show that the FRN does not merely reflect a simple binary outcome coding but rather an integrative scaling of multiple action consequences.

REDUCTION OF FEAR RESPONSES IN SPIDER FEARFUL INDIVIDUALS IN AN EMOTIONAL DECISION MAKING TASK - PSYCHOPHYSIOLOGICAL, BEHAVIORAL, AND VERBAL DATA

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1University of Mannheim, 2Technische Universität Dresden

Descriptors: decision making, phobia, operant conditioning

Avoidance is one of the key symptoms of anxiety disorders and a contributing factor to their maintenance. Therefore, the reduction of avoidance behavior is a primary goal during exposure-based treatments. However, it is often difficult to motivate patients to start with exposure and there is a relatively high attrition rate. We modified a decision-making paradigm which we had previously established as a laboratory measure of avoidance tendencies in order to foster a self-selected approach. Spider fearful individuals (N = 50) were assigned to one of two condi-
tions, Intervention group: individuals were differentially reinforced by hypotheti-

cal money for choosing a fear-relevant (spider picture) over a neutral picture (butterfly picture). Sham-control group: individuals were equally rewarded for selecting both stimuli. As expected, we observed a shift from avoidance to approach in the Intervention group but not in the Sham-control group. There were no group differences in self-reported fear of spiders, nor in arousal, fearfulness, and unpleasantness towards the fearful stimulus. Interestingly, compared to the Intervention group, those in the Sham-control showed a significantly larger number of electro dermal responses while looking at spider pictures. There was no transfer of approach behavior to a subsequent behavioral approach test (BAT) and no effects were found on psychophysiology in the BAT with a real spider. These findings suggest that incentives may be a useful tool to initiate self-selected exposure but this may not be sufficient to change affective responses.

DECISION MAKING, EMOTION ACTIVATION AND SOMATIC MARKERS IN OPIATE USERS

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Descriptors: opiate, somatic markers, decision-making

Opiate use is associated with deficits in decision-making. This may be due to abnormalities of the orbitalfrontal cortex, which is involved in the activation of emotion and the calculation of rewards. The Somatic Marker Hypothesis pro-
poses that emotion is involved in decision-making, and that increased physiologi-

cal arousal prior to poor choices (somatic markers) biases decisions away from poor long-term outcomes. Abnormal emotional activation and reduced somatic marker production prior to decisions have been argued to underlie poor decision-
making, however this has not been assessed in opiate users. This study investi-
gated whether the decision-making deficit observed in opiate users is associated with reduced somatic marking prior to poor decisions, and/or decreased emo-
tional activation more generally. The study included 28 opiate users and 32 healthy controls. To index somatic markers, skin conductance responses (SCR) were recorded whilst participants completed the Iowa Gambling Task (IGT). To measure more general emotional activation, subjective and objective (SCR) measures of emotional arousal were collected while participants watched emotionally-arousing videos. On the IGT, opiate users demonstrated worse decision-making than controls. However, there were no differences between groups in somatic marking before each decision on the IGT, or in subjective or objective emotional responses to the videos. The results show that while opiate users have reduced decision-making ability, this does not appear to be due to impaired somatic marking or emotional activation.

TAX DECISIONS ARE MORE CONFLICTING UNDER LEGITIMATE THAN COERCIVE TAX AUTHORITY – AN ERP STUDY

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Descriptors: taxpaying, cognitive control, social decision-making

In light of recent political developments, cooperation in social systems has never been more relevant than now. Taxpaying is an excellent example for cooperation in modern societies, although little is known about its underlying cognitive and neuronal processes. Therefore, we investigated the impact of perceived tax authority – coercive vs. legitimate – on event-related potentials (ERPs) during fis-
tive taxpaying situations in 78 volunteers. Coercive tax authorities are character-
ized by employing control and punishment to foster tax compliance and emphasize egoistic utility of taxpaying. In contrast, legitimate authorities apply information provision and expertise and focus on social norms of cooperation. The current study employed a within-subject design in which all participants experienced tax paying trials during both tax authorities (order counterbalanced).

Electroencephalogram was assessed with 64 channels within a frequency range of DC to 250 Hz and sampled at 500 Hz. Trials during legitimate authority yielded increased P2 and MFn (Medial Frontal Negativity) amplitudes compared to coercive trials when income and the corresponding tax rate were presented. These findings suggest heightened attention capture and cognitive control processes during early stimulus processing in legitimate compared to coercive trials. Legitimate tax authorities might led to higher fairness-related decision conflicts because they provoke a conflict between self- and social interests in contrast to coercive tax authorities that frame tax paying rather as rational business decision.

WHAT YOU GIVE IS WHAT YOU GET: PAYING OUT ONLY ONE TRIAL IN ECONOMIC STUDIES INDUCES RISK AVERSION AND REDUCES REWARD POSITIVITY AMPLITUDES

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Descriptors: risk behavior, payment, reward positivity

It is common practice in economic studies to pay out only one randomly selected trial instead of all trials. We doubt the equivalence of paying out one trial and paying out all trials, so we tested if both payment methods lead to different results. In addition, we recorded EEG signals while participants played a risk game in two payment conditions. We found that participants acted 12% more risk averse in the pay-one condition compared to the pay-all condition. Further, reward positivity amplitudes were significantly reduced in the pay-one condition compared to the pay-all condition. The reduction in risky behavior was signifi-
cantly associated with the reduction in reward positivity amplitudes. We conclude that paying out only one randomly selected trial leads to significantly different results than paying out all trials. Participants avoid risky choices in the pay-one condition. In order to do that, they exert more cognitive control, which is mir-
rored in smaller reward positivity amplitudes. We recommend to pay out all trials in economic paradigms.
PSYCHOPHYSIOLOGICAL AND EXPERIENTIAL CORRELATES OF SITUATION SELECTION: THE IMPACT OF ILLUSORY CHOICE

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Descriptors: emotion regulation, strategy efficiency

Functional emotion regulation is crucial in promoting well-being and adaptation to the environment. It involves processes that efficiently trigger appropriate modification of emotional responses, occurring at the experiential, expressive, and physiological levels. Our research tackles the effect of situation selection, an emotion regulation strategy dealing with the choice of a situation that we accept to live. A previous study in our lab showed that this strategy has a strong efficiency for negative experience and significantly impacts cardiovascular, exocrine and respiratory unfolding. More importantly, these effects are not related to the option we choose, but rather uniquely to the fact of choosing. In the present study, we wanted to examine within a situation selection procedure, if the subsequent availability or unavailability of the chosen option was affecting the regulatory impact of situation selection. We asked 68 right-handed participants (34 F, mean age = 21.1 y.) to watch imposed emotion inducing pictures or to select from different themes the emotional stimuli they wanted to see (situation selection). In this last condition, some choices were either respected (regular emotion regulation unfolding) or not respected, which we called “illusory choice” condition. Results show that the regulatory impact of illusory choice is globally not different from the effect of regular situation selection. Our study reinforces the concept that the most powerful effect of situation selection reside in the fact of having the choice, independently of the situation we end up in.

DUAL-NETWORK INTERACTION SUPPORTING EMOTION INHIBITION

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Descriptors: emotion, inhibition, graph theory

Neural mechanisms associated with reduced inhibition during emotion processing are poorly understood and often overlook the dynamic nature of the process. Inhibitory control has been associated with reorganization of brain networks, enabling them to be more specialized, integrated, and resilient. The brain structures and their associated properties when drawn into these networks are likely to depend on what is being inhibited. This study utilized graph-theoretic analysis of fMRI data during the emotion-word Stroop (EWS) to identify key changes in brain networks associated with emotion inhibition in healthy individuals. Subjects (N = 103) were presented with blocks of positive, neutral, and negative words presented in 1 of 4 colors. Results indicated that two networks were associated with emotion inhibition during the EWS task: one involving hyper-connectivity to prefrontal cortex and one involving hyper-connectivity to thalamus. Brain regions typically involved in emotion processing were most closely connected with the thalamic hub. To increase functional segregation and communication efficiency, high-arousal words were associated with restructuring of the global network. These results demonstrate that emotion inhibition involves interactions between cognitive control and emotion processing networks. Although previous work has demonstrated that inhibition is associated with higher resilience to damage, such changes were not shown to be associated with emotion inhibition in present data, possibly indicating that these networks are more sensitive to disruption.

RELAXATION EFFECTS OF ENVIRONMENTAL SOUNDS RELATED TO WATER

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Descriptors: relaxation, environmental sounds, eyeblink

The relaxation effects of environmental sounds related to water were investigated by examining changes in physiological responses and subjective feelings when listening to the sounds of rain and flowing water. Participants were eleven university students (six men and five women, mean age 21.0, age 21 to 23 years). Four types of stimuli were used: the sound of rain (strong and weak) and the sound of flowing water (strong and weak). These sounds were taken from CDs in the market and presented using headphones for 80s. Participants’ eyeblinks (vertical-EOG), heart rate (ECG), skin potential responses (SPR), and respiration were recorded through a polygraph system. Moreover, participants’ feelings were assessed after the listening task. Results indicated that the blink rate decreased significantly and heart rate increased significantly after listening to the sound of water. SPR integrated values gradually decreased significantly with the course of listening time. The respiratory rate increased significantly when listening to the sound of heavy rain. Subjective evaluations after stimuli presentation indicated that the sound of heavy rain was preferable to weak rain, or strongly flowing water. Furthermore, the sound of weakly flowing water was evaluated as more peaceful and less tiring, compared to the sound of strongly flowing water, or heavy rain. In conclusion, this study identified the relaxation effects and changes in physiological responses when listening to environmental sounds related to water.

FACIAL REACTIONS TO APPROPRIATE AND INAPPROPRIATE CRYING

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Descriptors: facial mimicry, crying

Crying is assumed to elicit support from others. Yet, tears can also be seen as merely strategic devices to manipulate others. Facial mimicry is a sign of affective intent but also dependent on an initial affective stance. Hess & Fischer (2013) consider the function of facial mimicry to regulate social distance. The present study aims to assess the impact of knowing whether crying was elicited by a serious (appropriate) or a trivial (inappropriate) event affects facial mimicry. Eighty-six participants saw still photographs of individuals who were filmed just prior to and during a crying episode and were provided with information about the supposed cause of the target’s emotional reaction. Facial EMG was measured at the Corrugator Superficialis (frown) and the Zygomaticus Major as well as Orbicularis Oculi (smile) sites in response to faces with and without tears in reaction to appropriate and inappropriate events. The results showed that participants mimic cry faces without actual tears only when shown in reaction to appropriate events. They show a smile in response to cry faces in reaction to inappropriate events and no facial expression in response to actual crying. The findings are in line with the notion that tearful crying by a stranger is perceived as socially threatening and a neutral face is shown as a means of downregulation. Only cry faces without actual tears in response to events that are perceived as appropriate elicitors elicit empathy. When the emotional reaction is perceived as inappropriate amusement or schadenfreude can result.

MORE THAN MEETS THE EYE: PHYSIOLOGICAL EFFECTS OF DIRECT EYE GAZE ON TRAUMA EXPOSED INDIVIDUALS

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Descriptors: psychophysiology, eye gaze

High parasympathetic nervous system activation is theorized to be a marker for emotion regulation and behavioral flexibility, both capacities necessary for engaging in social interaction. While eye contact may serve as an important social cue, people who have experienced trauma may perceive eye contact as ubiquitously threatening (Steauw et al., 2014), consistent with the social withdrawal associated with trauma. Thus, it was hypothesized that greater exposure to trauma would be associated with a decrease in RSA in response to the direct gaze of a computerized avatar (the “virtual other” task) regardless of emotional valence. RSA measures in the direct gaze VO task conditions were negatively correlated with trauma exposure severity ($r = - .346$, p = .03, n = 38) as opposed to the averted gaze conditions ($r = -.309$, p = .06, n = 39), regardless of emotional expression. These findings suggest that individuals with trauma exposure show reduced autonomic control in response to social engagement, particularly in social situations that involve direct gaze or interaction, indicating a perception of threat in response to eye gaze.
ASSOCIATED MOTIVATIONAL SALIENCE IMPACTS EARLY SENSORY PROCESSING OF HUMAN FACES

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Descriptors: emotion, associated salience, ERPs

Facial expressions of emotion have an undeniable processing advantage over neutral faces, discernible both at behavioral level and in emotion-related modulations of several event-related potentials (ERPs). Recently it was proposed that also inherently neutral stimuli might gain salience through associative learning mechanisms. The present study investigated whether acquired motivational salience leads to processing advantages similar to biologically determined origins of inherent emotional salience by applying an associative learning paradigm to human face processing. Participants (N=24) were trained to categorize neutral faces to salience categories by receiving different monetary outcomes. ERPs were recorded in a subsequent test phase consisting of 11 decision trials on previously associated faces, as well as on familiarized and novel faces expressing happy, angry or no emotion. Previous reward-associated faces boosted the P1 component, indicating that acquired reward-associations modulate early sensory processing. More specifically, relative to neutral mood, positive mood selectively alters two (i.e., “salience” and “phonological”) out of four main microstates (“visual” and “attention”) corresponding to salience processing increased. These results suggest that positive mood produces a specific and qualitative change in the structure of resting state brain activity. Such a change might foster a higher flexibility, external attention or creative thinking usually associated with this mood state.

EFFECTS OF POSITIVE MOOD ON EEG RESTING STATE ACTIVITY

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Descriptors: positive mood, resting state, EEG

Positive mood fuels resilience and wellbeing and bears a beneficial role for core cognitive processes, such as attention, reasoning or creativity. Nevertheless little is known about the neurobiological underpinnings accompanying this specific mood state initiating such long-lasting and broad effects. To explore this issue we manipulated in a between subjects design the current mood state (neutral or positive) using a guided imagery procedure. Each group included 23 subjects. Before and after the mood manipulation, sixty-four channels EEG was recorded during rest. Mood-related changes of resting state were identified by means of a standard microstates analysis. EEG microstates correspond to dissociable and stable topographic distributions of the scalp electrical activity, which have been related to resting state brain networks (as validated using fMRI). Results show that positive compared to neutral mood selectively alters two (i.e., “salience” and “phonological”) out of four main microstates (“visual” and “attention”) remain unchanged), with significant effects observed for their duration, frequency and time coverage. More specifically, relative to neutral mood, positive mood leads to a reduction of the phonological processing network, while the microstate corresponding to salience processing is enhanced. These results suggest that positive mood produces a specific and qualitative change in the structure of resting state brain activity. Such a change might foster a higher flexibility, external attention or creative thinking usually associated with this mood state.

OVARIAN HORMONES MODULATE FEAR-RELATED NEURAL ACTIVITY DURING TRAUMATIC FILM CLIP PROCESSING

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Descriptors: estradiol, trauma film, functional neuroimaging

Women are at higher risk to suffer from posttraumatic stress disorder (PTSD) and research has revealed an influence of ovarian hormones on PTSD-related cognitive-emotional processes including fear learning and intrusive reexperiencing. However, none of the previous studies investigated the role of estradiol and hormonal contraceptives for brain activity whilst viewing traumatic film material. Therefore, the present fMRI study investigated neural activity of 53 healthy women (23 using hormonal contraceptives) while watching traumatic (i.e., depicting severe interpersonal violence) vs. neutral films. As hypothesized, traumatic films activated areas of the fear processing network, such as amygdala, insula and dorsal anterior cingulate cortex. Women using hormonal contraceptives demonstrated heightened insula and dorsal anterior cingulate cortex activity in the traumatic vs. neutral condition, which might be indicative of elevated negative emotional responding. Estriol levels in women using no hormonal contraceptives were positively correlated with ventromedial prefrontal activity, possibly pointing to a protective, regulatory effect of estradiol during peritraumatic processing. Results suggest that both neuroendocrine alterations associated with hormonal contraception and natural variation in ovarian hormones modulate peritraumatic brain processing and might play a role for PTSD etiology and maintenance in women.

AUTOMATIC EMOTION REGULATION IN ATTENTIONAL ALLOCATION: THE TEMPORAL DYNAMICS OF SUBLIMINAL GOAL PRIMING DURING A DOT-PROBE TASK

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Descriptors: automatic emotion regulation, attention allocation, priming

Attentional allocation is a kind of basic strategy of antecedent-focused automatic emotion regulation. The present study aimed to examine whether subliminal priming the goal of emotion regulation would modulate the attentional allocation. Participants were randomly assigned to either the emotion control goal priming group or the neutral priming group. In the modified dot probe task, participants were asked to respond to the dot target as quickly and accurately as possible. When the picture was presented for 500 ms, followed by a 100 ms pre-mask stimulus. Then a 20ms word priming of regulation goals (emotion control or neutral) was presented. Then the after-mask stimuli appeared in the center of the screen for 100 ms. Subsequently, a snake and a mushroom were presented simultaneously on the left side or the right side of the fixation for 100 ms, 500 ms, or 1250 ms. Then a dot target appeared in the location of the left or the right of the fixation. When the picture was presented for 100 ms, mean amplitude of P1 of incongruous condition was less than congruous condition for the experimental group. P1 showed an opposite pattern for the control group. When the picture was presented for 100 ms or 500 ms, mean amplitude of P3 of incongruous condition were larger than congruous condition for the experimental group. P3 showed an opposite pattern for the control group. Our study provides evidence that unconscious emotion control regulation goal priming may affect the mechanism underlying attentional allocation.
SEXUAL ORIENTATION AND EMPATHY: WHAT MU-SUPPRESSION DOES AND DOES NOT TELL

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Descriptors: sexual identity, empathy, EEG

Self-reported empathy differs with gender and sexual orientation. The current study investigates whether empathy-related activity within the somatosensory cortex (mu-suppression) also is modulated by gender and sexual orientation. Pictures of painful and non-painful actions were presented to 20 lesbians, 20 gay men and 20 heterosexual men and women while EEG was recorded (15 electrodes). Individual peak frequencies of mu activity (electrodes C3, C4) were detected within the 6–11 Hz band for each participant. Participants rated the painfulness of the displayed actions, and reported their empathy via the Interpersonal Reactivity Index. In heterosexual individuals, mu-suppression was stronger in response to painful compared to non-painful actions (p < .001), while homosexual individuals did not differ in responses (p = .240). In contrast, lesbian women reported higher empathy compared to heterosexual women, while gay men reported lower empathy compared to heterosexual men (p = .059). A regression model (p = .011) revealed that mu-suppression was best predicted by painfulness ratings (beta = - .255, p = .020) and sexual orientation (beta = -.205, p = .060), while self-rated empathy did not predict mu-suppression (p = .958). The results indicate that sexual orientation affects empathy, however, the direction of this effect varies with the empathy marker in question. Moreover, the current results question the validity of mu-suppression as a marker for empathy, as mu-suppression was unrelated to empathy ratings, but mainly driven by conscious judgments of painfulness.

HOW THE DORSOLATERAL PREFRONTAL CORTEX CONTROLS AFFECTIVE PROCESSING IN ABSENCE OF VISUAL AWARENESS - INSIGHTS FROM A COMBINED EEG-RTMS STUDY

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Descriptors: subliminal affective processing, ERP, rTMS

The right dorsolateral prefrontal cortex (rDLPFC) is a key structure determining emotional stimulus appraisal and cognitive control. rDLPFC inhibition by means of repetitive transcranial magnetic stimulation results in increased neurophysiological responses to negative vs. neutral stimuli starting around 110 ms after stimulus onset (Zwanzger et al. 2014). Here we investigated, whether such modulations of bottom-up processing of negative stimuli when rDLPFC structures are inhibited, possibly serving to actively down-regulate these neural responses to superliminal but not subliminal negative images. These data suggest a modulation of bottom-up processing of negative stimuli when rDLPFC structures are inhibited, even when stimuli remain outside visual awareness. 

EFFECT OF VALENCE ON THE NEURAL CORRELATES OF HEART RATE RESPONSES TO EMOTIONAL SCENES

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Descriptors: heart rate, autonomic, fMRI

Previous work has shown that activity in the insula, amygdala, prefrontal cortex (PFC), and visual processing regions predict heart rate responses to emotional facial expressions. However, it is not clear whether these effects differ as a function of stimulus valence (negative or positive) and if the effects are greater for emotional scenes compared to neutral scenes. Further, effects in visual processing regions might be confounded by low-level perceptual differences in visual salience. While undergoing concurrent functional magnetic resonance imaging and psychophysiological monitoring, participants viewed 150 scenes (50 negative, 50 positive, and 50 neutral). For each item, participants indicated whether the pictures were blurred. Blurred and non-blurred presentations were blocked and counterbalanced. The EPN was scored as the mean activity at occipital electrodes (PO3, O1, O2, PO4, O2) in the 225–300 ms time window after picture onset. For non-blurred pictures, the EPN was significantly larger for snake pictures than for spider and bird pictures. The EPN snake effect was largely attenuated for blurred pictures. The results demonstrate the importance of high spatial frequencies for the typically enhanced EPN in response to snake pictures.
**Poster 1-037**

HIGH EXERCISE IMPACTS THE INTERPLAY BETWEEN ANXIETY AND COGNITION

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Descriptors: anxiety potentiated startle, threat of shock, n-back task

Exercise can reduce anxiety and improve cognition. The underlying mechanisms are unclear. Similarly, interactions of anxiety with cognition are poorly understood. Anxiety can impair cognition, but cognitive processes, particularly working memory (WM), can decrease anxiety. Exercise is expected to provide a means to manipulate this interaction, and thereby help in the search of causative mechanisms. Presently, 36 healthy subjects completed 2 experiments (WM and NPU). Each experiment consisted of 2 sessions at 1-week intervals of high- and low-intensity stationary biking (randomized order across subjects). Each session included alternating periods of induced-anxiety (threat-of-shock) and safety. WM-experiment: Startle blink EMG (Anxiety-Potentiated Startle APS), subjective anxiety, and WM performance were analyzed via ANOVAs, with Condition (threat, safety), Load (1-back,3-back), and Exercise (high,low) as within-subject factors. High-exercise predicted faster reaction time (RT) in the 3-back during safety (F(1,33)=11.4, p<0.01). In conclusion, high exercise improved WM performance in the hard task during safety, and reduced anxiety during threat (self-reports [WM and NPU], startle [NPU]).

**Poster 1-038**

PSYCHOPHYSIOLOGICAL RESPONSES DURING MUSIC INDUCED NOSTALGIA

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Occidental College

Descriptors: nostalgia, skin conductance, music

Nostalgia, “a wistful or sentimental yearning for the past”, is thought to be a buffer against loneliness and to promote validation of self. Previous studies have assessed effects of odor-evoked nostalgia on neurophysiological and psychophysiological responses, showing activation of cortical and limbic areas implicated in memory, emotion, and reward. However, little is known about the effects of music-induced nostalgia on physiological processes. In the present study, undergraduates and retirement community residents (N = 51) identified musical selections that they individually reported as likely to produce nostalgia and those that did not (control selections) of the same type (classical, popular, slow or fast tempo, etc.). Participants were exposed to six one minute nostalgic and six control selections while skin conductance level (SCL), non-specific skin conductance responses (NSRs), heart rate (HR) and digital pulse volume (DPV) were measured. Compared with control selections, nostalgic selections increased initial SCL peak increase from baseline after music onset, maximum SCL peak during the selection, and NSRs and HR during the selection, in both younger and older participants, indicating a stronger sympathetic nervous system response, likely associated with greater amygdala and frontal activity. Across participants, subjective nostalgia ratings did not correlate with autonomic responses, suggesting that the physiological and subjective aspects of nostalgia may be partially independent aspects of the process.

**Poster 1-039**

BURNDOUT-RELATED VARIATION IN EEG UNDER PHOTIC STIMULATION

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Descriptors: emotional burnout, photo stimulation, EEG

Burnout is linked to decrease of functional connectivity, reduction of emotionality and formation of negative emotional background. The aim of this study was to examine how burnout affects the resonant activity during photo stimulation (white light, a series of rhythmic stimuli lasting 1 min separated by 1 min pauses, the flicker frequency of 3, 6, 8, 10, 12, 15, 20, 24 and 30 Hz, the duration of single flashes and interstimulation intervals of 5–7 sec, the intensity of 0.24–0.35 J). 68 healthy volunteers (students aged 17–22 years old) participated in the study. The resistance stage of burnout was detected in 17 students. Higher burnout scores were associated with significantly lower coefficients of photic driving in response to the 10 and 12 Hz flicker frequencies and with a steady tendency to increase interhemispheric asymmetry. It was shown that development of burnout decreases the excitability mainly in alpha3- and beta2-bands, indicating the inhibition of cortical cognitive and emotional mechanisms, which reflects in the inhibition of downward control systems. Thus, the burnout can change the resonant structure of brain electrophysiological mechanisms and modulate the integrative activity of human brain. Topographical reorganization of brain activation under burnout and photostimulation had specific features reflecting the information- and emotion-activating processes. Thus, people experiencing burnout develop inhibitory processes of emotional and analytical activity, which is clearly manifested in the functioning of the resonant brain mechanisms.

**Poster 1-040**

MENSTRUAL CYCLE PHASE AND PROGESTERONE RELATE TO ELECTROCOORTICAL RESPONSE TO MONETARY GAINS AND LOSSES AND DEPRESSIVE SYMPTOMS IN WOMEN

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Descriptors: EEG/ERP, reward processing, menstrual cycle

The menstrual cycle is a natural biological process in women that has been shown to impact cognitive and emotional processing. A number of studies have examined the influence of the menstrual cycle and ovarian hormones on neural measures of reward processing, and results have indicated greater neural activation to reward during periods of elevated estradiol, such as the follicular phase, relative to periods of elevated progesterone, such as the luteal phase. Using a within-subject design, the present study examined ovarian hormones (estradiol and progesterone) and event-related potentials (ERPs) in response to feedback indicating gains and losses in both the follicular and luteal phases of the menstrual cycle. We also examined whether hormone levels and variation in neural reward processing across menstrual cycle phases was associated with symptoms of depression. Results indicated that participants had a greater neural response to both gains and losses during the follicular phase relative to the luteal phase. Moreover, higher progesterone and greater fluctuation in the neural response to gains (but not losses) across the menstrual cycle phases was associated with greater depression symptoms. Overall, the present study indicates that the follicular phase of the menstrual cycle is characterized by an increased sensitivity to rewards and decreased sensitivity to losses, which likely promotes approach-oriented behavior. Furthermore, greater fluctuation in the neural response to rewards may play an important role in the experience of depressive symptoms.
WHAT CONTRIBUTES TO THE SUCCESSFUL REGULATION OF NEGATIVE EMOTIONS? PREDICTORS OF BRAIN ACTIVATION DURING THE REGULATION OF NEGATIVE EMOTIONS.

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Descriptors: emotion regulation, self-control, brain activation

Emotion regulation (ER), personality and Self-Control (SC) are important for social adjustment and well-being with high correlations between those traits. We investigated, which individual variables are contributing to the explanation of brain activation during (successful) ER in a stressful situation. 125 healthy subjects (63 male, 20-35 years) participated in an fMRI task, where they had to permit or regulate their emotions whilst watching negative and neutral pictures. Subjects additionally filled in questionnaires on ER skills, personality, Self-Efficacy, and SC. Whole-brain fMRI data were collected with a 3T Siemens Tim Trio scanner, standard preprocessing and statistical analysis using general linear model was conducted with SPM 8. To investigate the effects of the predictor variables on brain activity during the ER task we included all variables into a multiple regression model. Only the ER skill Acceptance and self-reported Neuroticism were associated with brain activity during ER (Postcentral, Superior Temporal Gyrus, Insula; Fusiform and Lingual Gyrus; p < .10; FWE cluster corrected). Additionally, we extracted peak amygdala (de)activation during ER (indicating ER success) and performed a hierarchical multiple regression analysis with the predictor variables in SPSS. Results indicate that NEO Conscientiousness best explains ER success but also Self-Compassion skills contribute to the explanation. It might be concluded, that ER skills and personality but not general Self-Control abilities are associated with brain activity in key brain areas of ER.

CARDIOVASCULAR AUTONOMIC REGULATION IN THE EVOCATION OF AFFECTIVE EXPERIENCES DURING HYPNOTIC STATE.

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Descriptors: neutral hypnosis, hypnosis with experiences of positive and negative valence, cardiovascular autonomic response

Introduction: Cardiovascular autonomic regulation, under neutral hypnosis, is characterized by an increase in parasympathetic activity and a decrease in heart rate. However, it is not very clear how the regulation of the Autonomic Nervous System during affective experiences with positive and negative valence during the state of hypnosis. Objective: To determine the autonomic cardiovascular regulation during the evocation of affective experiences in the hypnotic state. Method: Quasi-experimental study, with a sample of 9 healthy subjects, in which autonomic cardiovascular regulation at rest, neutral hypnosis and in the processing of negative and positive intra - hypnotic affective experiences were studied, analyzing the heart rate variability in the (HF) and Low Frequency (LF) bands, through the RR intervals of the AngioECG electrocardiogram, for 20 minutes (5 minutes per state). Results: Regarding the psychophysiological state of rest, there is a tendency to decreased heart rate and increased HF (parasympathetic) and decreased LF (sympathetic) under neutral hypnosis and hypnosis with positive experiences, without Modification of these parameters in hypnosis with negative experiences. Conclusions: In neutral hypnosis and hypnosis with positive experiences, there is a tendency to decrease heart rate, as well as an increase in parasympathetic regulation and a decrease in the regulation of the sympathetic nervous system, with no tendency to variation in the evocation of negative experiences. With respect to rest.

THE CATEGORICAL PERCEPTION EFFECT OF EMOTIONAL VALENCE: AN ERP STUDY

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Descriptors: categorical perception, emotional valence, N170
Categorization is a ubiquitous way to simplify information for later processing, it happens automatically. Previous studies have shown that processing of emotional valence might occur at an early stage, but whether the categorization of emotional valence also happens early has yet to be investigated. To address this issue, ERP was used to examine the categorical perception (CP) of emotional valence in the current study. Four basic emotions (happiness, surprise, anger and disgust) were chosen to constitute within- or between-valence-category condition. Face images were morphed to keep the physical distance between stimuli pairs identical. Eighteen healthy college-aged volunteers participated in the “same-different” judgment task, in which one pair of stimuli (pair type: within-category, between-category or same) were presented simultaneously at a time. Stimuli of the same pairs were from the within- or between-category condition. The N170 showed a significant CP effect of emotional valence, with larger amplitude for within-relative to between-category stimuli. To eliminate the possible influence of perceptual differences, the N170 elicited by the same pairs was also analyzed and there was no significant effect, implying that the CP effect found on the N170 was irrelevant to physical attributes of face images. These results indicated that the N170 component might index the earliest time for CP of emotional valence, suggesting that the categorization of emotional valence not only has its objective neural basis but also happens at a relatively early stage of processing.

HOW REAL-LIFE HEALTH MESSAGES ENGAGE OUR BRAINS: SHARED PROCESSING OF EFFECTIVE ANTI-ALCOHOL VIDEOS

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Descriptors: health communication, fMRI, inter-subject correlation
Health communication via mass media is an important strategy when targeting risky drinking, but many questions remain about how health messages are processed and how they unfold their effects within receivers. Here we examine how the brains of young adults - a key target group for alcohol prevention - ‘tune in’ to real-life health prevention messages about risky alcohol use. In a first study, a large sample of authentic public service announcements (PSAs) targeting the risks of alcohol was characterized using established measures of message effectiveness. In the main study, we used inter-subject correlation analysis of fMRI data to examine brain responses to more and less effective PSAs in a sample of young adults. We find that more effective messages command more similar responses within widespread brain regions, including the dorsomedial prefrontal cortex, insulae, and precuneus. In previous research these regions have been related to processing narratives, emotional and self-relevant stimuli as well as attention towards salient stimuli. The present study thus suggests that more effective health prevention messages have greater ‘neural reach’, i.e. they engage the brains of audience members’ more widely. This work outlines a promising strategy for assessing the effects of health communication at a neural level.
PHARMAKO-EEG REVEALS NEW INSIGHTS ABOUT SHARED NEURAL REPRESENTATIONS OF FIRST-HAND PAIN AND EMPATHY FOR PAIN

Markus Rügten, Eva-Maria Seidel, Carolina Pletti, Igor Rieckensky, Andreas Gartus, Christoph Eisenegger & Claus Lamm
University of Vienna

Descriptors: empathy, pain, psychopharmacology

Conclusions about shared representations of pain and empathy for pain largely depended on evidence from shared activations so far, allowing only limited conclusions. To overcome these limitations, we pursued a conceptually novel approach: we used placebo analgesia to experimentally reduce first-hand pain, and assessed whether this results in a concomitant reduction of empathy for pain. In two previous studies, we showed that placebo analgesia also decreased empathy for pain, as shown by behavioral ratings, event-related potentials (ERPs) and functional magnetic resonance imaging. On a behavioral level, we showed that an opioid receptor antagonist blocked placebo analgesia effects on empathy for pain. Still, neural evidence for an involvement of the endogenous opioid system in empathy for pain was missing. In the present pharmaco-EEG study, we recorded ERPs (P2) in response to application of an antagonist after inducing placebo analgesia. We replicated the findings of our previous psychopharmacological study and found a similar pattern of results for the P2: amplitudes in response to both conditions were significantly greater than in a placebo group, and indistinguishable from a control group. We thereby provide evidence for opioidergic modulation of the P2, which is both informative about empathy for pain and the neural grounding of the P2. Taken together, these findings suggest that pain empathy may be associated with neural responses and neurotransmitter activity engaged during first-hand pain, and thus might indeed be grounded in our own pain experiences.

TRAIT EMPATHY MODULATES GAMMA EEG ACTIVITY IN RESPONSE TO EMOTIONAL FILM CLIPS

Antonio Maffei, Alessandro Angrilli & Chiara Spironelli
University of Padova

Descriptors: empathy, EEG, LORETA

The present study investigated the relationship between trait empathy and cortical activation during different affective states elicited through an ecological emotional induction procedure. 41 women, divided in High and Low empathy groups according to the IRI test score, underwent a film watching task in which 8 movie clips of four emotional categories (Erotic, Fear, Compassion and Neutral) were presented for 2 minutes each, while their EEG activity was recorded. The spectral energy of the Gamma EEG band (35–49 Hz) during the last 30 seconds of the clips was analyzed. Using multilevel modeling and adopting a model selection strategy based on AIC values, we first identified the model that best fitted to the data, and then carried out an F test to evaluate the significance of each predictor. The Group by Movie significant interaction (F(3,135)= 3.30; p=0.02) revealed in the HIGH empathy group a greater cortical activation to all the emotional categories compared to the neutral, whereas in the LOW empathy group an increased response only to the negative clips (Compassion and Fear) was found. The correlation between sLORETA reconstructed source activation and arousal score showed, in the HIGH empathy group only, a positive correlation in the right parietal cortex increased after 10 minutes have passed, although there were no differences expected time. It was significantly higher in the often-late group. Salivary amylase activity was measured every 10 minutes using a salivary amylase sensor. When 40 minutes passed from the expected starting time, collaborators arrived and the real purpose of the experiment was explained to the participants. Subsequently, a questionnaire was administered to the participants requiring about being late for appointments in their daily life. Participants were classified into two groups based on the results: often-late group and a rarely-late group. The results indicated that the heart rate of both groups increased significantly when after 10 minutes from the expected time. It was significantly higher in the often-late group. Salivary amylase increased after 10 minutes have passed, although there were no differences between the groups. This study identified changes in physiological responses in stressful conditions in which people have to wait for their friends.

NEURAL RESPONSE TO EXPLICIT SOCIAL REJECTION AND TO SOCIAL EXCLUSION IN ADOLESCENCE

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Descriptors: social rejection, social exclusion, EEG

One of the most widely used approaches to study social exclusion is the Cyberball paradigm. In Cyberball, the participant experiences ambiguous exclusion in the absence of explicit intention—a in ball toss game, the participant simply does not receive the ball without knowing why. We have shown that neural response to exclusion events in Cyberball are associated with subjective distress (slow wave, Crowley et al.,2010; frontal midline theta, van Noordt et al., 2015). In another approach, the Social Judgment Paradigm asks participants to rate whether they expect to be liked or disliked by an unknown peer and then provides explicit feedback of rejection or acceptance by that peer. In this task, explicit social expectancy violations also produce greater N2 and frontal midline theta responses (van der Molen, et al., 2017). Our preliminary analyses show an enhanced frontal N2 response for expectancy violations, (t(36) = 2.42, p = .021). In a sample of adolescents (age 12–17 years; current n=48, ongoing data collection), we will report on the extent to which enhanced N2 to explicit expectancy violations about being disliked predict frontal neural response to social exclusion and subjective ostracism distress.

STRESS RESPONSES WHEN WAITING FOR FRIENDS

Toshiro Mizuta, Haruka Yamada, Yuki Ishiguro & Yasuko Omori
Jin-ai University

Descriptors: stress, waiting, heart rate

Stress responses when people are waiting for their friends were examined using physiological indices. Participants were 11 university students (Mean age = 20.9). They were the same-sexed best friends of 11 experimental collaborators. Fake explanations were given to the participants stating that the collaborators were also participants, and the experiment would be conducted in pairs. Collaborators did not come at the promised starting time and participants were required to be seated and wait. During the waiting time, participants were required to wear a wireless biosensor, under the pretense of preparing for the recording, and their heart rate was continuously recorded. Moreover, salivary amylase activity was measured every 10 minutes using a salivary amylase sensor. When 40 minutes passed from the expected starting time, collaborators arrived and the real purpose of the experiment was explained to the participants. Subsequently, a questionnaire was administered to the participants requiring about being late for appointments in their daily life. Participants were classified into two groups based on the results: often-late group and a rarely-late group. The results indicated that the heart rate of both groups increased significantly when after 10 minutes from the expected time. It was significantly higher in the often-late group. Salivary amylase increased after 10 minutes have passed, although there were no differences between the groups. This study identified changes in physiological responses in stressful conditions in which people have to wait for their friends.

SALIVARY CORTISOL, ALPHA-AMYLASE AND PERSEVERATIVE COGNITION AMONG MUSIC STUDENTS BEFORE AND AFTER A SOLO PERFORMANCE

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Descriptors: music performance anxiety, cortisol, worry

Music performance anxiety (MPA) is a serious problem for many music students. Research has mainly investigated the psychophysiological concomitants of MPA during music performances. In the present ambulatory study, we aimed to explore the prolonged effects of a solo performance. We recorded the daily negative cognitions (i.e., worries and ruminations related and unrelated to the performance), salivary cortisol and alpha-amylase levels during four days prior and two days after a solo performance in 72 university music students who varied in their self-reported usual MPA level from low to high. Compared to the first day, students had more cognitions related to the performance and larger area under the curve with respect to ground (AU(UC) for cortisol only on the concert day. Compared to students with lower usual MPA level, students with higher usual MPA level exhibited smaller cortisol AU(UC), smaller cortisol awakening response and more negative cognitions both related and unrelated to the performance across the seven days. These findings suggest that the day of a solo performance is characterized by increased hypothalamic-pituitary-adrenal (HPA) axis activity but not by increased autonomic nervous system activity in music students. The effect on the HPA axis is largely limited to the concert day. Moreover, the findings point to attenuated HPA axis functioning and more negative cognitions in students with higher usual MPA level.
Poster 1-050
DETAILED THE ELECTROCORTICAL SIGNATURE OF EMOTION PROCESSING: A SYSTEMATIC COMPARISON BETWEEN FACES, GESTURES AND SCENES
Anna Kenter, Tobias Flaisch & Harald Schupp
University of Konstanz

Descriptors: emotion and attention, ERP, EPN and LPP

Previous research consistently observed that the processing of emotional compared to neutral pictures is associated with an increased early positivity (EPN) and late positive potential (LPP). However, previous reports indicate differences in amplitude, topography, and latency for different emotional stimulus classes. Here, we used high-density EEG to compare the EPN and LPP components elicited by faces, gestures and IAPS images. In addition, we investigated the influence of the stimulus context in which these images are presented. Participants (N = 26) viewed negative and neutral pictures from all stimulus classes, which were either presented in separate blocks, or in an intermixed block containing images from all classes. When viewed in isolation, emotional EPN and LPP effects were observed for all stimulus classes. However, profound differences in latency and topography emerged. Specifically, for the EPN, faces showed the earliest onset (≈ 140 ms), followed by IAPS pictures, and gestures (≈ 220 ms) with the latest onset. For the LPP, faces and IAPS pictures displayed earlier latencies (≈ 300 ms) than gestures (≈ 480 ms). As compared to gestures and faces, emotional ERP effects were largest for IAPS images, which also showed a distinctively more posterior topography. When presented intermixed, the same patterns were apparent for gestures and IAPS images while faces only showed an EPN, but no LPP modulation. Differences in amplitude, topography, and latency of the emotional modulation of the EPN and LPP are discussed with respect to a network model of emotion.

Poster 1-051
DECODING THREAT VS. NEUTRAL STIMULI FROM PATTERNS OF BRAIN ACTIVATION
Orlando Fernandes Jr.1, Liana Portugal2, Tiago Arruda-Sanchez2, Rita de Cássia Alves2, Eliane Volchan1, Janaina Mourao-Miranda2, Letícia Oliveira2 & Mirtes Pereira2
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Descriptors: threat stimuli, pattern recognition, fMRI

The direction of threatening stimuli seems to be a key factor to prompt different defensive responses. However, it is unknown if threat direction drives different patterns of brain activity. To address this question, we investigated whether pattern recognition analysis (PRA) could discriminate between threat and neutral stimuli in contexts with different directions. We used fMRI from 41 subjects (20 women) while they viewed 42 pictures of threat and 42 matched neutral stimuli. Threat stimuli contained images of a person directing a gun toward the viewer (directed toward threat) and images with a person pointing a gun away from the viewer (directed away threat). PRA consisted of Multiple Kernel Learning (MKL) and “leave-one-subject-out” cross-validation strategy. In model 1, the algorithm was trained to discriminate directed threat toward the neutral stimuli and successfully discriminated patterns of brain activation between those conditions (78.0% p<0.01). Brain regions with the highest contribution to the first group a greater startle reactivity, a finding needed of further explanatory investigation.

Poster 1-052
DIFFERENCES IN PSYCHOPHYSIOLOGICAL VARIABLES IN WOMEN WITH HIGH AND LOW RESILIENCE
Julia Otero Gonzalez, Azahara Miranda Gálvez, Miguel Ángel Muñoz García, Jaime Vila Castellar & Maria Sánchez Barrera
Granada University

Descriptors: resilience, cardiac defense response, startle reflex

The autonomic nervous system plays an important role in the adaptive response of the organism and, in particular, in the resilience to recover from the adverse situations. The aim of the present study was to examine the pattern of three reflexive responses - the Cardiac Defense Response (CDR), the Skin Conductance Response (SCR), and the eye-blink Startle Reflex (SR) - in women with high and low resilience. The sample was composed of 40 female psychology students from the University of Granada, aged from 18 to 28 years (Mean = 19.50; Standard deviation: 2.48), selected from an initial sample of 317 students based on their scores on two resilience questionnaires: The CD-RISC 25 Resilience Scale (Connor & Davidson, 2003) and the Wagnild & Young Resilience Scale (1993). The final sample was composed of twenty-one women with the highest scores on resilience and 19 women with lower scores in both questionnaires. Participants were exposed to two intense acoustic stimuli (white noise of 105 dB, 500 ms duration and instantaneous risetime) with 12.5 min inter-stimulus interval. The results showed (a) a higher CDR in the low resilience group than in the high resilience group, (b) a higher SCR in the low resilience group than in the high resilience group, and (c) a lower SR in the low resilience group than in the high resilience group. Our results suggest a greater defensive autonomic reactivity in people with low resilience than in the high resilience group, presenting the later group a greater startle reactivity, a finding needed of further explanatory investigation.

Poster 1-053
EMPATHIC ACCURACY IN NEURODEGENERATIVE DISEASE: DIAGNOSTIC DIFFERENCES AND NEURAL CORRELATES
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Descriptors: empathy, neurodegenerative disease

Empathic accuracy, the ability to recognize other’s emotions, is critical for social functioning. Neuroimaging and neurological studies of empathic accuracy often examine individuals’ ability to identify emotions in static photographs. These tasks fail to capture the dynamic ways emotions unfold over time. Empathic accuracy deficits can be caused by neurodegenerative disease. However, to our knowledge, no studies have investigated differences in empathic accuracy between types of neurodegenerative diseases using a dynamic tracking task. 186 patients with a variety of neurodegenerative diseases and 22 controls watched a film of an actress experiencing a range of emotions. Participants used a rating dial to indicate how the actress was feeling continuously. Empathic accuracy was determined by computing correlations between participant ratings and expert panel ratings. Findings revealed that patients with Alzheimer’s disease, behavioral variant frontotemporal dementia, and progressive supranuclear palsy had significantly lower empathic accuracy compared to controls. Additionally, we used whole brain voxel-based morphometry to examine neural correlates of empathic accuracy in 181 of these participants. Grey matter atrophy in a large bilateral cluster was associated with lower empathic accuracy, including regions such as the orbitofrontal cortex, anterior cingulate cortex, and insula (pFWE <0.05). Atrophy in right hemispheric temporal regions also predicted lower empathic accuracy (p<0.001). These findings highlight the neural networks involved in real-world empathic accuracy.
Poster 1-054

PROMOTING HEALTHY FOODS THROUGH HEDONIC AND SOCIAL APPEALS: PSYCHOPHYSIOLOGICAL RESPONSES IN ADOLESCENTS

Leila Samson & Moniek Buijzen
Radboud University

Descriptors: skin conductance, facial EMG, hedonic and social mechanisms

In order to counter the impact of junk food advertising and to prevent obesity, the current study examines a novel intervention approach which consists of promoting nutritious food through the hedonic reward system and through social mechanisms. Healthy foods are promoted through social and emotional incentives, which portrays healthy eating as hedonic activities taking place in a social context – such as having a nutritious meal with a close friend. Such stimuli are predicted to trigger attention, positive emotions, and attitudes. A within-subjects experiment was conducted among young adolescents. Psychophysiological measures of arousal (SCL), positive affect (facial EMG) and attentional selection were to trigger attention, positive emotions, and attitudes. A within-subjects experiment was conducted among young adolescents. Psychophysiological measures of arousal (SCL), positive affect (facial EMG) and attentional selection were measured for 30 participants while they were exposed to 48 images that displayed healthy eating through various levels of social and hedonic appeals. The hedonistic appeal factor varies with two levels: low and high; the social appeal factor varies with three levels (a person alone, two close friends, a big group). Results show that teenagers preferentially attend to and enjoy messages promoting healthy eating through hedonic and social appeals. They manifested higher arousal, F(1,26)=8.76, p<.01 and higher positive affect, F(1,26)=6.27, p<.01 to images displaying high as compared to low hedonic appeals. Furthermore, social appeals displaying two close friends elicited higher arousal, F(1,28)=5.42, p<.01 and higher positive affect, F(1,28)=3.12, p=.05 as compared to the alone and group conditions. Interesting interactions effects are also presented.

Poster 1-055

THE EFFECTS OF IMPLICIT SELF-ESTEEM ON CARDIOVASCULAR RECOVERY OF AFRICAN AMERICANS AFTER AN INTERPERSONAL CONFLICT

Mona El-Hout & Kristen Salomon
University of South Florida

Descriptors: cardiovascular recovery, self-esteem

Prior research has shown that African Americans exhibit blunted cardiovascular (CV) reactivity to uncivil interactions with white individuals (Salomon & Jagusztyn, 2008). Blunted CV reactivity and impaired recovery from a stressful event may have negative health implications (Salomon et al., 2013), but recovery has not been examined in this context. Impaired recovery may be due to the prolonged cognitive effects of the stressor via rumination (Brosschot, Gerin, & Thayer, 2006). We assessed rumination after uncivil treatment, as well as the potentially buffering effects of implicit self-esteem on stress. Participants included 110 African Americans whose CV responses were measured during baseline, conflict, and recovery. During recovery, participants were randomly assigned to one of three conditions. Participants were either given self-focused (ruminative) or other-focused (distracting) thought prompts, or no instructions (control). Implicit self-esteem was also measured. Moderated multiple regression analyses revealed no significant relationship between implicit self-esteem and CV reactivity. HR recovery was significantly impaired in the rumination condition relative to control. Interactions demonstrated that participants with higher levels of implicit self-esteem exhibited poorer diastolic blood pressure (DBP) recovery in the distraction condition whereas those with lower implicit self-esteem exhibited poorer DBP and total peripheral resistance recovery in the rumination condition. Implications for African American CV health are discussed.

Poster 1-056

TEMPORAL AND AFFECTIVE ORIENTATION OF THOUGHT IN DEPRESSION AND ANXIETY: AN ERP AND HEP STUDY

Yuichi Ito, Midori Shibata, Yuto Tanaka, Yuri Terasawa & Satoshi Umeda
Keio University

Descriptors: future thinking, interoception, automatic thoughts

Individuals with depression and anxiety suffer from automatic negative thoughts. To understand the behavioral characteristics, it is necessary to consider the interactions among psychological features, neural activities, and autonomic reactivities. Previous studies indicated that the monitoring system of afferent signals is associated with affective processing. We investigated the neural basis of the temporal (past/future) and affective (negative/positive) orientations of automatic thoughts. In this study, participants were required to think about the past or the future along with the presentations of sentences. Each sentence was separated into 3 parts: 1) temporal information, 2) object or theme, and 3) affirmative/negative phrase. We measured and analyzed the ERP (event-related potentials) and HEP (heartbeat-evoked potentials) at the presentations of temporal information. Results indicated that depressive individuals showed the larger N400 component for the words referring to the past. By contrast, anxious individuals showed the larger N400 component for the words referring to the future. The HEP amplitudes (200–300 ms), at the first heartbeat immediately after the presentation of temporal information, were found to be different between negative and positive thoughts. These results suggest that different temporal orientations of automatic thought are associated with depression and anxiety, and differential affective feedbacks from the body are involved in affective processing in past or future thinking.
A PHYSIOLOGICAL EXAMINATION OF TWO COPING STYLE MODELS
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1Indiana University, Bloomington, 2Clemson University of Technology

Descriptors: coping style, skin conductance, threat

Decades of research has attempted to understand the relationship between different coping styles and their corresponding information processing strategies and health behavior. The Weinberger model (Weinberger, Schwartz, & Davidson, 1979) and the model of coping modes (Koelke, 1989) have been widely used to classify coping style groups. The Weinberger model groups people based on their trait anxiety and defensiveness. The model of coping modes conceptualizes coping styles through vigilance and cognitive avoidance. Specifically, vigilance is defined as attention toward threats and cognitive avoidance is conceptualized as attention averted from threats. Earlier research indicated that vigilance is positively correlated with trait anxiety and cognitive avoidance is positively correlated with defensiveness (Egloff & Hock, 1997; Han & Lang, 2016). The goal of this study is to examine if this pattern can be observed physiologically when people watch threatening messages. Heart rate and skin conductance activity were recorded and used as indices of attention and bodily arousal. Median splits were used to create high and low groups for each of the dimensions of the two models. Results show that skin conductance level was significantly higher for low trait anxiety people than high trait anxiety people. In contrast, skin conductance level was significantly lower for low vigilance people than high vigilance people. Skin conductance level did not differ with respect to groups in defensiveness and the vigilance condition, as well as all high groups and low groups for the two models. The results of this study have implications for understanding the relationship between coping styles and health behavior.

Differential Effects of Carbohydrates on Behavioral and Neuroelectric Indices of Selective Attention in Preadolescent Children
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Descriptors: cognitive control, nutrition, children

The importance of breakfast consumption for ideal cognitive performance has received much attention recently, although research on the topic has yielded mixed results. The present study utilized event-related brain potentials (ERPs) elicited during a modified flanker task to investigate the neuroelectric implications of ingesting a high macronutrient drink after an overnight fast. Children completed cognitive testing while ERPs were collected during two non-consecutive testing sessions, one in which they received a treatment drink consisting of one of three mixed-macronutrient formulations (Carbohydrate Blend, Sucrose, Malto-dextrin). All children also received a non-caloric placebo sweetened with Sucrose. Performance indices, ERPs, and blood glucose were recorded at three time points before and after the ingestion of each drink. All three treatment groups showed a robust effect on P3 amplitude. When the placebo drink was consumed, P3 amplitude increased from 10 to 60 minutes post seminal when baseline amplitudes were statistically controlled, whereas amplitudes remained stable after ingestion of the treatment drinks. Furthermore, these effects were diminished when blood glucose was accounted for, suggesting that changes in neuroelectric function were driven by postprandial variations in glycemia. These findings suggest that ingestion of carbohydrates after an overnight fast may facilitate neural processing in preadolescent children by allowing them to maintain steady and robust elucidation of cognitive resources to achieve an equivalent level of behavioral performance.

THE COHERENCE OF AUTONOMIC RECOVERY AND CHILD ADJUSTMENT
Kris ten Rudd, Kimberly Contreras & Tuppett Yates
University of South Carolina, Psychology

Descriptors: attention, ERP source analysis, infant response to faces

Infant’s behavioral responses to faces changes over the first year. The current study examined the neural response of infants to pictures of faces and objects from 4.5 months through 12 months with event-related potentials (ERPs) and cortical source analysis with realistic head models. The infants were presented with brief pictures of pictures of women’s faces or infant-oriented toys. The ERPs in response to the stimuli were calculated for the P1 and N290 components. We found the P1 amplitude at about 100 ms post-stimulus-onset was larger for faces than toys overall, but the difference between faces and toys increased over age, especially from 6 to 12 months. Similarly, the N290, a negative deflection in the ongoing ERP about 290 ms following stimulus onset, also showed this increasing differentiation in responses to faces and toys, becoming larger over age to the face stimuli. The neural sources of the ERP components were identified with cortical source analysis in “regions-of-interest” (ROIs) theoretically involved in face processing. The sources of the P1 component were generally found in the lateral occipital and posterior-lateral temporal areas (e.g., lateral inferior occipital gyrus; posterior portion of the inferior temporal gyrus). The sources of the N290 were in the middle fusiform gyrus, anterior fusiform gyrus, parahippocampal gyrus, and temporal pole. By 9 and 12 months of age the CDR amplitude in the fusiform gyrus and adjacent neural areas differed for faces and toys, and also showed an enhanced peak around the time of the N290 peak amplitude.

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CAN PRESCHOOLERS MEDITATE? ELECTRODERMAL EVIDENCE FOR DISTRACTIBILITY
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Eotvos Lorand University

Descriptors: electrodermal activity, meditation, preschoolers

Mindfulness meditation has been found beneficial for children’s cognitive and social-emotional development (Flook et al., 2015), however, the physiological mechanisms during meditation such as electrodermal activity (EDA) is less studied in this young age. We aimed to investigate whether preschool-aged children are less easily distracted and thus more immersed during meditation as compared to a narrative story. This would suggest that listening to meditation instructions is a fundamentally different activity and might imply that children are capable of controlling their attention during meditation. We are conducting a within-subject randomized controlled experiment with university students and preschool-aged children. The participants listen to an orally presented 5-minute long, child-friendly mindfulness meditation and a matched narrative story while participants’ EDA levels is measured. Both the recordings were presented while a short whistle inserted in the middle. Our preliminary findings regarding the young adult sample suggest that there is no significant difference between the average EDA level during the guided mindfulness meditation and listening to a control story. However, the event-related response after the whistle was significantly lower in the mindfulness meditation condition compared to the control story. This suggest that adult participants were more immersed during meditation as compared to the control story. Results of preschool-aged sample and the feasibility of guided mindfulness meditation with young children will also be discussed.
THE EFFECTS OF NATURE IMAGES ON DIRECTED ATTENTION: AN ERP EXPERIMENT
Ford Dyke, Jence Rhoads, Jennifer O'Neil & Matthew Miller
Auburn University

Descriptors: attention, ERP, nature images
Attention Restoration Theory (ART) posits that neural resource allocation to task goals increases with exposure to nature stimuli. We tested this prediction by indexing neural resource allocation to task-related stimuli with EEG before and after participants were exposed to nature images. Specifically, 40 participants performed the Sustained Attention to Response Task (SART), which requires participants to manually respond to common (90%) stimuli (digits 1, 2, 4-9) presented on a computer monitor, while withholding responses to rare (10%) stimuli (digit 3). Participants completed a SART pretest consisting of 300 trials, while having their EEG recorded. Next, participants were randomly assigned to view 25 nature images for 15 seconds each or 25 urban images for 15 seconds each. Finally, participants completed a SART posttest consisting of 300 trials while having their EEG recorded. We extracted several ERP components to determine neural resource allocation to goal-related processes during SART. Specifically, we examined P3b amplitude to assess neural resource allocation to evaluating common and rare stimuli; N2 index for goal-related processes during SART. Specifically, we examined P3b amplitude to assess neural resource allocation to task-related stimuli with EEG before and after participants were exposed to nature images. Specifically, 40 participants performed the Sustained Attention to Response Task (SART), which requires participants to manually respond to common (90%) stimuli (digits 1, 2, 4-9) presented on a computer monitor, while withholding responses to rare (10%) stimuli (digit 3). Participants completed a SART pretest consisting of 300 trials, while having their EEG recorded. Next, participants were randomly assigned to view 25 nature images for 15 seconds each or 25 urban images for 15 seconds each. Finally, participants completed a SART posttest consisting of 300 trials while having their EEG recorded. We extracted several ERP components to determine neural resource allocation to goal-related processes during SART. Specifically, we examined P3b amplitude to assess neural resource allocation to common and rare stimuli; N2 amplitude to index neural resource allocation to cognitive control; and error-related negativity amplitude to incorrect responses to index neural resource allocation to performance monitoring. Using 2 (Image: nature/urban) x 2 Test (pretest/posttest) mixed-factor ANOVAs, we failed to observe significant differences in any ERP component amplitude as a function of image, test, or Image x Test interaction. Thus, results fail to support ART.

THE EFFECTS OF ACUTE HIGH-INTENSITY INTERVAL EXERCISE AND MODERATE-INTENSITY CONTINUOUS EXERCISE ON MEMORY AND COGNITIVE CONTROL
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Descriptors: acute exercise, memory, cognitive control
The present investigation examined the effects of acute high-intensity interval exercise (HIIE) and moderate-intensity continuous exercise (MICE) on memory and cognitive control. Thirty six young adults performed 20-minute sessions of HIIE, MICE, and seated rest on separate days in counterbalanced order. Following each session, all participants completed a free recall task and a modified flanker task while event-related potentials (ERPs) were collected. Results demonstrated an increased number of correctly recalled words during the free recall task following HIIE and MICE compared to seated rest. Reaction time (RT) during the flanker task was decreased following HIIE and MICE, while only HIIE reduced RT interference scores compared to seated rest. P3 analyses revealed that MICE increased P3 amplitude compared to HIIE and seated rest. In addition, HIIE showed shorter P3 latency compared to seated rest. The current findings indicate that single bouts of HIIE and MICE may enhance memory and cognitive control, with HIIE showing additional benefits on interference control. Further, the differential modulation observed in the P3 component following the two exercise protocols suggests possible differential neuroelectric mechanisms underlying cognitive control operations, as HIIE improved information processing speed and MICE increased attentional resources allocation. Such findings suggest that various types of exercise may differentially benefit brain and cognition.

TRAUMA-INFORMED COMMUNITY EMPOWERMENT: TRAINING IN TRAUMA-INFORMED CARE AND STRESS REDUCTION FOR SOUTH SUDANESE PARAPROFESSIONALS
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Descriptors: trauma, intervention
Following 50 years of civil wars and achievement of an independent state, South Sudanese individuals are still subject to continuous political and community violence, with the entire population directly experiencing Criterion A traumatic events. Accordingly, over half the population has posttraumatic stress symptoms (PTSS). But, despite clear clinical need, mental health resources in the region are scarce to nonexistent, and the majority of services are provided by paraprofessionals (e.g., tribal chiefs, teachers, police), who encounter trauma in their work but are not trained to address it. To meet this need, we trained paraprofessionals in introductory trauma support skills as well as to provide stress reduction training, a program we call Trauma-Informed Community Empowerment (TICE). Fifty South Sudanese paraprofessionals participated in a three-week intensive training followed by six weeks of mentorship in trauma-informed care. They were assessed using a multi-pronged psychological assessment designed to examine PTSS, effect dysregulation, empowerment, and physiological stress flexibility (using the sympathetic and parasympathetic components of heart rate variability [HRV]). After three weeks, PTSS and affect dysregulation improved significantly. Furthermore, small trending changes in sympathetic and parasympathetic elements of HRV. These results highlight the possibility of reducing the impact of trauma in high-conflict settings.

THE DISTRESSED (TYPE D) PERSONALITY FACTOR OF SOCIAL INHIBITION, BUT NOT NEGATIVE AFFECTIVITY, ENHANCES EYEBLINK CONDITIONING: FURTHER SUPPORT FOR A LEARNING DIATHESIS MODEL OF ANXIETY DISORDERS
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Descriptors: anxiety, personality, conditioning
Recent work has focused on a learning diathesis model in which a temperamental factor may influence associative learning and in turn increase risk for the development of anxiety disorders. We have found in a series of studies that individuals self-reporting high levels of behavioral inhibition (BI) exhibit enhanced acquisition of conditioned eyeblinks. In the work reported here, the exploration of how personality can influence anxiety vulnerability through associative learning was extended to include distressed (Type D) personality. Type D personality is measured with the DS14 scale which includes two subscales: negative affect (NA) and social inhibition (SI). Based on prior work, we hypothesized that SI, but not NA, would be related to enhanced eyeblink conditioning. Sixty participants completed personality inventories including the Adult Measure of Behavioral Inhibition (AMBI) and DS14. All participants received 60 acquisition trials with a 500 ms, 1000 Hz, tone CS and a 50 ms, 5 psi corneal air puff US. Behaviorally inhibited individuals acquired conditioned eyeblinks at a faster rate than non-inhibited individuals (p < 0.05). Socially inhibited individuals exhibited enhanced eyeblink conditioning as compared to non-inhibited individuals (p < 0.05), but there was no effect of NA on eyeblink conditioning. Personality factors now including social inhibition as well as behavioral inhibition can be used to differentiate fast and slow learners supporting the utility of eyeblink conditioning as a behavioral measure for assessing anxiety vulnerability.
Poster 1-068

DOES TRANSCRANIAL DIRECT CURRENT STIMULATION AFFECT THE LEARNING OF A FINE SEQUENTIAL HAND MOTOR SKILL WITH MOTOR IMAGERY?
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Descriptors: motor imagery, motor learning, transcranial direct current stimulation

Learning a fine sequential hand motor skill, comparable to playing the piano or learning to type, improves not only due to physical practice, but also due to motor imagery. Previous studies revealed that transcranial direct current stimulation (tDCS) and motor imagery independently affect motor learning. Other studies showed that training with motor imagery combined with anodal tDCS might generally enhance motor performance. In the present study, we investigated whether tDCS combined with motor imagery above the primary motor cortex influences sequence-specific learning of a fine hand motor skill. Four groups of participants were involved: an anodal, cathodal, and sham stimulation group, and a control group without stimulation. A modified discrete sequence production (DSP) task was employed: the Go/NoGo DSP task. After a sequence of spatial cues, a response sequence had to be either executed, imagined or withheld. The task allows to estimate general learning effects in a practice phase, and sequence-specific learning effects in a test phase by comparing the execution of unfamiliar sequences, familiar imagined sequences, familiar withheld and familiar executed sequences. Results showed that the effects of anodal tDCS were already developing during the practice phase, while no sequence-specific effects were visible during the test phase. These findings confirm that anodal tDCS affects motor performance but they also reveal that it does not facilitate the influence of motor imagery on sequence learning.

Poster 1-069

NEURAL MECHANISMS OF SOCIAL LEARNING IN A COOPERATIVE AND COMPETITIVE SOCIAL CONTEXT
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Descriptors: social learning, performance monitoring, prediction error

In competitive social contexts, it can be advantageous to monitor the performance of an opponent. For example, we might track the value of an action for another player in a card game and use the information to predict and counter their next move. The biological basis of social performance monitoring is not well understood but model-based analyses of neural data can offer insight into the latent computations of the brain during social tasks. In the current study participants completed a reversal learning, three-armed bandit game, in which the actor and observer switched roles every 1–3 trials. Participants worked together, gaining points for themselves and a computer player in one half of the experiment and in the other half, fought for points, gaining only when their opponent lost points. The magnitude of these wins and losses varied trial by trial. To examine the integration of outcome probability, magnitude and social information throughout the experiment, we fit a reinforcement-learning model to participants’ choices in the task and regressed the model-estimated output with their fMRI activity. Specifically, we calculate prediction errors - the difference between the actual and expected outcome on each trial and examine gain and loss trial PE-related activity in the two social contexts.

Poster 1-070

NEUROSTIMULATION OF HUMAN CEREBELLUM DURING ASSOCIATIVE LEARNING
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Descriptors: cerebellar tDCS, eye-blink conditioning

Delayed eye-blink conditioning (EBC) is a cerebellar-dependent associative learning task, which has been shown to be impaired in individuals with cerebellar lesions and cerebellar disorders. Transcranial direct current stimulation (tDCS), a form of noninvasive neurostimulation, has been experimentally utilized to potentially excite (anodal) and inhibit (cathodal) various brain structures including the cerebellum to impact behavior. The effects of cerebellar tDCS on EBC was examined in 37 healthy participants in a double blinded, between-subjects sham-controlled experiment. During conditioning, participants received stimulation of either sham, anodal, or cathodal tDCS at 1.5 mA for 25 minutes in the active conditions (anodal and cathodal). As predicted, cathodal stimulation significantly decreased conditioned responding compared to anodal stimulation, with effects of sham stimulation being intermediate but not significantly different compared to the two stimulation conditions. There were significant differences between sham and both cathodal and anodal for both conditioned response peak and onset latency. No significant differences were found in conditioned response peak amplitude across the three conditions. Results demonstrate that tDCS has an effect on acquisition and timing of EBC in humans and may be a viable mechanism of modifying cerebellar function. Further research is warranted to investigate potential therapeutic effects of anodal stimulation on populations with cerebellar deficits such as individuals with schizophrenia.

Poster 1-071

CONDITIONING OF SIGHS: CAN WE LEARN TO SIGH?
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Descriptors: sighing, dyspnea relief, reinforcement learning

Sighs serve important physiological and psychological regulatory functions. The regulatory properties of sighs may reinforce the use of sighs in conditions that require regulation. The present study aims to investigate whether sighs can become conditioned responses. The experiment consisted of four blocks of 16 trials. Each trial consisted of a 40 s dyspnea exposure phase during which a mild inspiratory resistance was presented, followed by the offset of the resistance. During one of two learning blocks, a cue during resistance offset predicted that a spontaneous sigh would be followed by a reward: the absence of resistance for an additional 20 s. During the other learning block, another cue during resistance offset predicted that a spontaneous sigh would be followed by a punishment: the onset of resistance for 20 s. During the subsequent two test blocks, dyspnea exposure phases were followed by dyspnea offsets during which both cues were presented without sigh reward or punishment. Sigh rate in the test blocks was higher during the presentation of a cue that signaled the reward of a sigh during the learning blocks than during the presentation of a cue that signaled the punishment of a sigh during the learning blocks. These results show that sighs can become conditioned responses through reinforcement learning. Specifically, dyspnea relief following a spontaneous sigh may reinforce sighs to increase relief during dyspnea offset and facilitate recovery. This mechanism could explain why sigh rates are excessive in emotion dysregulation.

Poster 1-072

IN THE BLINK OF AN EAR: MEASURING PAVLOVIAN APPETITIVE CONDITIONING IN HUMANS WITH THE POSTAURICULAR REFLEX
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Descriptors: appetitive conditioning, postauricular reflex, olfactory reward

Despite its evolutionary and clinical significance, appetitive conditioning has been rarely investigated in humans. This discrepancy might notably stem from a possible lack of sensitivity of the psychophysiological measures commonly used to index human appetitive conditioning. Here, we investigated whether the postauricular reflex – a vestigial muscle microreflex, which is potentiated by pleasant stimuli relative to neutral and unpleasant stimuli – may provide a valid psychophysiological indicator of appetitive conditioning in humans. To this end, we used a differential appetitive conditioning procedure, in which a neutral stimulus was contingently paired with a pleasant odor (CS+), while another neutral stimulus was not associated with any odor (CS−). We measured the postauricular reflex, the startle eyeblink reflex, and skin conductance response (SCR) as learning indices. Taken together, our results indicate that the postauricular reflex was potentiated in response to the CS+ compared with the CS−, whereas this potentiation extinguished when the pleasant odor was no longer delivered. In contrast, we found only marginal startle eyeblink reflex attenuation in response to the CS+ relative to the CS− and, no effect of appetitive conditioning was observed on SCR. These findings suggest that the postauricular reflex is a sensitive measure of human appetitive conditioning and constitutes a valuable tool for further shedding light on the basic mechanisms underlying emotional learning and reward processing in humans.
**Poster 1-073**

**EXTINCTION MEMORY IN HUMAN VISUAL CORTEX MEASURED BY STEADY-STATE VISUALLY EVOKED POTENTIALS AFTER A CONSOLIDATION INTERVAL**

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Descriptors: fear extinction, extinction recall, steady-state visual evoked potential

Sensory cortices participate actively in associative learning. Work with steady-state visually evoked potentials (ssVEP) has shown that cells in visual cortex change their selective tuning to stimuli orientation during classical fear conditioning. ssVEP are evoked narrow-band oscillatory brain responses matching the frequency of a flickering stimulus. In previous work, processing of a stimulus orientation (CS+) reliably predicting an aversive noise (unconditioned stimulus: US) was selectively enhanced in lower-tier visual cortex, while processing of similar unpaired orientations (CS-) was inhibited. In immediate extinction, the tuning curve rapidly adapted to the changed stimulus contingency with evidence for active inhibition of the CS+. Extinction includes new learning and is therefore also subject to consolidation after the initial extinction phase examined in previous work. The present study examined consolidation of extinction using ssVEP evoked by viewing Gabor gratings with 7 orientations, each presented in a phase-reversing ssVEP stream at 14 or 15 Hertz. In acquisition, one grating (CS+) was paired with an aversive 98 dB noise (US), and 6 were unpaired (CS-), followed by extinction training (no US). To allow for consolidation, extinction memory was tested after 24 h. Ongoing analyses demonstrate sustained changes in visual tuning, taking the shape of generalization, rather than lateral inhibition gradients. This supports a role of visual associative learning in biasing sensory tuning to relevant feature dimensions.

**Poster 1-076**

**THE ELECTROPHYSIOLOGICAL UNDERPINNINGS OF INDIVIDUAL DIFFERENCES IN WORKING MEMORY PERFORMANCE**

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Ural Federal University

Descriptors: working memory, EEG, individual differences

The main aim of this study was to reveal EEG correlates of individual differences in working memory performance in females. The final sample included 65 women (mean age 20.92, SD 2.96). The random sequences of letters of the alphabet were used as stimuli for WM task. Participants were instructed to memorize sets of 5 and 7 letters either without any manipulations (retention task) or after mental recombination of letters in the alphabetic order (manipulation task). EEG data were collected from 19 sites according to standard 10–20 system. All participants were subdivided into two groups separated by the median of their mean performance across the tasks. The groups are referred to as high performance (HP, N = 32) and low performance (LP, N = 33) groups. Segments of raw EEG recorded during the delay period. Our results suggest that the underlying individual differences can be explained by contribution of several factors including (i) a higher level of readiness to process relevant and to inhibit irrelevant information (higher alpha in HP group); (ii) stronger engagement of the left prefrontal cortex and the hippocampus; this factor can underlie efficient maintaining and manipulating information in WM due to a fast exchange of information between long term and working memory (higher theta power in the left hemisphere in HP group in the manipulation conditions) and (iii) an energy efficient strategy for distribution of frontal resources in order to maintain the necessary level of activity of the cingulate cortex (higher midline frontal theta power in HP group).

**Poster 1-075**

**EXAMINATION OF SIMULTANEOUS PRESENTATION OF AUDITORY AND VISUAL STIMULI DURING THE P300-BASED CONCEALED INFORMATION TEST: COMPARISON BETWEEN PICTURES AND WORDS AS VISUAL STIMULI**

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Descriptors: concealed information test, P300, auditory presentation

This study examined the effect of simultaneous presentation of auditory and visual stimuli during the P300-based concealed information test (CIT). We compared pictures and words as the visual stimuli. All participants (n=10) were instructed to steal one of five items from a room. After the mock crime, all participants underwent the P300-based CIT. There were two main conditions: a picture as visual stimulus with auditory stimulus, and a word as visual stimulus with auditory stimuli. Each stimulus was simultaneously presented using a computer display and headphones. During the picture condition, mean P300 amplitudes for the probe and irrelevant stimuli were 14.7 and 9.0 μV, respectively. For the word condition, mean P300 amplitudes for the probe and irrelevant stimuli were 10.6 and 8.6 μV, respectively. A repeated measures analysis of variance revealed significant differences for the main effect for the stimulus (F(1,9)=5.398, p=0.045) but no significant differences for the main effect for the condition (F(1,9)=3.106, p=0.112). Moreover, the interaction between stimulus and condition showed a clear tendency toward significance (F(1,9)=5.053, p=0.051). Main simple effects revealed that the probe elicited significantly larger P300 amplitudes than the irrelevant stimuli (p<0.01) in the picture condition. Additionally, the probe-elicited P300 amplitude in the picture condition was significantly larger than that in the word condition (p<0.05). We conclude that the picture was highly effective in the simultaneous presentation of auditory and visual stimuli during the P300-based CIT.

**Poster 1-074**

**ASSOCIATION AMONG SALIVARY ALPHA-AMYLASE ACTIVITY AND WORKING MEMORY FUNCTIONING IN HEALTHY CHILDREN**

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Descriptors: alpha-amylase, working memory, children

Salivary Alpha-Amylase (sAA) shows a statistically significant association with levels of peripheral noradrenaline under acute psychosocial stress conditions in young and healthy participants. In this study, our aim was directed to examine the relation among sAA and cognitive performance in various executive tasks in an experimental sample composed by 69 healthy children although we only could obtain the complete set of data for 44 boys and girls for this battery. The cognitive tasks employed were: Digits, Letters & Numbers, Arithmetic and Visual Span subtests of WISC-V (this full set of subtests is employed to the assessment of verbal and visual working memory). Saliva samples were obtained at baseline (10 minutes before the start of neuropsychological assessment), one minute before the start, after the end of the verbal tasks, and one minute after the end of the visual span task. Our statistical analyses showed a significant association among sAA levels and some of the parameters employed to describe the performance of each participant in the subscales of Digits and Letters & Numbers after controlling the effect of BMI. Scores in Letters & Numbers and visual span were associated with levels of salivary flow rate. These results are coherent with the findings of a previous pilot study conducted in our laboratory and are interpreted in relation with those results which have suggested a main role of the Locus Coeruleus-Noradrenaline System (LC-NA System) in the regulation of the level of arousal and executive behaviors.
GOOD FEEDBACK, BETTER MEMORY: HOW POSITIVE FEEDBACK IN AN ASSOCIATIVE LEARNING TASK ENHANCES RECOGNITION MEMORY FOR UNRELATED PICTURES
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Descriptors: feedback-related negativity, recognition memory, subsequent memory effects
Previous research has shown that in reinforcement learning, the hippocampus is involved in the processing of feedback when it is delayed for several seconds. Also, better recognition memory has been reported for temporally delayed than for immediately presented feedback pictures. Event-related potential (ERP) studies have found a decrease of the feedback-related negativity (FRN) with increasing feedback delay, and there is evidence that the FRN is modulated by declarative learning. In the present study we investigated the effects of feedback delay on feedback processing (as reflected in the FRN) in an associative learning task. Participants encoded pictures which were presented simultaneously with positive or negative feedback and recognition memory for the pictures was tested in a surprise memory test. Behaviorally, we found better memory for pictures presented with positive versus negative feedback, but, surprisingly, no effect of feedback delay. Electrophysiological activity during the FRN time window was found to predict subsequent memory for pictures presented together with positive, but not negative feedback. Furthermore, the FRN was reduced for delayed feedback only when feedback was useful for learning. By showing that the FRN is modulated by an interaction between feedback timing and utility, this finding extends prior results. Recognition ERP's and behavioral estimates of familiarity and recollection support the view that positive feedback enhanced memory mainly by boosting familiarity-based recognition.

A NEW METHOD TO ACCURATELY DETECT AUTOBIOGRAPHICAL MEMORIES: THE KINEMATIC MEMORY DETECTION TECHNIQUE
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Descriptors: memory detection, autobiographical memory, deception
It is known that cognition is largely involved in the process of lie. Deception is cognitively more complex than truth telling and this higher complexity reflects itself in a lengthening of the reaction times (RTs) during a response. According to literature, there are currently two memory detection techniques based on RTs that may be used as tools to detect the truthful or untruthful nature of a declared event (the CIT and the aIAT). However, both techniques require that the true event is itself in a lengthening of the reaction times (RTs) during a response. According to literature, there are currently two memory detection techniques based on RTs that may be used as tools to detect the truthful or untruthful nature of a declared event (the CIT and the aIAT). However, both techniques require that the true event is known to the examiner. The goal of this work is to present a new memory detection technique based on mouse movement recording, to identify false declared events without knowing real information about the under scrutiny event. This method exploits kinematic mouse analysis as implicit measure of deception, while the user is answering to questions about an autobiographical event. Data from 60 subjects were employed to build different machine learning models and data from 30 totally fresh subjects were used for testing. Results show that using mouse movement analysis, it is possible to reach a high rate of accuracy in detecting the veracity of memories. In fact, we reached an accuracy of 90% in the classification of the autobiographical memory as truthful or untruthful. Moreover, this method shows many advantages compared to the currently available techniques.

HALLUCINATIONS IN PARKINSON’S DISEASE ARE REPRESENTED WITH INCREASED EEG-GAMMA BAND ACTIVITY
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Descriptors: Parkinson’s Disease, EEG-gamma band activity, hallucinations
The previous studies investigated the auditory hallucinations in schizophrenia and reported that phase locking in the gamma-band range was related with hallucinations. However, there was almost no study analyzing the EEG-Brain oscillations in Parkinson’s disease patients (PD) with hallucinations. The aim of the present study was to investigate gamma frequency band in PD and its relationship to hallucinations. 17 Parkinson’s disease patients (8 with hallucinations, 9 without hallucinations) and 10 aged matched healthy controls were included in the study. Spontaneous EEG from 32 different locations was recorded during eyes closed and eyes open conditions. Power spectrum analysis, inter and intra-hemispheric coherence analysis was performed. The results of the present study showed that PD patients with hallucinations had increased gamma power in comparison to PD patients without hallucinations and healthy controls especially during eyes open condition (p<0.05). Furthermore, intra-hemispheric and inter-hemispheric gamma coherence values were higher in PD patients with hallucinations in comparison to PD patients without hallucinations (p<0.05). The present study showed that like in schizophrenia patients, hallucinations were represented with increased gamma power in PD patients. Furthermore, we have shown that not just in local circuits but in intra and inter hemispheric long-range circuits gamma activity was increased in PD patients with hallucinations. The abnormally increased gamma activity could be in an important general candidate of a biomarker for hallucinations.
EEG ALPHA AND BETA RESPONSES IN PARKINSON’S DISEASE UPON APPLICATION OF A COGNITIVE PARADIGM

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Descriptors: EEG, Parkinson’s Disease, cognition

The analysis of event related oscillatory responses is an important methodology in understanding of functional deficits in neurodegenerative diseases. Previous research showed that alpha and beta responses are related with memory and cognitive functions. The aim of the present study is to analyze event related alpha and beta responses of patients with Parkinson’s disease (PD) during visual oddball paradigm. We hypothesized that since PD had cognitive impairment, the patients would have abnormalities in alpha and beta responses in comparison to healthy controls. 23 patients with PD (9 cognitively normal PD,14 mild cognitive impaired PD) and 10 age matched healthy controls were included in the study. EEG was recorded at 32 electrode sites upon application of visual oddball paradigm. Event related alpha and beta responses were analyzed by application of digital filtering and phase locking factor analysis. The results of the present study showed that both patient groups of PD had lower values of alpha and beta phase locking than healthy controls upon presentation of target stimulation (p<0.05). Furthermore digitally filtered alpha and beta responses were also lower for PD patients in comparison to healthy controls (p<0.05). Cognitive impairment in PD during visual oddball paradigm is represented with decrease alpha and beta responses. These results could be candidates for electrophysiological biomarkers in Parkinson’s disease. Further research is also needed which will analyze all frequency bands in all topologies.

CAROTID BARORECEPTOR STIMULATION BY NECK SUCTION: EVIDENCE FOR AN INHIBITORY EFFECT ON CEREBRAL BLOOD FLOW VELOCITY

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Descriptors: carotid baroreceptor stimulation, cerebral blood flow, peripheral hemodynamics

Activation of the baroreceptors modulates central nervous system (CNS) activity, producing a generalized inhibitory effect on the brain. This effect might be mediated in part by changes in cerebral blood flow (CBF). We analyzed the impact of carotid baroreceptor stimulation by neck suction (BS), in comparison with a control baroreceptor condition (BP), on CBF dynamics. Participants were 15 healthy students. Baroreceptor stimulation was performed by a laboratory-built pneumatic device that induces neck suction (BS) or pressure (BP) in the carotid area. Functional transcranial Doppler sonography (fTCD) was used for the continuous measurement of bilateral CBF velocities in the middle (MCA) and anterior (ACA) cerebral arteries. Heart rate (HR) and blood pressure (BP) were recorded continuously. BS produced a pronounced decrease in CBF velocity, while no significant changes were observed for the BP. The inhibitory effect on CBF velocity was faster and long lasting in the ACA than in the MCA. This difference was greater in the right arteries than in the left ones. BS produced a short-term decrease in HR and BP, while an increase in BP (but with no change in HR) was observed during BC. For the BS, significant positive correlations between the CBF decrease in ACAs and the changes in BP and HR were found. We conclude that stimulation of carotid baroreceptors reduced CBF. This decrease might be explained by the actuation of a neuronal vasomotor mechanism and, secondarily, by the effect of the baroreflex-elicited changes in peripheral hemodynamic (BP and HR) on perfusion pressure.

ACCUMULATION OVER TIME: A STUDY OF ERP AND OSCILLATORY BRAIN ACTIVITY

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Descriptors: prediction, event-related potentials, oscillatory activity

The predictive coding model postulates that the primary function of the brain may be predicting future states of the environment in order to optimize sensory processing. Predictions are probabilistic, and must be continuously updated on the basis of their mismatch with sensory evidence. Although some electrophysiological correlates have been described in relation to prediction, there is little evidence about how this activity supports prediction build-up over time. Here we address this gap. Participants were required to make moment-by-moment predictions about the upcoming stimulus while observing sequences of stimuli in which building predictions by accumulating evidence was either possible or not. The probability of making accurate predictions steadily increased as more information was gathered throughout the sequence. We found that evidence accumulation over time was reflected by the progressive increment of P3 event-related potential (ERP) amplitude and oscillatory theta power, with modulation of P2 ERP reflecting variations in prediction error. Alpha power decrease in anticipation for the last stimulus indexed the success in prediction build-up. Moreover, mispredicted stimuli elicited larger error responses than unpredicted stimuli and led to supplementary P3 amplitude increase, suggesting the involvement of additional processing resources when a prediction is violated. These results are in agreement with the notion of predictions as probability distributions and provide evidence of prediction fine-tuning as probability increases over time.
Poster 1-085

BASELINE RELIABILITY OF EEG AND ERP IN A FOUR-WAY CROSSOVER STUDY IN HEALTHY SUBJECTS

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Descriptors: test-retest reliability, EEG, ERP

In this analysis we presented baseline data of a larger study assessing the effect of EEG/ERP (electroencephalographic/event-related potentials) of different doses and types of antidepressants in healthy subjects. We investigated the reliability of qEEG features in spontaneous EEG and auditory steady state response (ASSR), and of several ERP components in oddball and Hybrid Flanker tasks. 32 healthy male subjects were randomly allocated to 4 session sequences of four treatment regimens: 10 mg and 20 mg Venlafaxine, 15 mg Escitalopram and Placebo. Each session was separated by a washout period (≥ 18 + 4 days). Power spectrum of qEEG measures, N1 and P300 in oddball task and ERN and Pe of Hybrid Flanker task were computed. Reliability was quantified using Pearson’s r and intra-class correlation coefficient (ICC). The absolute ICC of EEG showed moderate to high reliability (.48-.91, varied across electrodes). Theta, alpha, beta and gamma1 bands showed higher test-retest reliability (.63-.91) than delta and gamma2 bands (.48-.82). ERP data showed lower reliability than EEG data, but still of modest size at sites where ERPs are maximal. Frontal N1: .45, fronto-parietal P300: .61-.65 to odd stimulus. Frontal-central ERN: .32-.38 and centro-parietal Pe: .66-.75 to wrong responses. Moreover, pharmacokinetic assessments confirmed that there was no carry over effect from the previous treatment. The results provide evidence that EEG/ERP is reliable across time and thus can serve as a potential biomarker for clinical use.

Poster 1-086

ACUTE EFFECTS OF HIGH-INTENSITY INTERVAL TRAINING ON EEG BRAIN ACTIVITY

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Descriptors: electroencephalographic, high-intensity interval training, Tabata training

High-intensity interval training (HIIT) has become progressively popular in the last years because of its large effects on exercise capacity and the small-time requirement. Tabata Training is a particular HIIT technique of eight all-out exercise bouts of 20 seconds followed by 10 seconds of rest. This makes a total of 4 minutes of exercise after warm-up and followed by a cool-down. Recent electroencephalographic (EEG) studies have shown effects of physical exercise on brain activity. To date, there are no systematical studies on the effects of HIIT on brain activity. In the present study, we investigated acute effects of Tabata training on spontaneous EEG brain activity. Subjects performed a Tabata protocol with two intervals of push-ups, squats, planks and lunges. Spontaneous resting EEG was recorded before, immediately after, and ten minutes after the exercise. EEG data revealed a decrease in alpha-1 and theta power in the frontal lobe after the exercise compared to the pretest. After ten minutes recovery, an increase in alpha-1 and beta power was observed in the frontal lobe and in alpha-2 power in parietal lobe compared to the measurement taken immediately after the exercise. Comparing recovery phase and pretest, there is an increase in beta and gamma power in the right frontal lobe. Our results indicate a decrease of EEG brain activity immediately after the Tabata training and a delayed increase in brain activation after a ten-minute recovery.

Poster 1-087

AUTONOMIC INDICES OF PSYCHOSOCIAL STRESS RESPONSE AND RECOVERY IN HEALTHY CHILDREN AND THE LINK TO EXTERNALIZING

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Descriptors: stressors, autonemics, recovery

The hypoarousal hypothesis proposes that autonomic under-arousal is linked to higher levels of externalizing behavior due to a state of fearlessness or simulation-seeking. Yet research to-date has yielded inconsistent results with small sample sizes, and few have explored both stress response and recovery with multiple autonomic indicators. We tested the association between externalizing problems and psychosocial stress response and recovery in a large urban community sample of children aged 11 to 12 years (N = 311; 49% boys). Heart rate (HR) and skin conductance level (SCL) were collected at rest, during a modified Trier Social Stress Task, and again at rest. HR and SCL continued to increase from at rest to speech preparation and delivery, and then significantly decreased post-stressor (HR dropped back to initial baseline but SCL was still elevated). The correlation between SCL and HR reactivity was significant but small (r = .13). Neither SCL stress reactivity nor recovery was associated with externalizing problems (Child Behavior Checklist and Youth Self-Report). Both parent-report and self-report externalizing problems were inversely associated with HR stress reactivity but positively associated with HR stress recovery, suggesting that children high on externalizing problems showed a blunted stress response coupled with a faster recovery indexed by HR. The two ANS indicators of stress response and recovery capture distinctive information and may not be interchangeable. We will discuss the theoretical and practical implications for children’s externalizing behavior.

Poster 1-088

PSYCHOPATHIC TRAITS AND REDUCED AUTONOMIC RESPONSES DURING DECISION-MAKING OF FAIRNESS NORM VIOLATION

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Descriptors: psychopathic trait, fairness norm violation, electrodermal activity

It has been argued that social norm violations in individuals with psychopathy are responsible for deficient functioning in the defensive system. As supports this, multiple studies have found that primary psychopathy or interpersonal/affective facets of psychopathic traits reduce physiological responses to threat-related stimuli. To extend this, the current study examined whether reduced physiological reactivity serve as a bridge between psychopathic traits and social norm violations. Participants (36 Japanese undergraduate students) were required to decide the amounts of money distributed to another student. Half of 60 trials were conducted under the ultimatum game condition where participants could not get any amount of money if the partner would reject their decisions. The other half trials were the dictator game where participants could get money based on their decisions. In each trial, participants chose between two offers (i.e., an unfair offer and a relatively fair offer). Skin conductance response (SCR) and heart rate (HR) were measured during decision-making. After all trials, participants completed the Levenson’s self-report psychopathy scale. Primary psychopathy was negatively correlated with SCR and HR acceleration prior to the choice of more unfair offers regardless of games. Only in the dictator game, mediation analyses revealed that primary psychopathy was associated to choosing unfair offers through the reduced autonomic responses. These findings suggest that psychopathic traits decrease internal indices that may guide socially adaptive decision-making.
FACTOR 1 AND FACTOR 2 PSYCHOPATHIC TRAIT SEVERITY DISSOCIATED IN EARLY VISUAL ERPS

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Descriptors: psychopathy, attention, ERPs

Affective processing models of psychopathy suggest that attentional deficits limit the perception of peripheral affective information. These attentional abnormalities are shown to differentiate those high in primary (Factor 1; F1) versus secondary (Factor 2; F2) psychopathic traits. We asked whether these attentional differences between F1 and F2 would be evident in the early stages of visual processing using ERPs (N75, P1, N170). We examined the relation between these traits and ERPs to simple visual stimulation (Study 1) and the explicit and implicit processing of spatially-filtered emotional faces (Study 2). We expected that reduced attention to peripheral information would be reflected in early ERP components and these, in turn, would relate to F1/F2 trait severity. In both studies, F1 severity was related to reductions in component amplitudes, whereas F2 severity was associated with delayed ERP latencies. Taken together, this suggests that F1 is associated with the amount of neural resources recruited during early stages of visual processing, while F2 is associated with a general delay in the recruitment of necessary resources, which, in turn, may more broadly reflect reduced responsivity of both the central and autonomic nervous systems. Everyday attention also was related to ERPs but the F1 and F2 relations held when attention variance was removed. CONCLUSIONS: Factors 1 and 2 traits are dissociable at early stages of visual processing with implications for the existence of distinct, factor-specific differences in neural and attentional resources.

WITHIN-SUBJECTS MODULATION OF EEG ALPHA ACTIVITY BY CARDIAC VAGAL CONTROL

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Descriptors: major depressive disorder, frontal EEG Alpha, RSA

Resting frontal Electrocencephalographic (EEG) activity and Respiratory Sinus Arrhythmia (RSA) have been identified as two promising biomarkers of Major Depressive Disorders (MDD), with trait-like stability and reliability (Allen, Urry, Hitt, & Coan, 2004; Stewart, Bismark, Towers, Coan, & Allen, 2010). The relationship between these two biomarkers in MDD has been largely unexplored. The present study examined the relationship between RSA and frontal EEG alpha asymmetry and total EEG alpha power, using the EKG and EEG data from 220 subjects, of which 108 had had lifetime MDD while 112 had no history of MDD. The RSA signal was derived using the IBI-series that had been transformed to a RSA signal. The alpha power for each epoch was obtained using FFT and then was divided into epochs with a length of 2.048 s, overlapping by 75%. Epochs was derived using the Hilbert transform. The eight-minute resting EEG signal was averaged across the epochs. Test results from paired sample t test found no significant differences in neural and attentional resources.
VARIABILITY AND VULNERABILITY: EXAMINING THE TRAIT AND STATE VARIANCE IN REWARD RESPONDING USING TRAIT-STATE-OCCASION MODELING

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Descriptors: reward positivity, depression, state-trait-occasion modeling
Blunted reward responding (RR) has been shown to be a core dysfunction in major depressive disorder (MDD). One measure of RR is the Reward Positivity (RewP), a positive-going event-related potential (ERP) component that peaks 250–350ms after reward feedback. Blunted RR indexed by the RewP is associated across-sectionally and prospectively with MDD symptoms, suggesting that it may confer vulnerability to MDD. Retest reliability for the RewP is moderate, but it is unclear to what extent this represents trait vulnerability. Trait-state-occasion (TStO) modeling is a statistical method for parsing variance accounted for by trait versus state factors over repeated observations. In the present study, participants attended five sessions during which they were administered a RR task (the widely used “doors task”) while ERPs (i.e., RewP) were recorded. The task involved participants choosing one of two stimuli, after which they were notified that they either won or lost money on the trial. The preliminary TStO model (n = 57, data collection is ongoing) for the win condition converged (CFI = 0.99; RMSEA = 0.04 [0.00–0.10]). Results indicated that 63% of the variance in the RewP was accounted for by trait factors, whereas 37% was accounted for by state factors. The retest reliability between pairs of assessments (e.g., session 1 with 2, 2 with 4, etc.) ranged from r = 0.49–0.88, suggesting that the TStO model provides a more precise assessment of the stability of the RewP. These results add to a growing literature showing that the RewP indexes trait neural RR implicated as a mechanism of MDD.

AUTONOMIC STRESS REACTIVITY AND CRAVING IN INDIVIDUALS WITH PROBLEMATIC INTERNET USE

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Descriptors: problematic Internet use, heart rate variability (HRV), craving
The link between autonomic stress reactivity and subjective urge/craving has been less systematically examined in behavioral addictions than in substance use disorders. The present study investigated whether problematic Internet users (PIU) show enhanced autonomic stress reactivity than non-PIU, indexed by lower Heart Rate Variability (HRV) and higher Skin Conductance Level (SCL) during the Trier Social Stress Test (TSST), and whether greater reactivity is related to stronger urge/craving. Based on their Internet Addiction Test scores, participants were divided into PIU (N = 24) and non-PIU (N = 21). Their heart rate and skin conductance were continuously recorded during baseline, the TSST, and recovery. HRV and SCL reactivity during the TSST were measured as autonomic indices of the stress response. “Urge to be online” ratings were collected using a Likert scale before and after the TSST. The SDNN, an overall measure of HRV, was significantly lower in PIU than non-PIU during baseline, but not during the TSST and recovery. Furthermore, only among PIU a significant negative correlation emerged between SDNN during recovery and urge ratings after the test. No group differences emerged for SCL. Our findings suggest that problems in controlling one’s use of the Internet may be related to reduced autonomic balance at rest. Moreover, our results provide new insights into the characterization of craving in PIU, indicating the existence of a relationship between craving for Internet usage and reduced autonomic flexibility.
### Poster 1-097

**CEREBRAL BLOOD FLOW AS A BIOLOGICAL MARKER OF PSYCHOPATHOLOGY ACROSS DISORDERS IN YOUTH**

Antonios Kaczurkin, Tyler Moore, Monica Calkins, Rastko Cric, John Detre, Angel de la Garza, David Roalf, Adon Rosen, Kosha Ruparel, Raquel Gur, Ruben Gur & Theodore Satterthwaite  
University of Pennsylvania

**Descriptors:** cerebral blood flow, psychopathology, developmental

The high comorbidity among neuropsychiatric disorders suggests a possible common neurobiological phenotype. Regional cerebral blood flow (CBF) is one brain phenotype that may be a useful biological marker across different types of psychopathology, as abnormalities in CBF are present in many neuropsychiatric disorders. To investigate abnormalities in CBF common across psychiatric disorders, CBF was quantified on a voxelwise basis using arterial spin labeled MRI at 3T in a sample of 1,042 youths who completed cross-sectional imaging as part of the Philadelphia Neurodevelopmental Cohort. A dimensional measure of psychopathology was constructed using a bifactor model of item-level data from a psychiatric screening interview, which defined four factors (fear, anxious-misery, psychosis, and behavioral symptoms) plus a general factor: overall psychopathology. Overall psychopathology was associated with elevated perfusion in the right dorsal anterior cingulate cortex (ACC) and left rostral ACC. Psychosis symptoms were related to reduced perfusion in the left frontal operculum and insula, whereas fear symptoms were associated with less perfusion in the right occipital/fusiform gyrus and left subgenual ACC. Follow-up functional connectivity analyses using resting-state fMRI collected in the same participants revealed decreased connectivity between the dorsal ACC and bilateral caudate. The results of this study demonstrate common and dissociable CBF abnormalities across neuropsychiatric disorders in youth.

### Poster 1-098

**CORTICAL CORRELATES OF RISK EVALUATION IN ALCOHOL DEPENDENT PATIENTS**

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University of Konstanz

**Descriptors:** risk evaluation, alcohol use disorder, feedback processing

Dysfunctional risk evaluation regarding one’s own alcohol use is assumed to contribute to continuing alcohol abuse of patients with alcohol use disorders (AUD). The present EEG study examined event-related potentials (ERPs) in n=24 AUD patients and n=23 healthy controls (HC) in a modified version of the Balloon Analogue Risk Task (BART). On each of 100 runs, subjects followed the picture of a balloon on a screen, which they inflated by button press (pump). Balloons popped after the 3rd to 12th pump in pseudorandom order. Each pump was rewarded by 5ct, while the accumulated monetary gain was lost whenever the balloon popped. Fifty trials of 3rd balloon size were considered as low-risk and rewarded by 5ct, while the accumulated monetary gain was lost whenever the balloon popped. Analysis of variance revealed decreased connectivity between the dorsal ACC and bilateral caudate. The results of this study demonstrate common and dissociable CBF abnormalities across neuropsychiatric disorders in youth.

### Poster 1-099

**TRAUMA SYMPTOMS ARE ASSOCIATED WITH AN INCREASED STARTLE REFLEX IN ANTICIPATION OF TEMPORALLY UNPREDICTABLE PICTURES**

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**Descriptors:** trauma, startle reflex, unpredictability

Posttraumatic stress disorder and symptoms have been associated with increased defensive motivation in anticipation of high arousal unpleasant pictures and temporally unpredictable stimuli. However, it is unclear whether trauma symptoms are associated with elevated defensive motivation as a function of emotional content, temporal predictability, or both. In the current study, 82 participants completed a picture-viewing task during which low arousal neutral, moderate arousal pleasant, and high arousal unpleasant images were presented with either predictable or unpredictable timing. The startle reflex was measured in anticipation of picture presentation. In addition, participants completed the self-report Inventory of Depression and Anxiety Symptoms to assess current trauma symptomatology. Results indicated a Predictability x Trauma interaction, such that greater trauma symptoms were associated with increased startle potentiation in anticipation of temporally unpredictable relative to predictable pictures, irrespective of the picture content. These findings provide novel evidence that mild-moderate trauma symptoms are associated with increased sensitivity to temporal unpredictability, which may represent a vulnerability factor for the development of more severe anxiety-related psychopathology.

### Poster 1-100

**ATTENUATED INTRINSIC CONNECTIVITY WITHIN COGNITIVE CONTROL NETWORK AMONG INDIVIDUALS WITH REMITTED DEPRESSION: TEMPORAL STABILITY AND ASSOCIATION WITH NEGATIVE COGNITIVE STYLES**

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**Descriptors:** cognitive control, major depressive disorder, resting-state connectivity

Many individuals with major depressive disorder (MDD) experience cognitive dysfunction including impaired cognitive control and negative cognitive styles. However, few studies have evaluated the extent to which impaired connectivity within the cognitive control network (CCN) may be present in MDD, nor have studies examined the temporal stability of such attenuation over time. This represents a major gap in understanding stable, trait-like depression risk phenotypes. Resting-state functional connectivity data were collected from 52 unmedicated young adults with remitted MDD (rMDD) and 47 demographically-matched healthy controls, using three bilateral seeds in the CCN (dorsolateral prefrontal cortex [dlPFC], inferior parietal lobule [IPL], and dorsal anterior cingulate cortex). Mean connectivity within the entire CCN was attenuated among individuals with rMDD, was stable over time, and was most pronounced from the right dlPFC and right IPL to the CCN. Attenuated connectivity in rMDD appeared to be specific to the CCN as opposed to representing attenuated within-network coherence in other networks (e.g., default-mode, salience). In addition, attenuated connectivity within the CCN mediated relationships between rMDD status and cognitive risk factors for depression, including rumination, brooding, pessimistic attributional style, and negative automatic thoughts. Given that these cognitive markers are known predictors of relapse, these results suggest that attenuated connectivity within the CCN could represent a biomarker for trait phenotypes of depression risk.
Poster 1-101
ATTENTION ALLOCATION UNDER CONDITIONS OF THREAT IN SOCIAL ANXIETY DISORDER: INCREASED SCANNING VS. AVOIDANCE OF SOCIAL STIMULI
Richard Wermes, Tanja Lincoln & Sylvia Helbig-Lang
University of Hamburg

Descriptors: social anxiety disorder, autism spectrum disorder, event-related potentials

According to cognitive behavioral models, a biased attention for threatening stimuli plays a crucial role in the development and the maintenance of social anxiety disorder. However, there is little data on how social state and trait anxiety actually shapes attention for threatening and non-threatening social stimuli. To address this question, adult participants with social anxiety (n = 58) and healthy controls (n = 57) were examined with an extended visual search design that included the assessment of eye movements as an indicator of visual attention. Half of the participants additionally underwent an induction of social state anxiety in order to disentangle effects of state and trait anxiety on visual attention allocation. We considered the visual scanpath length as indicator of general attentional patterns.

Results showed an interaction effect between trait and state components of social anxiety (F (1, 117) = 5.584, p < .020, $\eta^2_{partial} = .046$), which was consistent for all types of social stimuli (neutral, positive, and threatening). The scanpath of participants with social anxiety disorder was initially shorter and increased after state anxiety induction, while the reverse effect was observed in healthy participants. Findings suggest that state social anxiety induces excessive scanning behavior at least in socially anxious individuals, which is consistent with assumptions of hypervigilance under impending threat. Without state anxiety, socially anxious individuals might rather avoid social stimuli.

Poster 1-102
THE LATE POSITIVE POTENTIAL PROSPECTIVELY PREDICTS SUBJECTIVE STRESS DURING THE TRANSITION TO UNIVERSITY
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Descriptors: stress, attention to reward, risk and resilience

The transition from high school to university can be a major life stressor that increases risk for depression among first-year university students. Increased attention to reward may contribute to resilience to life stressors by reducing subjective experience of stress and conferring protection from depressive symptoms. The Late Positive Potential (LPP) is a useful neural marker of attention to reward that reflects preferential attention towards motivationally-salient information. The present study examined modulation of the LPP to rewarding images as a potential predictor of perceived stress in first-year university students. To that end, we assessed total lifetime stress exposure (both count and severity) and the reward-elicited LPP in first-year students (n = 52) at the start of the academic year. Six weeks later, during midterm period, participants completed measures of perceived stress and current depressive symptoms. A larger LPP to rewarding images at the start of the year was associated with lower levels of perceived stress six weeks later, even after controlling for the total number and severity of lifetime stressors participants experienced prior to the transition to university. Furthermore, students who showed this enhanced LPP at baseline reported lower levels of depressive symptoms six weeks later.

This finding indicates that the LPP may be a valuable predictor of risk and resilience for future psychopathology following the transition into university.

Poster 1-103
COVARIANCE AMONG EVENT-RELATED POTENTIALS ACROSS GO/NOGO AND FLANKER TASKS AND THE TRIARCHIC CONCEPTUALIZATION OF PSYCHOPATHY
Pablo Ribes, Rosario Poy, Pilar Segarra, Ángels Esteller, Victoria Branchadell, Sara Rodríguez & Javier Molto
Universitat Jaume I

Descriptors: triarchic model of psychopathy, event-related potential, go/no-go and flanker tasks

This study examined the covariance among multiple ERP indices of performance monitoring across Go/NoGo (1200 trials, 80% Go) and Flanker (576 trials, 50% congruent) tasks, and its associations with the psychopathy domains of disinhibition, meanness and boldness as assessed by the Triarchic Psychopathy Measure (TriPM), in a sample of 143 undergraduates (102 women). An exploratory principal-axis factor analysis with varimax rotation on N2, P3, ERN and Pe ERPs in both tasks revealed a two-factor solution (eigenvalues > 1) accounting for 71% of the variance. The first factor (hereinafter referred to as ‘N2ERN’) best reflected the shared variance among P3 and Pe ERP’s (loading range = .77-.86) probably related to a more elaborated processing of task stimuli and errors; the second factor (hereinafter referred to as ‘N2ERN’) reflected the coherence among frontal negativities (N2 and ERN ERPs; loading range = .61-.80) related to conflict/error processing.

‘P3Pe’ scores selectively correlated with Disinhibition scores ($r = -.25, p < .01$) and accounted for the associations found between each P3 and Pe measure and this psychopathy domain ($r$s from .23 to -.15; $ps$ from .01 to .06). On the other hand, the correlation between the NoGo-ERN and Disinhibition scores ($r = .21, p < .05$) remained significant even after controlling for ‘N2ERN’ scores, which did not significantly correlate with neither TriPM scale score. Implications for the selection of tasks to study ERP indicators of certain psychopathic traits are discussed.

Poster 1-104
A ‘BODY SITUATED’ MODEL OF EMBODIED COGNITION: CARDIOVASCULAR MALFUNCTION TRiggers INTEROCEPTIVE DEFICITS IN HYPERTENSION
Adrian Yoris1, Sofia Abrevaya3, Lucas Sedeño1, Agustina Legaz2, Agustin Ibanés3, Adolfo García & Facundo Manes4
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Descriptors: heart evoked potential, intersession, hypertension

Interoception, the sensing of visceral-body signals, involves an interplay between neural and autonomic mechanisms. Studies under the brain-centered approach characterizing embodied cognition research have focused on patients with neuro-logical and psychiatric disorders. However, virtually no attention has been paid to the neural correlates of interoception in patients with cardiac and autonomic disruptions. Here, we bridge this gap examining multidimensional neural markers of interoception in hypertensive disease (HTN). We included only HTN patients with no brain atrophy (as assessed with voxel based morphometry) or white matter atrophy (evidenced by diffusion tensor imaging analysis). In particular, we evaluated interoceptive domains through (i) a behavioral heartbeat detection (HBD)task; (ii) measures of the heart-evoked potential, an electrophysiological cortical signature of attention to cardiac signals; and (iii) neuroimaging recordings (MRI and fMRI) to evaluate anatomical and functional connectivity properties of key interoceptive regions. Regarding controls, our results showed perturbed interoceptive performance in HBD (impaired accuracy); reduced HEP amplitude modulation; and deficient functional connectivity in interoceptive key areas (insula and ACC) for HTN. These result constitute novel approach to embodied cognition of interoceptive measures, evidencing that subtle abnormalities of the peripheral cardiac system directly impact on neurocognitive markers of body sensing.
Poster 1-105

DYSPNEA CATASTROPHIZING AND BRAIN ACTIVATION DURING THE ANTICIPATION AND PERCEPTION OF DYSPNEA
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1University of Leuven, 2University of Hamburg, 3University of Würzburg

Descriptors: anticipation, respiration, fear
High levels of negative affectivity are associated with increased perception and neural processing of dyspnea (breathlessness). Recently, more dyspnea-specific negative affective experience demonstrated that dyspnea catastrophizing is suggested to contribute to increased perception of dyspnea above effects of rather unspecific negative affectivity such as general anxiety levels. Therefore, the present study examined the associations of dyspnea catastrophizing with neural activations during the anticipation and perception of dyspnea. Sixty-six healthy volunteers underwent twenty blocks of inspiratory resistive load breathing with parallel acquisition of fMRI data. Loads inducing either severe or mild dyspnea (dyspnea conditions) were presented in alternating order with each condition being visually cued (anticipation conditions). Dyspnea catastrophizing and general trait anxiety were measured with the Breathlessness Catastrophizing Scale (BCS) and the State-Trait Anxiety Inventory, respectively. Correlating the BCS scores with neural activations during the perception of dyspnea yielded no significant results. However, during the anticipation of dyspnea BCS scores correlated positively with activations of the anterior cingulate cortex (ACC), even after controlling for general anxiety levels. The present results suggest that dyspnea catastrophizing is associated with stronger ACC recruitment during the anticipation of dyspnea. This might reflect increased affective and/or top-down modulatory processing in individuals with higher dyspnea catastrophizing when anticipating dyspnea.

Poster 1-106

AUDITORY EVOKED PATIENTS AS A POSSIBLE SURROGATE FOR SEROTONIN PET IMAGING
Dhajapillai Pillai, Christine De Lorenzo & Ramin Parsley
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Descriptors: LDAEP, serotonin, PET
Serotonin receptors via positron emission tomography (PET) can provide valuable information on BD pathophysiology and treatment mechanisms. However, PET is expensive and restricted to adults due to radioactivity. To overcome this, cheaper alternative, we directly compared serotonin 1A (5-HT1A) and serotonin 5-HTT binding measured by PET to the loudness dependence of auditory evoked potentials (LDAEP), an electroencephalography (EEG) parameter. 13 patients with BD were examined: 7 males and 6 females. PET scans were performed with [11C]-CUMI-101, a 5-HT1A partial agonist, and [11C]-DASB, which binds 5-HTT. EEG was performed with a 32-electrode Biosemi ActiveTwo system. The EEG was recorded while subjects listened to 1000 Hz tones at 60, 70, 80, 90, and 100 dB in pseudorandomized order in five blocks of 100 tones. LDAEP was calculated as the slope of the peak-to-peak amplitude of the N1 and P2 late auditory potentials at each decibel level. A sharp increase in amplitude with increasing loudness results in high LDAEP, while a shallow increase results in low LDAEP. LDAEP was then correlated with 5-HT1A and 5-HTT binding. EEG measures tended towards positive correlation with 5-HT1A binding in the temporal lobe (p = 0.06), but not in the raphe nucleus (p = 0.40). LDAEP showed significant negative correlation with 5-HTT binding in the midbrain (p = 0.02). Our findings support the serotonergic nature of LDAEP and offer the possibility of a PET surrogate.

Poster 1-107

COGNITIVE TASK-SPECIFIC REORGANIZATION OF EEG UNDER TRIGEMINAL EXPOSURE
Sergii Takaiev & Igor Zyma
National Taras Shevchenko University of Kyiv

Descriptors: trigeminal agent, cognition, EEG
It is well known that the stimulation of trigeminal system cause a activating effect on a functional state of brain. The aim of the study was to investigate the neurodynamics of the human brain during intellectual load under passive perception of trigeminal agent (ammonia). 51 healthy volunteers (male and female students aged 18-23 years) participated in this study. EEG was recorded over a period of 9 min during the rest state and 6 minutes during mental arithmetical subtraction under odor stimulation with ammonia. We estimated the spectral power density (SPD) and the levels of coherence of all the frequencies from 0.2 to 35 Hz. Odor stimulation with ammonia resulted in generalized activation (depression of low frequency components and partial activation of beta2-subband) and increased levels of cortial integration in theta2-, alpha1-, alpha3- and beta2-subbands (mainly in the posterior cortex). We did not observe any pronounced adaptation to the smell during the action of ammonia. We also found that activation of trigeminal chemosensory system did not lead to any deactivating processes in the neocortex. Neurodynamics of brain processes in this case likely reflected the interaction of brain systems that exert upstream and downturn control. Perceptions of ammonia did not alter cognitive task-specific reorganization of EEG, but activation processes during intellectual load were less marked in comparison to those in control: we observed strongly pronounced increase of alpha2-subband in the frontal-temporal brain regions during the mental load under stimulation with ammonia.

Poster 1-108

THE CONTINGENCY BETWEEN SELF-ACTION AND INTERVENING EVENTS GENERATES THE EXPECTATION OF SUBSEQUENT RESULT
Tsukasa Kimura & Jun`ichi Katayama
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Descriptors: sensory attenuation, contingency, expectation
The self-action facilitates expectation of its consequences and decreases the event-related brain potentials (ERPs) amplitude for this result. This decrease, called sensory attenuation, becomes weaker by temporal delay between the self-action and its consequence. Sometimes the self-action produces some intervening events, followed by the final result, in which we can expect the effect even with the time delay. We focused on relationship between self-action and events, and examined influence of this relationship for expectation of subsequent result. ERPs, as index of expectation, were recorded during a simple reaction task to somatosensory stimuli. The participants (N = 14) were instructed to put their arms on a desk, and press the left or right key to start trial. After that, one visual stimuli appeared left (or right) side on the desk, and somatosensory stimuli were presented with high probability at the same side as visual stimuli and with lower probability at the opposite side. In the contingent condition, visual stimuli invariably appeared at the side of key press. In random conditions, the half numbers of visual stimuli were presented at side of key press (random contingent condition), and another half were presented at the opposite side of key press (random non-contingent condition). Under the contingent condition the amplitudes of P1 elicited by high probability somatosensory stimuli decreased. The present result indicates that contingency between self-action and intervening events makes it possible to expect subsequent result even with temporal delay.
THE ROLE OF CULTURE IN THE TIME SEQUENCE OF CONFIGURAL AND FEATURAL FACE PROCESSING

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Descriptors: culture, configural face processing, featural face processing

Previous research suggests that East Asians pay more attention to configural information than Caucasian Westerners, while Caucasian Westerners pay more attention to featural information than East Asians. However, it is unclear whether there exists cultural variation in the temporal sequence of configural and featural face processing. To avoid confounding physical stimuli differences between configural and featural face processing on ERP components, spatial attention paradigm was employed to instruct Chinese or Caucasian participants to attend the face location (attended condition, own- or other-race faces) or the house location (unattended condition). The results showed that configural and featural processing of own- and other-race faces involve different neural mechanisms. Specifically, for Caucasian participants, a larger posterior P1 was observed for configural relative to featural processing both in own- and other-race faces, whereas a larger P2 was found for featural relative to configural processing in other-race faces on the left hemisphere and in own-race faces. In contrast, for Caucasian participants, the P1 was larger for featural than for configural processing in own-race faces and the opposite pattern was observed in other-race faces, whereas the P2 was larger for configurural than for featural processing both in own- and other-race faces. These results demonstrated the robust cultural influence in the time sequence of configural and featural processing in own-race faces but not in other-race faces.
Poster 1-113

JUST TRUST ME: DISTINCT DIRECTIONAL CONNECTIVITY NETWORKS DURING WILLFUL CONTROL OF INTERPERSONAL EXPECTATIONS

Megan Filkowski, Katelyn Oliver, Brian Haas & Dean Sabatinelli
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Descriptors: directional connectivity, fMRI, social attitudes

When introduced to a friend, or warned about an enemy, we may be biased toward trust or distrust. Recent research has identified regions of the brain associated with the willful control of this process by asking people (n=100) to view balanced blocks of neutral faces, and varying an instruction to trust, distrust, or assess the age of a face, while functional magnetic resonance imaging data was collected. These 3 tasks differentially recruited the amygdala, fusiform gyrus (FG), orbitofrontal cortex (OFC), temporoparietal junction (TPJ), and lateral occipital cortex (LOC), with TPJ and OFC uniquely active during trust/distrust conditions. Here, we apply Granger Causality analysis to this data in an effort to identify directional connectivity (DC) patterns associated with these tasks. Results show that the distrust task engages a broader bidirectional causal network than the trust or age tasks. Specifically, the distrust condition resulted in reliable bidirectional connectivity between FG and LOC, between FG and OFC, and between LOC and TPJ. Moreover, the OFC showed reliable DC to all other regions, TPJ showed reliable DC to amygdala and FG, the amygdala showed reliable DC to FG, and the LOC showed reliable DC to amygdala. In contrast, the trust condition resulted in reliable DC from the TPJ to FG. Finally, when participants were asked to evaluate the age of a face, only the OFC showed reliable DC to all other regions of interest, as in the distrust condition. The broad network engagement during willful distrust may reflect distinct evolutionary demands.

Poster 1-114

AN EVENT-RELATED POTENTIAL STUDY OF INTERLETTER SPACING DURING VISUAL WORD RECOGNITION

Elizabeth Sacchi, Ryan Mirchin & Sarah Laszlo
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Descriptors: event-related potential, reading, letter spacing

Increasing spacing between letters in words (e.g., s p a c e vs. space) makes reading in children and adults more fluid and less error prone. This effect has been demonstrated chiefly through the use of lexical decision reaction time and total paragraph reading time. To date, no electrophysiological work has examined this effect, meaning there is little insight available regarding how letter spacing impacts “hidden” levels of processing between apprehension of the word form and the final behavioral outcome. Here, we examined how varying levels of inter-letter spacing (crowded, standard, and increased text spacing) impact ERPs elicited by words and other stimulus types (pseudowords, illegal strings, and a false font). Results indicate that letter spacing does not impact the ERP within the first 100 ms, but there is an effect in the 200–250 ms latency range. This effect is consistent with the idea that the letter spacing (crowded, standard, and increased text spacing) impact ERPs elicited by words and other stimulus types (pseudowords, illegal strings, and a false font). Results indicate that letter spacing does not impact the ERP within the first 100 ms, but there is an effect in the 200–250 ms latency range. This effect is consistent with the idea that the letter spacing does not impact the ERP within the first 100 ms, but there is an effect in the 200–250 ms latency range. This effect is consistent with the idea that the letter spacing does not impact the ERP within the first 100 ms, but there is an effect in the 200–250 ms latency range.

Poster 1-115

EFFECT OF EMPHASIZING WORDS IN A MESSAGE ON LISTENER’S ATTENTION, AROUSAL, AND RECALL

Emma Rodero & Jose Mata
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Descriptors: emphasized words, attention, recall

How a person speaks can be very relevant for listeners to understand the content of what the speaker says. One of the most salient ways to highlight some information in a message is to emphasize certain words. The question here is whether or not this strategy can influence the listener’s attention and arousal as well as facilitate the recall of this concrete information. The goal of this study is to explore the effect of highlighting some words in a complex message, such as an audio commercial, to know how this strategy influences the listener’s cognitive processing. A within-subjects experiment was conducted in which participants listened to 16 radio commercials. Four audio commercials were produced without highlighting any word, and twelve ads were elaborated with different quantity of prominent words. Dependent variables were psychophysiological arousal, attention, and immediate recall. We employed psychophysiological measures to index attention and arousal (heart rate and skin conductance), and a recall task. Results showed that the prominent words elicited greater skin conductance activation and less heart rate level than those without an emphasis. Also, the prominent words were the best recalled. These results indicate that the emphasis on the most important words of a message improves attention, arousal, and recall. Therefore, we can conclude that this strategy is very effective for public speaking.

Poster 1-116

INNER AND OVERT SPEECH PRODUCTION MATURATES FROM CHILDHOOD TO ADULTHOOD: A COMBINED EEG AND FNIRS STUDY

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Descriptors: inner speech, EEG, fNIRS

Previous research showed maturational effects on language processing as well as executive functioning. Inner speech is the ability to speak in one’s mind and has been implicated in many cognitive functions as well as self-regulation in children and adults. The use of overt speech starts to decrease at 6–7 years of age and continues to fade out until being mostly internalized by age 10. The present study particularly investigated the impact of inner speech during planning of a subsequent speech production in contrast to the actual execution of speech in children (6–7 and 8–9 years) compared to adults by simultaneously applying the electroencephalography (EEG) and the functional near-infrared spectroscopy (fNIRS). Participants were grouped as high versus low performers regarding the Tower of London task assessing executive functions in order to compare brain processing of these two groups. Our results suggest age-related maturational processes in inner and overt speech planning and naming from childhood to adulthood. In particular, inter-hemispheric as well as frontal-to-parietal recruitment of brain areas are almost immature in 8–9-year olds. A long lasting negativity showing larger amplitudes for low than high performers was found in the EEG of 6–7-year-olds. This negativity suggests a selective-attention and working memory mechanism. Thus, lower performers might need more working memory capacity and more attentional processes to perform inner speech and to inhibit articulatory processes.

Poster 1-117

INDIVIDUAL DIFFERENCES PREDICTING AUTONOMIC RESPONSES ASSOCIATED WITH LISTENING EFFORT

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Descriptors: listening effort, autonomic response, noise sensitivity

Autonomic nervous system (ANS) responses can reflect the effort of listening to speech in adverse conditions, but response patterns may vary across equally challenging conditions. We previously showed that a decrease in blood volume pulse (BVP) is stronger when listening to noise-masked speech compared to equally intelligible synthetic speech, reflecting an increase in either stress or cognitive demand in noise. Here we extend this research, asking how individual traits affect ANS responses associated with listening effort, including BVP, skin conductance level, facial EMG, and heart rate variability. Traits included selective attention, working memory capacity, vocabulary (PPVT-IV), noise sensitivity (NoiseQ), hearing thresholds, and personality (BFI-10). Listeners heard 10 short stories and answered questions about them. Listening effort was manipulated in two ways: Half the stories were spoken in non-native accented English, half in native-accented English masked by speech-shaped noise. Signal-to-masker ratio was adjusted for each subject to match performance across conditions. Preliminary growth curve analyses (N=10) show a significantly stronger BVP decrease in masking noise than in the accented condition, confirming previous findings. The model is improved by including the trait variables of NoiseQ, PPVT and BFI-10 scores. Median-split smoothing spline ANOVAs show a decrease in BVP in the noise condition only for listeners with high noise sensitivity, suggesting that the BVP decrease may reflect stress or annoyance from noise rather than increased cognitive demand.
BRAIN ACTIVITY DURING BIMODAL ATTENTION AND WORKING MEMORY
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Descriptors: divided attention, working memory, fMRI

In our recent functional magnetic resonance imaging (fMRI) study, we examined healthy adult participants’ (N = 15) brain activity associated with division of attention between simultaneously presented tones and gratings delivered at a rate of one audio-visual stimulus pair in 1.8 s. The participants’ task was to perform a 1-back tone-pitch or grating-orientation discrimination task, or both. In a control condition, they performed a simple reaction-time task. The left dorsolateral prefrontal cortex showed enhanced activity during intermodal division of attention compared with unimodal selective attention supporting the role of this cortical region in the control of divided attention. This interpretation is also supported by results from our other recent fMRI study. In this study, healthy adult participants (N = 17) were presented with simultaneous tones and gratings. Their task was to memorize one auditory feature, one visual feature, one auditory and one visual feature or two features in one modality in delayed discrimination tasks with a 7-s memory interval. Comparison of uni- and bimodal two-feature tasks with one-feature tasks indicated enhanced activity predominantly in the left dorsolateral prefrontal cortex, as well as in parietal, temporal, occipital and insular cortices.

SPEEDING OF RSVP-EVOKED VEPs AT THE RIGHT HEMISPHERE IS INDEPENDENT OF ATTENTION BUT DEPENDS ON RIGHT-HANDEDNESS
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Descriptors: multiple-object processing, ERPs, fMRI

When black letters are presented in fast series, both left and right from fixation, including two targets, a colored letter and a special character (e.g., a black digit), the special character is better identified in the left than in the right stream. We have described three ERP correlates of this left visual field (LVF) advantage: speeded target-evoked N2pc at the right hemisphere (RH), larger P3 amplitudes evoked by left-side targets, and earlier VEPs at the right than at the left hemisphere evoked by the first few black letters. This latter correlate might be causal to the LVF advantage by its occurring before the targets. In three experiments, we studied dependence of this VEP asymmetry on stimulus material (letters, digits, Tibetan letters = unfamiliar characters), on directing of attention (by having targets occur in one stream only) and on participants’ handedness. VEP asymmetry decreased, though still remaining present, with unfamiliar characters, was additive to changes in asymmetry induced by shifts of attention, and was absent in left-handers. It appears that the VEP asymmetry reflects some RH dominance in early perceptual processing which is absent in left-handers, even though both left- and right-handers have the LVF advantage in target identification. There was not any positive evidence that VEP asymmetry was related, let alone causal, to this LVF advantage.

BIOFEEDBACK COMPONENTS EVALUATED IN THE LAB SETTING
Lauren Kennedy
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Descriptors: real-time, cognitive workload, simulation-based medical education

Feedback derived from psychophysiological variables is increasingly recognized as an appropriate real-time intervention to improve outcomes. Such outcomes can include improved health, performance, and acute stress states. Bio- and neuro-feedback are both examples of this quickly advancing technology. In both cases, non-invasive sensors are equipped to individuals and these sensors detect, process, transform, and display physiological changes to the user via some sensory modality. The goal of using data-driven physiological feedback is to train users to control their own physiology in a way that results in a measurable improvement. This talk will overview existing components of physiological feedback contributing to its effectiveness. This talk will also present the background, methods, and results from a pilot study supporting the inclusion of visual coping instructions as an additional biofeedback component. During this pilot study, we collected psychophysiological measures including electrocardiography (ECG), electromyography, and skin temperature. Importantly, we manipulated the time schedule in which a coping instruction was administered during an acutely stressful lab-based task, without the presence of biofeedback. Results from ECG analysis support the physiological benefit of administering coping instructions immediately after moments of elevated stress, in terms of both downstream physiological recovery and certain task-specific performance measures. Implications and future steps for evaluating a similar design within the healthcare setting will be discussed.

CARDIOVASCULAR REACTIVITY DURING VERBAL, OBJECT, AND SPATIAL WORKING MEMORY TASKS
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Central Michigan University

Descriptors: cardiovascular reactivity, working memory

Working memory provides temporary storage for and manipulation of information. Baddeley’s (1992) model includes three components: the central executive attention control system, and two memory buffers, the visuospatial sketchpad (for visual objects) and the phonological loop (for verbal information). Smith and Jonides (1997; 1999) in a series of neuromaging studies found a neural basis to support Baddeley’s model, but found evidence for verbal, object, and spatial memory buffers. In our study, 73 students (Mage = 20 years, 31 male) participated in 0-, 1-, and 2-back working memory tasks with either verbal (letters) or object (Tamil characters) stimuli presented in one of six locations while cardiac reactivity was observed before and after practice for each task. The verbal group (n = 17) responded to whether the letter name matched or did not match the target, whereas the object group (n = 17) responded to the Tamil character, regardless of location. Two spatial groups responded to whether the stimulus matched the target location regardless of the letter (n = 20) or character (n = 19). Memory load and practice effects were similar across all four groups. Reaction time (RT) increased and accuracy decreased while heart period (HP) was shorter and respiratory sinus arrhythmia (RSA) was more suppressed than baseline as memory load increased. RT decreased and accuracy increased while HP lengthened and RSA was less suppressed following practice. We suggest that these effects were due to improved efficiency of the central executive independent of the memory buffer.

OVERPROTECTIVE AND AUTHORITARIAN PARENTING, AND NOT LOW PARENTAL WARMTH, IS ASSOCIATED WITH AN INCREASED ERROR-RELATED NEGATIVITY (ERN) IN YOUNG ADULTHOOD
Julia Banica & Anna Weinberg
McGill University

Descriptors: error-related negativity, parenting

Overprotective and authoritarian parenting styles are associated with increased anxiety in offspring; however, the mechanisms through which increased anxiety occurs are unclear. Because authoritarian parents tend to catastrophize about and harshly punish less than perfect performance, one possibility is that this parenting style sensitizes neural performance monitoring networks in children, leading to excessive fear of making mistakes and later mental health problems. This enhanced fear of making mistakes may be reflected in the magnitude of the error-related negativity (ERN), which is larger in some anxious individuals. Prior evidence suggests that harsh parenting predicts an enhanced ERN in children, and enhanced fear of making mistakes may be reflected in the magnitude of the error-related negativity (ERN), which is larger in some anxious individuals. Prior evidence suggests that harsh parenting predicts an enhanced ERN in children, and that the magnitude of children’s ERN mediates the relationship between punitive parenting and children’s later anxiety. To establish whether these effects persist into adulthood, a sample of 70 female undergraduates reported on their parenting experiences and performed a flanker task to elicit the ERN. Consistent with evidence that maternal overprotection and authoritarian behaviors are more strongly associated with later anxiety, higher reported overprotective and authoritarian maternal behaviour – and not low maternal warmth or paternal behaviours – was uniquely associated with an enhanced ERN. These results indicate that overprotective and authoritarian parenting behaviors can have lasting impacts on neural response to errors, suggesting that adverse parenting may influence mental health through the long-term sensitization of neural performance monitoring networks.
USING DATA-DRIVEN EEG AND ERP COMPONENTS TO EXPLORE EEG-ERP DYNAMICS: A FEASIBILITY STUDY

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Descriptors: temporal and frequency principal components analyses, EEG-ERP dynamics, go/nogo task

Donchin first used temporal Principal Components Analysis (t-PCA) more than 50 years ago to decompose evoked potentials into their components, and t-PCA has been increasingly used to extract components underlying the Event Related Potential (ERP). Papers by Kayser et al. and Debener et al., presented at the SPR conference in 2000, began a similar expansion in regard to decomposition of the EEG amplitude spectrum into its frequency components via frequency-PCA (f-PCA). Here we investigate the feasibility of employing both forms of EEG/ERP decomposition to explore the brain’s dynamic task-related EEG-ERP linkages. We recorded resting EEG in both eyes-closed and -open resting conditions, followed by an equi-probable go/nogo task. EEG f-PCA, over spectra from the resting periods and the immediately-prestimulus periods of the go and nogo ERPs, found seven frequency components within the delta to beta range. Parietal topography and reductions from eyes-closed to eyes-open identified the alpha components. Separate t-PCAs of the go and nogo ERPs were used to obtain N1 and P3 components. Multiple regressions explored which EEG components predicted these ERP components. A mid-range alpha component was the major direct determinant of both P3a and P3b amplitudes, and an upper beta component inversely affected go N1–1 (i.e., increased beta was associated with a larger go N1–1). This is the first demonstration of joint t-PCA and t-PCA data-driven decompositions in the study of EEG-ERP linkages, and indicates the potential value of this approach in future brain dynamics studies.

WORKING MEMORY TRAINING DOES NOT MODULATE ERROR-RELATED NEGATIVITY IN ANXIOUS INDIVIDUALS

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Descriptors: ERN, working memory training, anxiety

A key cognitive bias associated with anxiety is exaggerated error monitoring, which can be indexed by the error-related negativity (ERN). The ERN is a negative-going event-related potential (ERP) elicited 0–100ms following an error response on simple behavioral tasks, such as the flanker task (Eriksen & Erisksen, 1974), and has been postulated as a biomarker of trait anxiety and worry (Moser et al., 2013). Working memory (WM) training programs have been used to decrease symptoms of anxiety and improve attentional control in high anxious individuals (Sari et al., 2016). However, it is not clear how WM training affects neuro-biomarkers of anxiety, such as the ERN. Twenty-five undergraduates with high trait anxiety were randomly assigned to 9 sessions of online emotional dual N-back or 1-back minimal-dose training, and completed an arrow flanker task before and after training. Results revealed no significant pre-post differences in mean ERN at central sites (Fz, Cz, Pz), and no behavioral pre-post differences in flanker performance (accuracy, errors, and reaction time). The ERN at posterior sites was significantly larger (more negative) on error trials compared to correct trials, and was correlated with self-reported trait worry at the baseline session. Our data suggest that an emotional WM training program may have poor transfer to index tonic (baseline) and phasic (task-evoked change) LC-NE activity. Subjects responded to a letter in a target color and ignored a distractor, which was either congruent or incongruent with the target. Incongruence costs indexed distractibility. The target color periodically changed in one of two ways: On Perseveration-Inhibition blocks, the target color became the target color and vice-versa, whereas on Pure Updating blocks, both target and distractor became novel colors. There were significant positive linear and U-shaped quadratic effects of tonic pupil size on reaction time (RT). Tonic pupil size did not interact with task condition and phasic pupil response did not have a main effect on RT. However, larger phasic responses predicted smaller incongruence costs in the Pure Updating condition. These findings suggest that tonic LC-NE activity may have a nonspecific effect on performance, whereas the effect of phasic LC-NE responses on task set maintenance differs across contexts. Future analyses will examine the influence of tonic and phasic pupil measures on attentional set updating.
ASSOCIATION OF CALORIE CONTENT AND BMI STATUS WITH FOOD-RELATED INHIBITORY CONTROL: A P300 EVENT-RELATED POTENTIAL STUDY

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Descriptors: inhibitory control, P300, food

Diet and obesity have significant implications for both physical and mental health. Food-related inhibitory control (i.e., withstanding automatic urges to eat palatable food) may relate to food intake and managing weight. We examined inhibitory control to high- and low-calorie foods in normal-weight (n=18) and overweight (n=18) individuals and individuals with obesity (n=19). EEG data were obtained while participants completed two food go/no-go tasks: 1) withholding responses to high-calorie food images and 2) withholding responses to low-calorie food images. We examined the go/no-go P300, an ERP that may reflect inhibitory control processes, such as inhibition of motor responses. Participants recorded daily food intake using multiple pass 24-hour dietary recalls for four days. A 2-task (high-calorie, low-calorie) x 2-trial (go, no-go) x 3-BMI (normal-weight, overweight, obese) ANOVA revealed that no-go trials had larger amplitudes than go trials (p<.001). There was a Task x Trial interaction that suggested individuals recruit more inhibitory control resources when withholding responses to high-calorie foods (p=.04). There were no differences by BMI group (p>.38). When controlling for age, BMI, and sex, regression analyses showed that high-calorie P300 difference amplitude did not predict daily calorie or carbohydrate intake (p>.49). Results suggest that adults across the BMI spectrum recruit additional inhibitory control resources when withholding responses to high-calorie foods; however, neural indices of later inhibitory control processes may not relate to food intake.

RESPONSE TIME IS RELATED TO ATTENTION AND CERTAINTY: EVIDENCE FROM RESPONSE-RELATED AND FEEDBACK-RELATED ELECTROENCEPHALOGRAPHIC OSCILLATORY ACTIVITY

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Descriptors: cognitive control, attention, error detection

Cognitive control can be viewed as an interplay between two constituent aspects: maintenance of task-specific processes related to attention, and non-specific regulation of motor threshold, both of them having strong influence on response accuracy and response time. Specifically, slow responses (both correct and erroneous ones) may be related to decreased attention and uncertainty. In the current study, we aimed to find out if response time might be a valid approximation distinguishing trials with high and low levels of attention and decision uncertainty. We used the auditory version of the condensation task, which is highly demanding for sustained attention while involves no inhibition of prepotent responses. We analyzed power and topography of EEG oscillations in theta, alpha, and beta frequency bands; we focused on response-related and feedback-related modulations, since “internal” response-related outcome detection is likely in conditions of attention and certainty, while “external” feedback-related outcome detection is more likely in conditions of inattention and uncertainty. We found that error-related frontal midline theta was strongest on fast erroneous trials. Late post-response posterior alpha suppression was strongest on slow erroneous trials. Feedback-related frontal beta was strongest on slow correct trials. This cumulatively supports our hypothesis and suggests that response time allows distinguishing the two types of trials, with slow trials related to lower levels of attention and higher uncertainty.

ATTENTIONAL SWITCHES IN A WISCONSIN CARD SORTING TASK CAN BE DECODED FROM FRONTAL LATERAL BRAIN AREAS

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Descriptors: attention switching, prefrontal cortex, negative feedback

In a changing environment, we need to flexibly adjust our behaviour to the current task demands. When stimulus-related contingencies change and our performance becomes worse than expected, we might need to change what stimuli we attend to. The medial frontal cortex has been suggested to signal the need for adjustments after negative outcomes and the lateral prefrontal cortex to participate in attentional top-down modulations. Here, we investigated attentional switches after negative feedback in a variant of the Wisconsin Card Sorting Test to determine if attentional switches to a certain visual feature can be decoded from frontomedial or frontolateral areas. Participants were asked to respond to one of three possible stimulus features. The relevant feature unpredictably changed every few trials. Feedback was provided, so individuals could infer when a change had happened. Participants were not told which feature would be relevant. By using a multivariate searchlight analysis of fMRI data, we investigated if it is possible to identify brain areas that show different activity patterns depending on the stimulus feature that the individual will respond to in the following trial. Above-average decoding in left lateral prefrontal areas and the intraparietal sulcus bilaterally suggests that these areas show differential activity for switching to each of the three visual features. The results indicate that these brain areas are not only active in response to switching in general, but show a specific activity pattern for switching attention to colour, motion or faces, respectively.

CEREBRAL BLOOD FLOW MODULATIONS DURING RESPONSE PREPARATION AND PROACTIVE INHIBITION

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Descriptors: cerebral blood flow, executive functions, inhibitory control

In the study cerebral blood flow modulations related to response preparation and proactive inhibition were investigated using a precued antisaccade paradigm. Blood flow velocities in the middle cerebral arteries of both hemispheres were recorded in 48 healthy subjects by means of functional transcranial Doppler sonography. Video-based eye tracking was applied for recording of eye movements. During the antisaccade task subjects were asked to look in the opposite direction of a sudden onset visual target; prosaccadic eye movements were applied as control condition. Movements of the target were preceded by an acoustic warning signal (interstimulus interval 5 s); anti- and prosaccadic trials were either presented in block-wise or interleaved order. A right dominant blood flow response was observed during the interstimulus interval. Blood flow increases were stronger during antisaccade than prosaccade performance. Moreover, antisaccade trials were associated with higher error rate, longer response latency and lower spatial precision of the eye movements. There were no differences between block-wise and interleaved trials in blood flow or behavioral variables. The blood flow modulations indicate enhanced neural activity during antisaccade preparation. This may reflect proactive inhibition in the sense of suppression of stimulus-driven reflexive behavior (i.e., following the target) in favor of a voluntary, goal-directed action. Cerebral blood flow modulations may constitute a valuable tool for investigation of neural processes related to response preparation.
INDIVIDUAL DIFFERENCES IN WORKING MEMORY CAPACITY AND Distracter PROCESSING DURING NEUTRAL AND UNPEACEFUL EMOTIONAL STATES.

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Descriptors: working memory, emotion, individual differences

The working memory system is responsible to keep goal-relevant information in mind ready to be manipulated or used. Previously, we found that an unpleasant emotional state reduced how many task-relevant items the participants could hold in working memory (WM), indexed by the Contralateral Delay Activity (CDA). Now, we aimed at understanding if individual differences in participant’s WM capacity during the neutral emotional state can predict control strategies to handle with the distracter processing at the subsequent trial. Twenty-nine participants performed a change detection task in which two arrays containing 2 (low-load) or 4 (high-load) colored squares were presented sequentially and they should respond if the test array was different or identical to the memory array. The task was preceded by neutral or unpleasant distractor images in a blocked fashion to induce different emotional states. The CDA and the Late Positive Potential (LPP) event-related components indexed the working memory capacity and the emotional reactivity, respectively. We found that the CDA predicted the LPP to a neutral distractor when it was preceded by a high-load change detection task (β = .37; R² = .23; p < .05), but not when the distractor was unpleasant (β = -.31; R² = .14; p > .05). These results suggest that individuals with greater WM capacity are better at handling distracters’ processing by using the load of the previous trial to avoid the intrusion of irrelevant information on the subsequent trial. However, such strategy may be disrupted during an unpleasant emotional state.

RESOURCE DEPLETION DISRUPTS THE ASSOCIATION BETWEEN AGREABLENESS AND ERROR RELATED NEGATIVITY

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Descriptors: agreeableness, error related negativity, resource depletion

Prior research has observed that agreeable individuals display larger error related negativities (ERNs), presumably because agreeable individuals are particularly sensitive to (social) errors and signals of evaluation (Tops et al., 2006). But evidence suggests that increased sensitivity among more agreeable individuals is reduced when they are fatigued or depleted (e.g., Finley, Crowell, Harmon-Iones, & Schmeichel, in press). The current experiment tested the hypothesis that the relationship between agreeableness and ERN amplitude is reduced under resource depletion. Participants were fitted with an EEG cap and completed either a writing task the relationship was significantly reversed, such that agreeable-otherwise sensitive to signals of errors and evaluation (i.e., individuals higher in agreeableness).

EMOTIONAL CONFLICT RESOLUTION ATTENUATES THE LATE POSITIVE POTENTIAL TO EMOTIONAL PICTURES

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Descriptors: emotion, cognitive control, event-related potentials

Theories on conflict control assume that the detection of response conflict leads to increased conflict resolution on the subsequent trial. A recent functional imaging study revealed that emotion-mediated conflict leads to attenuated preferential attention processing in extra-striate cortex, but not in early visual cortices. Following up on these findings, the present study used event-related potential (ERP) to examine the time course of this effect. Specifically, we determined whether emotion-sensitive ERP components, i.e., the early posterior negativity (EPN) and the late positive potential (LPP), are attenuated by response conflict of the preceding trial. Participants discriminated between emotional words while ignoring simultaneously presented emotional pictures in the background. These distractor images evoked either emotional (pleasant and unpleasant) or neutral, and were either congruent or incongruent to the target word. A further passive viewing condition served to determine sensor clusters and time windows of the EPN and LPP components independent of the main task condition. Scoring the EPN and LPP based on the passive viewing condition, the results show that response conflict in the preceding trial is associated with an attenuated emotional modulation of the LPP, but not EPN component in the current trial. Overall, considering functional imaging and ERP data, emotion mediated response conflict seems to be resolved at higher order processing stages.

THE TIME COURSE OF COGNITIVE CONTROL: NEW INSIGHTS UNDER RELAXED LINEARITY ASSUMPTIONS.

José García Alanis & Martin Peper
University of Marburg

Descriptors: event-related potentials, general additive modelling, mixed-effects modeling

Objective: The relationship between predictor variables and brain activity is often assumed to be linear. However, there exist many situations for which this assumption does not hold. To demonstrate this, we focused on recent findings (Braver, Gray & Burgess, 2007) suggesting that cognitive control operates in two distinct modes. The first, proactive control, is resource costly and preparatory. The second, reactive control, is flexible and allows corrective behavioral adaptation. We believe that these processes achieve balance in accordance to task demands and are optimised over time. Further, we believe that these processes are best represented by the magnitude of fronto-central (e.g. CNV) and fronto-parietal (e.g. P3) brain potentials (i.e. ERPs). Method: EEG from 60 participants was recorded during a Continuous Performance Task. Here, participants needed to establish stable proactive control based on the predictive value of cues. Conversely, reactive control was necessary when these predictions were violated. Further, we combine spline regression and multilevel modelling (MLM) to illustrate the relationship between ERPs and the predictors (e.g. predictability, expectancy violation, and time on task). Results: Activation patterns for the preparatory and reactive control modes differed significantly, as well as their (curvilinear) modulations through time. Discussion: Results indicate that non-linear MLM offers new insights into the modelling of EEG-data. We discuss its advantages in terms of incremental validity, goodness of fit and statistical power.
Poster 1-136

COGNITIVE AND AUTONOMIC CORRELATES OF PERFORMANCE – EVIDENCE FROM SINGLE-TRIAL ERN, CRN, AND SCR IN HEALTHY INDIVIDUALS AND PATIENTS WITH OCD

Lars Thomae, Anja Riesel, Christian Kaufmann, Norbert Kathmann & Julia Klawohn
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Descriptors: error-monitoring, autonomic measures, single-trial EEG

Dysfunctional neuronal processing of errors has repeatedly been found in patients with obsessive-compulsive disorder (OCD). While research on correct- and error-related negativity (CRN & ERN) has received considerable attention, their functional significance still is under debate with positions suggesting the ERN either to be an alarm signal in the case of negative events (i.e. errors) or a correlate of compensatory cognitive effort. One crucial aspect regarding these diverging interpretations might be the association of error monitoring with arousal. With the current study, we thus aimed at a replication and extension of previous evidence for autonomic reactions after error occurrence. A sample of 72 healthy controls, varying in OCD symptoms level, and 24 patients with OCD performed a flanker task while EEG and skin conductance (SCR), as a measure of autonomic arousal, were recorded. Results of aggregated analyses showed skin conductance responses (SCR) to be higher after errors than after correct responses. Further, in a linear mixed model analysis, we found single-trial ERN and CRN amplitudes to significantly predict SCR across all participants. When analyzed separately in both groups, this coupling was even stronger in the OCD subgroup than in healthy participants. These findings show a direct connection between neural correlates of performance monitoring and an autonomic measure of arousal and thus further support the view of the ERN as an alarm signal, which is then amplified in internalizing clinical disorders such as OCD.

Poster 1-137

ROLE OF THE POSTERIOR CINGULATE CORTEX IN RESPONSE INHIBITION: FMRI STUDY

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Descriptors: executive functions, response inhibition, fMRI

Background. According to the Cascade-of-control model higher activation in the posterior dorsolateral prefrontal cortex (DLPFC), the mid-DLPFC, the posterior and anterior dorsolateral anterior cingulate cortex (ACC) is observed in executive functions involved in the Stroop task (Banch, 2009). The aim of this study is to identify brain structures that are crucial to response inhibition. Methods. The Russian words ‘red’ and ‘green’ written in red or green font were used in two Stroop tasks. The subjects had to press right or left button as a response to presenting of words written in red or green font, respectively (task 1). The same subjects conducted a repetition and extension of previous evidence for autonomic reactions after error occurrence. A sample of 72 healthy controls, varying in OCD symptoms level, and 24 patients with OCD performed a flanker task while EEG and skin conductance (SCR), as a measure of autonomic arousal, were recorded. Results of aggregated analyses showed skin conductance responses (SCR) to be higher after errors than after correct responses. Further, in a linear mixed model analysis, we found single-trial ERN and CRN amplitudes to significantly predict SCR across all participants. When analyzed separately in both groups, this coupling was even stronger in the OCD subgroup than in healthy participants. These findings show a direct connection between neural correlates of performance monitoring and an autonomic measure of arousal and thus further support the view of the ERN as an alarm signal, which is then amplified in internalizing clinical disorders such as OCD.

Poster 1-138

THE POTENTIAL PROTECTIVE EFFECT OF SELF-COMPASSION ON ADOLESCENT STRESS: FINDINGS OF A PILOT STUDY

Karen Bluth
University of North Carolina

Descriptors: emotion regulation, mental health, self-referential processing

The aim of this study was to ascertain if adolescents who were high in self-compassion self-reported different levels of emotional wellbeing and responded differently under a lab social stressor than those low in self-compassion. In a lab setting, participants (age 13-18; n = 28) completed the Trier Social Stress Test (TSST) and physiological stress was assessed via salivary cortisol, heart rate, blood pressure, and heart rate variability at baseline, during the TSST, and during recovery. After completing the lab protocol, participants were emailed a link to an online survey which included measures of perceived stress, life satisfaction, positive affect and negative affect. After conducting repeated measure ANOVAs to determine whether the TSST induced a significant stress response, the sample was split at the median of self-compassion. T-tests were conducted to determine meaningful differences (Hedges’ g > 0.20) between the groups. Findings indicated that those in the high self-compassion group (> median) self-reported greater emotional wellbeing than those in the low self-compassion group (< median). Overall, those in the high self-compassion group also had a lower physiological stress response when exposed to the TSST than those in the low self-compassion group. Regression analyses were also conducted; baseline self-compassion predicted self-reported emotional wellbeing, but did not predict physiological response to the TSST. Findings support the potential buffering effect that self-compassion may have in protecting adolescents from social stressors.

Poster 1-139

MINDFULNESS-BASED COGNITIVE THERAPY NORMALISSES PSYCHOPHYSIOLOGICAL RESPONSES TO A SELF-COMPASSION EXERCISE IN RECURRENT DEPRESSION

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Descriptors: emotion regulation, mental health, self-referential processing

The protective effects of self-compassion for mental health have become of great interest. We have previously shown that in healthy individuals the cultivation of self-compassion might exert its protective effects by stimulating the positive affiliative affect system, a psychophysiological system associated with adaptive emotion regulation and well-being. This was reflected in increased parasympathetic activity (indexed by increased heart rate variability) and decreased physiological arousal (indexed by decreased heart rate and skin conductance levels) as well as increased self-reported positive affiliative affect and self-compassion in response to a self-compassion induction. However, this activation might be made more challenging when there is an underlying psychopathology such as recurrent depression. In this study we investigated the effects of mindfulness-based cognitive therapy (MBCT) – a therapy recently been shown to increase levels of self-compassion - on psychophysiological responses to a self-compassion induction in remitted depressed individuals (N=25) as compared to a untreated control group (N=25). The results of the study suggest that MBCT might be beneficial for individuals at risk of depression by helping them to develop skills to access and activate the positive affiliative affect system when invited to direct compassion towards the self. This was critically reflected in an altered post-treatment psychophysiological response pattern towards one similar to that of healthy individuals whereas the untreated control group showed signs of threat sensitization.
PERCEIVED APPEARANCE JUDGMENTS ARE LINKED TO HEALTH-RELEVANT PSYCHOLOGICAL AND BIOLOGICAL STRESS PROCESSES FOR MEN AND WOMEN AT ALL AGES

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Descriptors: emotion regulation, mental health, Self-referential processing

Current stress theories posit that stress is experienced when an aspect of an individual’s identity has the potential to be negatively evaluated. The present studies extend this idea to appearance judgments, more specifically, to how negative self and perceived appearance judgments contribute to shaping biological and psychological stress responses in a mental health-relevant manner. To address this question, we first examined the role of internalized and perceived appearance judgments in cortisol stress responses to a laboratory stressor (TSST) as well as self-reported perceived stress in 36 young (18-33yrs) and 35 middle-aged (47-65yrs) adults. Next, we assessed whether appearance judgments (self judgment or perceived judgment by others) would predict depressive symptom severity directly or mediated by chronic stress. Participants of this online survey study were 498 individuals ages 18-65. Study 1 revealed that feeling others negatively judge one’s appearance was associated with a stronger cortisol response to a social-evaluative stressor. Further, perceived external appearance judgments as well as appearance self-judgments were associated with higher self-reported stress as well as depressive symptoms. Study 2 further confirmed that stress mediated all associations between appearance judgments and depressive symptoms. These findings suggest that negative self and perceived appearance judgments predict psychological and biological stress, and confirm stress as a mechanism through which these negative judgments render individuals vulnerable to mental health problems.

ASSOCIATION AMONG SALIVARY ALPHA-AMYLASE ACTIVITY AND EXECUTIVE FUNCTIONING IN HEALTHY CHILDREN

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Descriptors: alpha-amylase, executive functions, children

Salivary alpha-amylase (sAA) is employed in basic research as a surrogate and non-invasive marker of the activity of Autonomous Nervous System (ANS) and Adrenomedullary System (AMS). In particular, sAA has showed a statistically significant association with levels of peripheral noradrenaline under acute psychosocial stress conditions in young and healthy participants. In this study, our aim was to directed the relation among sAA and cognitive performance in different executive tasks in a sample composed by 69 healthy children (45 boys). The tasks employed to assess executive functioning belong to the ENFEN battery (which measures different aspects of executive functions through four subtests: Phonologic and Semantic Fluency, Trail Making Test, Towers, and Interference). Saliva samples were obtained at baseline (10 minutes before the start of neurocognitive test) and at the end of the last subtest of ENFEN. Our statistical analyses showed a direct and significant association among sAA and scores in Phonologic Fluency, Trail Making, Towers and Interference subtests of ENFEN after controlling the effect of BMI. Our statistical analyses showed a direct and significant association among sAA and cognitive performance in different aspects of executive functioning, after controlling the effect of BMI.

IMPACT OF MILD TRAUMATIC BRAIN INJURY (MTBI) ON VISUOSPATIAL MECHANISMS IN AGING: AN MEG STUDY

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Descriptors: visual attention, mild traumatic brain injuries, magnetoencephalography

Visuospatial attention functions decline with normal aging and a deficit is often an early symptom of neurodegenerative diseases or cognitive disorders. Previous research has shown that prior mild traumatic injuries (mTBI) may be a risk factor for neurological and psychiatric disorders. Also, visuospatial attention deficit is a common symptom after mtBI but usually does not persist beyond 3 months depending on certain factors like age. We therefore expect to observe deficits in visuospatial attention in older adults with a prior mtBI. The present study compared aging adults with or without a prior mtBI in standard neuropsychological tests measuring visuospatial deficits, as well as on a visuospatial task during which brain activity was recorded using magnetoencephalography (MEG). We anticipated a decrease in mN2pc amplitude, a component measuring the deployment of attention, and a decrease in performance on visual cognitive tasks for the mTBI group compared with matched controls. Source localization showed a decrease in activation in the right parieto-occipital cortex and in occipito-temporal region for the mTBI group compared to controls during the mN2pc time window. We suggest that these differences reflect a change in two subcomponents combining to form the mN2pc. Participants in the mTBI group also showed deficits, compared to controls, in the Trail making test A. These results help us to understand the consequences of mtBI for the neurological and functional aspects of underlying mechanisms mediating critical aspects of attention and memory in an aging population.
Poster 2-005
INTER-HEMISPHERIC COMMUNICATION ABILITY MODULATES THE LATERALITY OF P600 RESPONSES TO SYNTACTIC CATEGORY VIOLATIONS IN HEALTHY YOUNG AND OLDER ADULTS
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Descriptors: aging, language, syntax

The present study investigated how inter-hemispheric communication may contribute to brain asymmetry of syntactic category processing in healthy young and older adults. 28 young and 32 older right-handers without familial sinistrality background participated. Event-Related Potentials were assessed while participants judged the grammaticality of two-word phrases (a central syntactic cue followed by a lateral target word matching or mismatching the syntactic category expectancy). To measure inter-hemispheric inhibition and coordination, all participants underwent a bilateral flanker task—participants responded to arrows in one visual field (VF), and a word-matching task—participants judged the semantic relatedness of two words appearing in the same or different VFs. Older adults were less accurate in grammaticality judgment than younger adults. While younger adults elicited P600 grammaticality effects with right VF display only, older adults elicited bilateral P600 effects. P600 effects were regressed against behavioral inter-hemispheric measures. Young adults with more cost in bilateral than in unilateral word-match conditions showed more left-lateralized P600 effects. Older adults less able to inhibit directional distractors from the unattended VF showed larger P600s to syntactic errors in that VF. Our results provide no support for the compensatory role of bilateral activity in older adults and suggest that functional brain asymmetry in syntactic category processing is driven by multiple forces—coordination and inhibition, that are weighted differently across the lifespan.

Poster 2-004
USING EYE GAZE BEHAVIOR IN A GUILTY KNOWLEDGE TEST
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Descriptors: eye-tracking

In the current study we assessed perspective of eye-tracking technic for revealing concealed information. Healthy adult participants (N = 28) were randomly divided into two groups: “guilty” group and “innocent” group. We devised a mock crime scenario: 3 high-priced objects were hidden in the experimental room and each participant from the “guilty” group made a mock crime by “stealing” one of them. The other group didn’t take part in any activities related with the crime. Eye tracking recording was performed in both groups. Six stimuli contained written questions related with the crime and according to the standard polygraph guilty knowledge test were exposed to the participants. We found statistically significant differences in fixation duration and fixation dispersion between two groups: “innocent” participants were looking at the distractors more frequently and their fixations were more distributed. At the same time “guilty” participants had fixations in the areas which were related with the object of crime and/or had more fixations in the blank areas. Saccade velocity was higher and saccade amplitude was smaller in the “guilty” group. Their gaze was moving at smaller distances within saccades and did it significantly faster than in the “innocent” group.

Poster 2-006
EMOTIONAL AROUSAL IN NOVELTY PROCESSING IS INDICATED BY THE P3A AND BY THE SYMPATHETIC COMPONENT OF THE PUPIL DILATION RESPONSE
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Descriptors: pupil dilation, arousal, sympathetic nervous system

In response to surprising or arousing events a dilation of the pupil (PDR) can be observed as part of the autonomic components of the orienting response. In response to novel sounds in an oddball paradigm a biphasic PDR has been observed. This biphasic PDR was suggested previously to reflect the relaxation of the iris sphincter muscle due to parasympathetic inhibition and the constriction of the iris dilator muscle due to sympathetic activation. Here we aimed to confirm this interpretation by manipulation of lighting condition in order to verify the hypothesis that emotional arousal is specifically associated with sympathetic activity. In an auditory oddball paradigm, we presented neutral and emotionally arousing negative sounds in dark and bright lighting conditions and measured the pupil diameter and event-related potentials (ERPs). By means of principal component analysis we could extract two components: the early component was absent in darkness and, thus, presumably reflects parasympathetic inhibition. In contrast, the late component presumably reflecting sympathetic activation was observed in dark and light conditions. Importantly, only the sympathetic late component was enhanced for emotionally arousing sound directly confirming previous indirect conclusions. In the ERPs we observed early and late P3a in response to novel sounds. Both P3a subcomponents were enhanced for emotionally arousing sounds giving support to the hypothesis that P3a is associated with a co-activation of the locus coeruleus-norepinephrine system and the peripheral sympathetic nervous system.

Poster 2-003
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standard sound, recovery to a deviant sound, and dishabituation to the representation of the standard were assessed for small and large deviations embedded in to-be-ignored auditory sequences. The results showed that i) a PDR was triggered by unexpected change in the auditory stimulation, ii) its amplitude was related to the size of that change, and iii) the PDR displayed habituation and dishabituation patterns. The present study demonstrated that pupillometric activity displayed stimulus-response patterns that are consistent with the orienting response, suggesting that the PDR could be used as a valid physiological index of auditory attentional capture in the same way as the skin conductance response and the P300.

Poster 2-007
ATTENTION MODULATES THE MISMATCH NEGATIVITY EVOKED BY FEATURE CONJUNCTIONS
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Descriptors: feature binding, attention, mismatch negativity

Feature binding is an essential aspect of sensory perception, since most realistic objects can be identified only by grasping conjunctions of multiple features and their patterns. Psychophysiological mechanisms of this phenomenon are still under debate; importantly, mutually exclusive points of view exist concerning the role of attention in feature binding. The current study aimed at testing the hypothesis that mismatch negativity (MMN) to specific feature conjunctions may depend upon attention. Two experiments were conducted in the auditory and visual modalities respectively. Within each experiment, we used four stimuli that differed in two distinctive features, with two feature conjunctions designated as standards, and two feature conjunctions designated as deviants. Features used in the auditory modality were tone pitch and location; Gabor grating orientation and spatial frequency were used in the visual modality. Attentional modulation involved four conditions: selective attention to targets, selective ignoring of non-targets, nonselective attention within a given modality, and deviation of attention to a task in a different modality. The basic finding was that MMN was evident only in conditions of within-modality attention. MMN was reduced or abolished in response to ignored feature conjunctions, as well as in conditions of the cross-modal distraction of attention. Thus, contrary to previous studies of MMN under feature conjunctions, our data show that the preattentive stage of feature conjunction processing requires a proper top-down attentional influence.
STRESS AND VISUOSPACEATL ONN ATION: EFFECTS ON PRETARGET OSCILLATORY ALPHA-BAND ACTIVITY

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University of Trier

Descriptors: stress, attention, EEG

Stress is assumed to influence attentional processes, however, previous studies have been widely restricted to behavioral indices and display mixed results. Here, we used an auditory variant of the established Posner cuing task to measure stress effects on endogenous visuospatial attention deployment and concurrently assessed modulations of oscillatory alpha-band activity over left versus right posterior sites in the cue-target interval that have been shown to be causally linked to successful orienting. 24 male participants underwent the bilateral feet cold pressor test (CPT) and a warm water control procedure on two separate days, one week apart. After the interventions they completed 288 trials of the cuing task in which a brief auditory cue instructed them to covertly shift their visual attention to left or right screen positions. The appearance of forthcoming visual target stimuli had to be indicated by left or right button press. The CPT led to a significant increase in cortisol that was absent in the control condition but did not influence behavioral indices of attention (RT, detection rates). By contrast, the reduction of oscillatory alpha-band activity at posterior sites contralateral to the cued position, indicative of successful attention deployment, was stronger and of higher variability during the cue-target interval after stress compared to control. Our results indicate that stress modulates top-down control of visuospatial attention in a complex way and that lateralization of oscillatory alpha-band activity is a sensitive measure for these effects.

EFFECTS OF PHASIC AND TONIC MODULATIONS OF DIFFICULTY EXPECTATIONS ON THE P3A ERP COMPONENT

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Descriptors: event related potentials, difficulty expectations

The P3a difficulty effect denotes that P3a ERP component elicited by novel stimuli in three-stimulus or novelty oddball tasks is larger in task blocks with increased perceptual difficulty. One interpretation of the effect is that in difficult task blocks standard/deviant discrimination requires increased (tonic) attention and novel stimuli also receive increased attention as a side-effect. By the same token, phasic, short-term modulation of perceptual difficulty and attentional engagement might as well lead to increased P3a amplitude. In the present line of studies we created a phasic version of the classical P3a difficulty effect paradigm. Subjects had to decide if an S2 stimulus (a circle) is larger or smaller than a standard S1 stimulus (another circle) on trial-by-trial basis. The difficulty of the trial (small or large difference between S1 and S2) was predicted by a cue stimulus (small colored square). In 12% of the trials, S2 was replaced with novel stimuli (pictures of butterflies) requiring no response. In Study 1, this “trialwise” experiment was accompanied with a “blockwise” version where difficulty was constant during the 6 minutes long block. Results show that difficulty expectations modulated the novel P3a only in the “blockwise” version. In a behavioral (Study2) and an ERP experiment (Study 3) we excluded the possibility that subjects ignored cue information by contrasting predicted and unpredicted trials in the “trialwise” version. Study3 confirmed the results of Study1 regarding the absence of phasic modulation of P3a amplitudes.

ALONE IN A CROWDED ROOM: AN ASSESSMENT OF CROWD NOISE AS AN AUDITORY STRUCTURAL FEATURE IN MUSIC RECORDINGS

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Descriptors: auditory processing, social facilitation, cognitive resource allocation

Individuals exhibit differential patterns of cognitive processing and emotional responding when consuming media in the presence of another person. However, what is not yet understood is if this effect is the same when crowd noise indicates this co-presence. This study predicted that crowd noise is an auditory structural feature that elicits social facilitation in the listener such that their psychophysiological reactions should be like those seen when media is consumed in the presence of another person. Specifically, the prediction was that crowd noise would result in greater resource allocation to encoding—evidenced by lower heart rate (HR)—and greater arousal—evidenced by increased skin conductance level (SCL). The study presented eight songs from four genres (hip hop, instrumental rock, and orchestral; two repetitions of each genre) with four songs having crowd noise edited in to simulate a concert environment and four songs presented without any edits to sixty subjects. The results revealed a significant interaction effect of crowd noise and time on HR, $F(98,4802)=1.25, p<.048$. As predicted, participants’ heart rate was lower when crowd noise was present compared to when crowd noise was absent. In addition, there was a significant interaction effect of crowd noise and time on SCL, $F(98,4802)=1.35, p<.013$. SCL was higher early (the first 10 seconds) for the crowd noise condition, but then was lower for the rest of the stimulus. So, it would appear there is the predicted social facilitation early, but that the effect does not last for the entire song.
**Poster 2-013**

COMPONENTS OF STIMULUS-PRECEDING NEGATIVITY PRIOR TO VOICE, BEEP, AND RHYTHMIC SOUND

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Descriptors: stimulus-preceding negativity, anticipation

Stimulus-preceding negativity (SPN) is an event-related potential that relates to anticipatory attention for an upcoming stimulus. Our previous study revealed that SPN consists of two components: early SPN and late SPN. These two components were identified using visual stimuli including face, word, and symbol stimuli, and the amplitude of early SPN was larger before a face stimulus than the other two stimuli. This finding means that face anticipation is faster than anticipation process of word and symbol stimuli. In the present study, we recorded the SPN preceding auditory stimuli, and conducted a principal component analysis to elucidate whether or not the early SPN is a specific component for face anticipation. Participants (N = 54) performed a time estimation task where they had to press a button four seconds after a cue stimulus. A feedback stimulus about task performance (i.e. correctness of time estimation) was presented two seconds after the button press, and the contents of the feedback stimulus were manipulated. There were three experimental conditions: (a) beep sound, (b) rhythmic sound, and (c) voice sound. We found six components in the SPN, and the factor 3 showed the largest amplitude in the early part of anticipation interval (-2000 ms to -1000 ms before an auditory stimulus). Furthermore, the waveform of the factor 3 was almost identical to the early SPN waveform that was found in the previous study. Thus, we concluded that the factor 3 could be the early SPN. This finding implies that the early SPN is not a component specific to face anticipation.

**Poster 2-014**

GAMMA POWER INCREASE IS ASSOCIATED WITH CANNABIS RELATED TARGET AND DISTRACTER WORDS IN EARLY-ONSET CANNABIS USERS

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University of Newcastle

Descriptors: early onset cannabis use, gamma power

Increase in gamma oscillatory power is associated with word processing and recognition. Cannabis words bias attention and interfere with task processing in cannabis users. ERPs for cannabis and neutral words differ in cannabis users while associated gamma power for cannabis and neutral words has not yet been investigated. EEG was collected from 18 early-onset cannabis users (Mage = 22.33, SD = 3.53) and 22 controls (Mage = 22.41, SD = 4.9) in a word recognition task. Targets were either cannabis related or neutral words presented briefly at 24ms or 50ms which were then presented paired with either a same or different distractor. Gamma power data (range: 32-61.2 Hz) extracted from collected EEG, normalized with a decibel (dB) transformation were averaged between the onset and 800ms post stimulus onset. These data were analysed by mixed measures ANOVAs run with Group (control, cannabis) as the between subject factor and Target (cannabis, neutral), Time (24ms, 50ms), Distractor (cannabis, neutral) as the within subject factors (across midline sites). Gamma power was overall higher for cannabis target words than for neutral words in the cannabis group and was higher for neutral words compared to cannabis words in the control group. In addition, in the early-onset cannabis group significant increase in gamma power was found in response to either target word presented with a cannabis distractor than with neutral distractor with no changes in gamma power for either distractor in the control group.

**Poster 2-015**

YOUR BRAIN IN THE WORLD: INVESTIGATING THE N1 AND P2 FOR ECOLOGICAL STIMULI

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Descriptors: selective attention, mobile EEG, ecological stimuli

Most experiments using EEG recordings take place in highly isolated and restricted environments, limiting their applicability to real-life scenarios. New technologies for mobile EEG are changing this by allowing EEG recording to take place outside of the laboratory. However, before results from experiments performed outside the laboratory can be fully understood, the effects of ecological stimuli on brain activity during cognitive tasks must be examined. In the first experiment, participants performed an auditory oddball task while also listening to concurrent background noises of silence, white noise and outdoor ecological sounds. We found a significantly increased N1 and decreased P2 when participants were exposed to the task with outdoor sounds and white noise in the background, with the largest differences in the outdoor sound condition. This lead to the conclusion that these components indicate a process of sensory filtering of background sounds. In the second experiment, we investigated these effects in the visual modality. Participants performed a visual oddball task while either viewing a video, or static ‘snow storm’ screen in the background. We again found that ecologically valid background stimuli in the video decreased the P2, compared to the synthetic background stimuli. These results further our understanding of the mechanism of sensory filtering on ecologically valid stimuli. This understanding can be utilized in the design, analysis, and interpretation of future mobile EEG experiments.

**Poster 2-016**

I SEE TREES OF RED, GREEN ROSES TOO: LIMITATIONS TO OBJECT-BASED IDENTIFICATION IN VISUAL SEARCH

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Descriptors: selective attention, visual search, object-based attention

Previous electrophysiological investigations have dissociated feature- and object-based stages of attention, with suggestions that object identification through feature integration may occur during item encoding/maintenance within visual working memory. Here, we tested this prediction using a novel two-object search task, measuring the N2pc and SPCN components as neural markers of attentional selection and visual working memory processes, respectively. Participants searched for one of two possible target objects defined by colour/shape conjunctions (e.g., blue circle or green square). In addition to targets and non-targets that matched one of the target-defining colours or shapes (e.g., blue hexagon or red circle), we also included objects with an invalid conjunction of a target colour and shape (e.g., blue square or green circle). These objects were encoded/maintained in visual working memory. Here, we tested this prediction using a novel two-object search task, measuring the N2pc and SPCN components as neural markers of attentional selection and visual working memory processes, respectively. Participants searched for one of two possible target objects defined by colour/shape conjunctions (e.g., blue circle or green square). In addition to targets and non-targets that matched one of the target-defining colours or shapes (e.g., blue hexagon or red circle), we also included objects with an invalid conjunction of a target colour and shape (e.g., blue square or green circle). N2pc components elicited by targets and invalid conjunction objects were identical, and significantly larger than N2pc components elicited by targets and invalid conjunction objects. These results suggest that the access of invalid conjunction objects during item encoding/maintenance within visual working memory is contingent on the presence of both target-defining features at the same location, irrespective of how these features are combined. The full integration of these features, required to discriminate targets from invalid conjunction objects, only takes place at a later post-perceptual stage.
ARTERIAL PULSE WAVE VELOCITY DERIVED FROM IMPEDANCE PLETHYSMOGRAPHY

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Descriptors: pulse wave velocity, impedance cardiography, aging

Vascular assessments are important for studies of aging, cardiovascular disease, and sympathetic nervous system activation. Pulse wave velocity (PWV) is a vascular metric in declining use in psychophysiology, but expanding use in biomedical research. In medical contexts, PWV is assessed from expensive instrumentation, combining user-dependent ultrasonography and peripheral pulse measures. A cost-efficient measure of PWV is desirable. In pilot work (n=27 men, aged 25–35), dual impedance cardiograph measures from the thorax and calf were compared to PWV from a commercial Colin VP-200 instrument. Two Minnesota 304 B impedance devices were used with different excitation frequencies. Ensemble averaged signals were used to estimate time from the electrical activation of the heart to vascular ejection (thorax signal, PEP) and to pulse arrival at the calf (calf signal, PTT). The difference, PTT-PEP, divided by the arterial distance yielded PWV in m/s. Dual-impedance derived PWV was 7.08 m/s compared to 12.6 m/s from the Colin device, r = .62, p < .001. The value of 7.08 is comparable to invasive measurements of PWV, possibly indicating greater validity for dual impedance PWV measures. Further testing of dual-impedance PWV is ongoing, using a vendor-modified Mindware (Gahanna, OH) device. The use of excitation separately over the calf and thorax has yielded signals superior to those seen in pilot work. Dual-impedance signals will be illustrated, and further data presented.

DOES CARDIOVASCULAR REACTIVITY TO BEHAVIORAL TASKS PREDICT RETINAL BLOOD VESSEL DIAMETER IN HEALTHY PERSONS WITH DIFFERENT BLOOD PRESSURE LEVELS IN A 10-YEAR FOLLOW-UP?

Martti Tuomisto, Lauri Parkkinen, Virpi Hemminki, Mika Kähönen, Jyrki Ollikainen & Hannu Uusitalo
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Descriptors: psychological stress, arteriovenous ratio, generalized arteriolar narrowing

Retinal vessel changes belong to known target-organ damage of high blood pressure (BP). Cohorts of 35-, 40-, and 45-year old normotensive, borderline hypertensive, and hypertensive men according to WHO criteria were recruited. They were otherwise healthy, without BP medication and with normally distributed diagnostic BPs and could be analyzed as one group. The participants underwent a 5-minute relaxation followed by eight standardized behavioral challenges divided to active, social and passive tasks. The fundus photography of 56 men was analyzed in the 10-year follow-up. Retinal vessels were measured two mean disc diameters from the optic disc edge. Arteriovenous ratio was determined using central retinal artery equivalent/central retinal venous equivalent (CRAE/CRVE). Hierarchical regression analysis included baseline systolic BP, diastolic BP, and heart rate (HR) during relaxation as predictors in the first model adding cardiovascular task measures to the respective baseline measures as predictors in the second model. The baseline SBP predicted 13.1% of the variance in CRAE/CRVE (F = 10.54, p = .002) in the follow-up. The DSP model predicted 12.2% of the variance (F = 9.72, p = .003). The different behavioral task models added 2.4%–2.7% in the explanation of CRAE/CRVE in the SBP models. Relative increase in the explanatory power in the DBP models were 3.0%–3.1%. None of the HR models were predictive of the vessel diameters. In conclusion, cardiovascular reactivity may contribute to the explanation of retinal blood vessel diameters and, thus, be of importance to health.
SKIN CONDUCTANCE REACTIVITY MODERATES THE ASSOCIATION BETWEEN DELIBERATION TIME AND WILLINGNESS TO TAKE RISK IN A PROBABILISTIC DECISION-MAKING TASK

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Descriptors: skin-conductance reactivity

Individual differences in decision-making when reward opportunities are probabilistic have implications for risky behavior. Gray’s model of behavioral inhibition suggests that individuals will delay behavioral responses when confronted with uncertainty, in order to enable deliberation of response options. Further research suggests that skin conductance serves as an internal marker of perceived risk, mediating individuals’ ability to discern probabilistic contingencies associated with rewards and adjust decision strategies over time. This study examined two different SVO types took part in a simple gambling task in which children chose to accept or reject cards of varying point value at varying levels of probability. Deliberation times ranged from .22 to 30.75 seconds (M = 2.57, SD = 2.21). Skin conductance (SC) was recorded throughout the task. Trial-by-trial decisions to accept or reject probabilistic rewards were modeled using a generalized linear multilevel model. Neither duration of decision time, nor mean SC, predicted decision outcome. However, SC moderated the effect of deliberation time on decision. On trials in which the individual deliberated longer, suggesting less certainty of the best behavioral response, those with higher mean SC were more likely to decide in favor of rejecting the card, whereas those with lower mean SC were more likely to decide in favor of accepting the card. Results indicate that skin conductance contributes to how individuals resolve decisions under maximal uncertainty.

USING A FOREIGN LANGUAGE AFFECTS YOUR DECISION MAKING—THE UNIQUE ROLE OF EMOTIONAL AROUSAL

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Descriptors: foreign language effect, emotional arousal, event-related potential (ERP)

Recently, a growing number of studies have demonstrated that, compared with native language, foreign language diminished some decision bias such as ‘the hot hand effect’, which was called ‘the foreign language effect’. In addition, as we all know that emotion is another key factor in decision making, especially in outcome evaluation. Hence, the present study is interested in the particular role of emotional arousal in the foreign language effect. 24 late Chinese-English bilinguals participated in a gambling task that including feedback with different languages and emotional arousal using the event-related potential (ERP) to investigate the effect of the foreign language and the emotional arousal in the process of decision making. The behavioral results showed that foreign language and low emotional arousal indeed decreased the hot hand effect. While the ERP results indicated that the feedback-related negativity (FRN) was more negative in Chinese than in English in general and it was significantly enhanced in high emotional arousal condition. Moreover, P3 was larger in Chinese than in English and it’s the same in high emotional arousal condition. Particularly, only in high emotional arousal condition, the amplitude differences between two language conditions were significant. Therefore, these findings suggest that the foreign language effect can be modulated by the emotional arousal.

SOCIAL VALUE ORIENTATION MODULATES THE PROCESSING OF OUTCOME EVALUATION

Xiaojin Mai & Xinnu Hu
Renmin University of China

Descriptors: social value orientation, outcome evaluation, feedback-related-negativity (FRN)

Social value orientation (SVO) is a stable personality trait which reflects how people evaluate interdependent outcomes for themselves and others in social environments. Generally people can be classified into two types: proselms and prosocials. The present study examined how SVO affect the processing of outcome evaluation temporally using the event-related potential (ERP). Participants with two different SVO types took part in a simple gambling task in which they received outcome distributions for self and other. Results showed that the feedback-related negativity (FRN) was more negative for other loss than other gain in the prosocial group but insensitive to others’ outcome in the prosel group, and the P3 was larger for other gain than other loss when participants’ own outcome was gain in the prosocial group but no difference between other gain and loss in the prosel group. In addition, the FRN for both self and other outcomes was larger in the prosocial group than prosel group. These findings suggested that self and other outcomes are processed differently at the early and late stages of evaluation processing in the brains of individuals with distinct SVO.

NEURAL CORRELATES OF SELF-SERVING DISHONESTY

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Descriptors: dishonest decision-making, ventromedial prefrontal cortex, ventral striatum

People usually expect certain benefits when deciding to make dishonest decisions. While the benefits of being dishonest are often self-serving (e.g., when salespersons sell unnecessary insurance for their own commissions), they can also be prosocial (e.g., to prevent public panic in natural disasters). We aimed to dissociate neural correlates of (1) dishonest decisions that do not concern about the distinction between self-serving and prosocial benefits from (2) those that do. To distinguish individual variations in these two types of dishonest decisions, we gave participants (n = 31) chances to maximize the monetary benefits by voluntarily engaging in dishonest decisions in an fMRI task. More specifically, the monetary benefit from being dishonest in each trial was either self-serving or prosocial. We found that people who decided to make dishonest decisions more frequently, regardless of whether the benefits were self-serving or prosocial, elicited a stronger ventromedial prefrontal cortex (vmPFC) activity when having a chance to make dishonest decisions. Additionally, for people who decided to make dishonest decisions predominately for self-serving benefits, they elicited a stronger ventral striatum (vStr) activity when having a chance to make dishonest decisions for self-serving (compared to for prosocial) benefits. Thus, we found two disso- ciable brain areas in the valuation system (vmPFC and vStr) that were separately responsible for individual variations in the two types of dishonest decisions: one that do not concern who were the beneficiaries and the other that do.

WHEN THREE IS GREATER THAN FIVE: EEG AND FMRI SIGNATURES OF ERRORS IN NUMERICAL AND PHYSICAL JUDGEMENTS

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Jagiellonian University

Descriptors: numerical cognition, centro-parietal positivity, errors

Understanding why the brain commits an error is one of the key questions in cognitive neuroscience. As indicated by studies using conflict tasks, errors occur due to insufficient stimulus processing, what manifests in their shortened reaction times in comparison to correct responses. In the study, EEG and fMRI experiments were conducted using the numerical Stroop paradigm, which yielded unique behavioural outcomes. Particularly, errors in numerical comparison had shorter reaction times than correct trials, whereas physical comparison resulted in the opposite pattern. Group ICA was applied to both neural measures and the cross-shaped interaction was used as a marker when exploring event-related time-courses. With this approach, we found activations of one centro-parietal EEG component and one tempo-parietal fMRI neural network showing significant task and accuracy interactions. Activity of the centro parietal EEG component was linked to a recently characterized decision variable signal. Numerical and physical judgements showed distinctive characteristics of the signal built-up rates and action-triggering thresholds, which explained the behavioural outcomes. That is, errors are committed due to accumulation of evidence in favour of the other (wrong) task instruction. The architecture of the fMRI network comprising bilateral inferior temporal and intraparietal regions is highly consistent with the core “number network”. These findings link perceptual decisions with generalized magnitude system and impart novel insights into the neural determinants of errors in humans.
MEDIAL FRONTAL CORTEX RESPONSE TO APPETITIVE AND AVERSIVE OUTCOMES IN A GAMBLING TASK
Heather Soder & Geoffrey Potts
University of South Florida

Descriptors: feedback-related negativity, decision-making, gambling

The Predicted Response Outcome (PRO) model states when expected outcomes occur, medial frontal cortex (MFC) signals are inhibited and when an expected outcome does not occur, they are maximal. In a previous study, we found medial frontal negativities (MFNs) to unexpected withheld rewards ($0 compared to $1) and to unexpected withheld penalties (silence compared to loud noise), supporting the PRO model. In this design, participants passively watched as the outcomes came up on the screen. In the next study, participants made a bet (small, large) based off of a known probability of winning (30–40%, 50%, 60–70%), which was followed by a feedback signal and then the actual outcome. Outcomes were not associated with the known probabilities and instead were delivered randomly 50% of the time. Participants completed two versions: one including winning or losing $0.05 or $0.10 and one including listening to noise bursts with increasing or decreasing volume of either 5 dB or 10 dB. Behavioral results indicated that participants believed the probabilities, as bet sizes tracked with the probability of winning in both versions (i.e., smaller bets for smaller probabilities). The MFN to feedback was most positive when the trial was won (increasing money, quieter noise) and most negative when the trial was lost (decreasing money, louder noise, less consistent with the PRO model). These results in combination with the previous study suggest the MFC response adapts to the range of available outcomes, as well as to whether or not the participant has some control over the outcomes.

CONFLICTING MOTIVATIONAL TENDENCIES IN BLOOD PHOBLA: A TIME-FREQUENCY STUDY OF RESPONSE INHIBITION
Rocco Menmella, Michela Sarlo, Simone Messerotti Benvenuti, Giulia Buodo, Giovanni Mento & Daniela Palomba
University of Padua

Descriptors: emotional response inhibition, blood phobia, time-frequency alpha activity

Contrary to other phobias, individuals with blood phobia do not show a clear-cut withdrawal disposition from the feared stimulus. The study of emotional response inhibition could provide novel insights into reduced action inhibition in blood phobia. Twenty individuals with and 20 individuals without blood phobia completed an emotional Go/Nogo task, including phobia-related pictures as well as phobia-unrelated unpleasant, neutral, and pleasant stimuli. Behavioral results did not indicate a phobia-specific reduced action inhibition in the phobic group. Time-frequency decomposition of event-related EEG data showed a reduction of right prefrontal activity, as indexed by an increase in alpha power (250 ms), for Nogo Mutination trials in the phobic group but not in controls. Moreover, theta power (300 ms) increased specifically for phobia-related pictures in individuals with, but not without, blood phobia, irrespective of Go or Nogo trial types. Passive avoidance of phobia-related stimuli subverted by the increased alpha in the right prefrontal cortex, associated with increased emotional salience indexed by theta synchronization, represents a possible neuropsychological correlate of the conflicting motivational response in blood phobia. Through the novel use of time-frequency decomposition in an emotional Go/Nogo task, the present study contributed to clarify the neuropsychological correlates of the overlapping motivational tendencies in blood phobia.

PREFRONTAL RECRUITMENT AND EMOTIONAL WELL-BEING: INAPPROPRIATE BRAIN ACTIVATION DURING COGNITIVE REAPPRAISAL EFFORTS PREDICTS DEPRESSIVE AFFECT
Corinna Perchtlold, Andreas Fink, Christian Rominger, Elisabeth Weiss & Ilona Papousek
University of Graz

Descriptors: depression, cognitive reappraisal, EEG asymmetry

Affective neuroscience shows a growing interest in recording brain activation patterns while individuals undergo affective challenges in order to identify indicators of both adaptive and maladaptive emotional responding. However, few studies have been concerned with the impact of assumedly appropriate brain activation during an emotion regulation task on individuals’ psychological well-being. In the present study, we recorded EEG from eighty participants while they generated cognitive reappraisals for self-relevant, negative events. In line with the capability model of frontal EEG alpha asymmetry, the obtained prefrontal activity was then correlated with participant’s self-reported depression over the past week. As a result, individuals showing less left-lateralized brain activity in the ventrolateral prefrontal cortex during cognitive reappraisal efforts reported experiencing a greater amount of depressive symptoms. This effect was independent from self-efficacy beliefs in managing negative emotions. The present study demonstrates that individuals differ in their proneness to recruit appropriate brain activation while generating cognitive reappraisals of negative situations. These inter-individual differences seem to have sustainable effects on psychological well-being.

EFFECTS OF A DISGUST NOCEBO ON VISUAL CORTEX ACTIVITY AND CONNECTIVITY
Carina Höfler, Albert Wabnegger & Anne Schienle
University of Graz

Descriptors: disgust nocebo, visual cortex, psychophysiological interaction analysis

Passive viewing of affective scenes not only causes activity of limbic brain areas but also involves numerous visual regions located along the ventral and dorsal processing stream. A previous functional magnetic resonance imaging (fMRI) study on affective picture processing demonstrated that a ‘disgust placebo’ (inert pill administered with the verbal suggestion of an anti-nausea medication) is able to modulate this visual-affective processing system by changing visual cortex activity and connectivity. In the present investigation, we examined corresponding effects of a nocebo treatment for the first time. The participants were presented with a ‘disgust nocebo’ (odorless stimulus that had been introduced as a disgusting scent) during the view of disgusting, fear-inducing, and neutral images. fMRI data from 29 women, who had responded to the nocebo suggestion and reported perceiving a slightly unpleasant odor, were analyzed. During the presentation of disgusting stimuli, the nocebo increased experienced disgust and fusi-form gyrus activation, which showed enhanced coupling with the amygdala, the striate and extrastriate cortex. Our results provide first evidences that nocebo treatments influence elementary visual perception processing of affective information.

TRANSCRANIAL DIRECT CURRENT STIMULATION OF THE VENTROMEDIAL PREFRONTAL CORTEX MODULATES AFFECTIVE FACIAL PICTURE PROCESSING: NEURONAL AND BEHAVIORAL EVIDENCE
Constantin Winker, Maimu Rehbein, Mira Dohn, Volkker Arolt, Carsten Wolters & Markus Junghoefer
University of Muenster

Descriptors: brain stimulation, MEG/EEG, affective facial processing

Affective processing is strongly influenced by top down streams of cortical areas like the ventromedial prefrontal cortex (vmPFC). Previously, we could show that excitatory transcranial direct current stimulation (tDCS) of the vmPFC enhances processing of appetitive compared to aversive scenes, while inhibitory tDCS yields the opposite pattern. Here, we tested the influence of vmPFC stimulation via tDCS on emotional face processing. During three measurement blocks (baseline, post-excitatory tDCS, post-inhibitory tDCS) processing of faces with happy or fearful expression was recorded by means of magnetoencephalography (MEG). Following both post-tDCS measurements, behavioral data were assessed in an emotion discrimination task. In this task, morphed faces of individuals with happy and fearful expressions were presented and participants were asked to categorize morphs as either happy or fearful. For the MEG data, analysis of estimated neural activity revealed clusters with stronger activation for appetitive compared to aversive stimuli after excitatory stimulation and an inverted pattern after inhibitory stimulation. Convergent to the neural results, emotion discrimination was significantly shifted towards happy faces after excitatory compared to inhibitory stimulation. These findings support the hypothesis that the vmPFC is specifically active during states of ‘positive affect’. They further support our previous finding that the affect modulating impact of this region can be tuned by means of non-invasive tDCS.
links between empathic skills and executive control in depression: the contribution of physiological measures
Khira El Bouragui, Christel Besche-Richard, Laurent Lefebvre & Mandy Rossignol
University of Mons, University of Reims Champagne-Ardenne

Posters:

Poster 2-031
Potentiated processing of high-arousing target stimuli as revealed by eeg frequency analysis
David Schubring, Harald Schupp & Ursula Kirmse
University of Konstanz

Descriptions: emotion, attention, s-ERD
Previous research revealed that explicit task relevance and implicit emotional stimulus significance are associated with alpha-band desynchronization (α-ERD). The main aim of the present study was to compare the α-ERD of explicit task and implicit emotional stimulus significance in terms of topography and frequency and to assess the interaction of target and emotion effects by comparing task effects to pleasant stimuli differing in emotional arousal. Towards this end, participants (N=16) viewed pictures from two stimulus categories. The ‘undressed’ category comprised erotic images and the ‘dressed’ category consistent of couples in romantic poses. In alternating blocks, participants were asked to respond either to the dressed or undressed picture category. Frequency was analyzed by a frequency transformation of the one second post-stimulus interval. Results indicate that the processing of stimuli from the ‘undressed’ as compared to ‘dressed’ picture category was associated with a reduced z-power over anterior and posterior clusters. Similar to emotion effects, reduced z-power was observed when contrasting target with non-target stimulus processing over anterior and posterior sensor regions. Of main interest, over posterior regions, a significant interaction of task by emotion was observed indicating stronger α-ERD for the ‘undressed’ compared to ‘dressed’ target stimuli. The present study replicated previous findings on the modulation of α-ERD by explicit and implicit stimulus significance and provided evidence for the potentiated processing of high-arousing target stimuli.

Poster 2-032
Links between empathic skills and executive control in depression: the contribution of physiological measures
Khira El Bouragui, Christel Besche-Richard, Laurent Lefebvre & Mandy Rossignol
University of Mons, University of Reims Champagne-Ardenne

Descriptions: depression, empathy, executive functions
Empathy consists of ability to infer and share others’ emotional states. Cognitive theories posit that depression could be characterized by reduced empathy and executive control. The purpose of this study is to investigate emotional activation during empathy task in link with executive functioning. To this aim, we recruited subjects with a low or high level of depression on Beck Depression Inventory (BDI), and patients who received a diagnosis of major depressive disorder regarding the Hamilton’s depression interview (HDRS) conducted by a psychologist/psychiatrist. To assess affective (AE) and cognitive empathy (CE), participants performed the Multifaceted Empathy Test (MET), which consists of photographs depicting people in emotionally charged situations. Subjects had to rate their level of arousal, the protagonist’s emotional state, its valence and their level of compassion and distress. During the task, cardiac variability (CV), respiratory frequency (RSA), electro-dermal activity (EAD) and facial activation (EMG) were recorded. Subjects completed three Miyake’s tasks (2000) measuring executive functions in neutral (rectangles) and emotional contexts (faces). Subjective empathy was assessed with the Basic Empathy Scale (BES). Results will be presented and discussed accordingly. Performances at the MET should reveal less empathy and executive control, and reduced processing of the emotional images.

Poster 2-033
The effects of ambivalence and emotion reporting on attention
Catherine Norris, Rares Mosneanu & Amanda Elam
Swarthmore College

Descriptions: ambivalence, attention, N200
Ambivalence, the co-occurrence of positive and negative affect, is uncomfortable, arousing, and short-lived. We have previously shown that ambivalence distracts individuals from performing subsequent tasks. Individuals experienced greater interference on a color Stroop task after watching an ambivalent vs. a positive or negative film clip; however, allowing individuals to report their feelings eliminated this impairment (Norris & Henderson, 2013). In the current study we sought to examine the effects of ambivalence and emotion reporting on attention, using the Attention Network Test (ANT; Fan et al., 2002) and event-related brain potentials (ERPs). Participants randomly assigned to report their feelings after watching an emotion-inducing film clip showed both better accuracy and longer response times on the ANT than non-reporters. These effects were driven by participants who viewed an ambivalent (vs. a negative or positive) film clip, and were strongest for incongruent (vs. neutral or congruent) ANT trials. N200 amplitudes were smaller for incongruent than for neutral or congruent trials; and were reduced for participants who watched the ambivalent film clip and reported their feelings afterward. Higher mixed feelings correlated with worse accuracy on the ANT and with smaller N200 amplitudes: this effect was driven by participants who viewed the ambivalent film clip. In sum, ambivalence may lead to impaired executive attention, as evidenced by both ANT accuracy and reduced N200 amplitudes, but reporting those mixed emotions may help alleviate these impairments.

Poster 2-034
The neural signature of viewing dynamic emotional faces: complementary contributions of evoked versus induced oscillatory brain activity
Rafaela Campagnoli, L. Forest Gruss, Lisa McTeague & Andreas Keil
University of Florida, Medical University of South Carolina

Descriptions: emotion, affect, attention, EEG
The processing of facial expressions is often studied using static photographs. A body of recent research however suggests that dynamic expressions are more robust in evoking physiological responses in the observer, owing to their ecological validity. Here, we used sequences of neutral-to-affective and neutral-to-neutral facial expressions while recording electrocortical activity. Twenty-two participants viewed sequences of grayscale faces periodically turned on and off at a rate of 17.5 Hz, to evoke steady-state visual evoked potentials (ssVEPs). Each sequence began with a neutral face (flickering for 2290 ms), immediately followed by a flickering face from the same actor (also flickering for 2290 ms), with one of four expressions (happy, angry, fearful, or another neutral expression), followed by the initially presented neutral face (flickering for 1140 ms). Evoked activity (Hilbert transformation of the time-domain averages) and induced (tonic) brain oscillations (wavelet transform of each trial) were analyzed. We found a transient perturbation (reduction) of the ssVEP evoked by the face stream only in response to the neutral-to-angry change, selectively at right posterior sensors. Induced alpha-band power was reduced at mid-occipital sites, only after the first and after the second neutral-to-neutral change. Thus, the ssVEP showed modulation consistent with involvement of face-sensitive cortical areas in affective expression decoding, whereas alpha-band changes varied with perceptual similarity and trial statistics, consistent with its role in selective attention.

Poster 2-035
Spontaneous and motivation-elicited proactive control of emotional processing
Amy Maddock, Christel Deve, Cathryn Bjarnesen & Gina Grimshaw
Victoria University of Wellington

Descriptions: motivation, emotion, proactive control
Attention to emotional content is prioritized, but can be modulated by top-down control. The current study uses pupil size to index cognitive control and emotional arousal to examine spontaneous (Study 1) and motivation-elicited (Study 2) proactive control of emotional processing. In Study 1, participants passively viewed briefly-presented intact images that were interspersed with phase-scrambled images. The positive, negative, and neutral images were blocked by emotional context, showing greater preparation for an upcoming image consistent with involvement of face-sensitive cortical areas in affective expression decoding, whereas alpha-band changes varied with perceptual similarity and trial statistics, consistent with its role in selective attention.

Poster 2-036
Spontaneous and motivation-elicited proactive control of emotional processing
Amy Maddock, Christel Deve, Cathryn Bjarnesen & Gina Grimshaw
Victoria University of Wellington

Descriptions: motivation, emotion, proactive control
Attention to emotional content is prioritized, but can be modulated by top-down control. The current study uses pupil size to index cognitive control and emotional arousal to examine spontaneous (Study 1) and motivation-elicited (Study 2) proactive control of emotional processing. In Study 1, participants passively viewed briefly-presented intact images that were interspersed with phase-scrambled images. The positive, negative, and neutral images were blocked by emotional context, showing greater preparation for an upcoming image consistent with involvement of face-sensitive cortical areas in affective expression decoding, whereas alpha-band changes varied with perceptual similarity and trial statistics, consistent with its role in selective attention.

Poster 2-037
Spontaneous and motivation-elicited proactive control of emotional processing
Amy Maddock, Christel Deve, Cathryn Bjarnesen & Gina Grimshaw
Victoria University of Wellington

Descriptions: motivation, emotion, proactive control
Attention to emotional content is prioritized, but can be modulated by top-down control. The current study uses pupil size to index cognitive control and emotional arousal to examine spontaneous (Study 1) and motivation-elicited (Study 2) proactive control of emotional processing. In Study 1, participants passively viewed briefly-presented intact images that were interspersed with phase-scrambled images. The positive, negative, and neutral images were blocked by emotional context, showing greater preparation for an upcoming image consistent with involvement of face-sensitive cortical areas in affective expression decoding, whereas alpha-band changes varied with perceptual similarity and trial statistics, consistent with its role in selective attention.

Poster 2-038
Spontaneous and motivation-elicited proactive control of emotional processing
Amy Maddock, Christel Deve, Cathryn Bjarnesen & Gina Grimshaw
Victoria University of Wellington

Descriptions: motivation, emotion, proactive control
Attention to emotional content is prioritized, but can be modulated by top-down control. The current study uses pupil size to index cognitive control and emotional arousal to examine spontaneous (Study 1) and motivation-elicited (Study 2) proactive control of emotional processing. In Study 1, participants passively viewed briefly-presented intact images that were interspersed with phase-scrambled images. The positive, negative, and neutral images were blocked by emotional context, showing greater preparation for an upcoming image consistent with involvement of face-sensitive cortical areas in affective expression decoding, whereas alpha-band changes varied with perceptual similarity and trial statistics, consistent with its role in selective attention.

Poster 2-039
Spontaneous and motivation-elicited proactive control of emotional processing
Amy Maddock, Christel Deve, Cathryn Bjarnesen & Gina Grimshaw
Victoria University of Wellington

Descriptions: motivation, emotion, proactive control
Attention to emotional content is prioritized, but can be modulated by top-down control. The current study uses pupil size to index cognitive control and emotional arousal to examine spontaneous (Study 1) and motivation-elicited (Study 2) proactive control of emotional processing. In Study 1, participants passively viewed briefly-presented intact images that were interspersed with phase-scrambled images. The positive, negative, and neutral images were blocked by emotional context, showing greater preparation for an upcoming image consistent with involvement of face-sensitive cortical areas in affective expression decoding, whereas alpha-band changes varied with perceptual similarity and trial statistics, consistent with its role in selective attention.

Poster 2-040
Spontaneous and motivation-elicited proactive control of emotional processing
Amy Maddock, Christel Deve, Cathryn Bjarnesen & Gina Grimshaw
Victoria University of Wellington

Descriptions: motivation, emotion, proactive control
Attention to emotional content is prioritized, but can be modulated by top-down control. The current study uses pupil size to index cognitive control and emotional arousal to examine spontaneous (Study 1) and motivation-elicited (Study 2) proactive control of emotional processing. In Study 1, participants passively viewed briefly-presented intact images that were interspersed with phase-scrambled images. The positive, negative, and neutral images were blocked by emotional context, showing greater preparation for an upcoming image consistent with involvement of face-sensitive cortical areas in affective expression decoding, whereas alpha-band changes varied with perceptual similarity and trial statistics, consistent with its role in selective attention.
PSYCHOPHYSIOLOGICAL EVALUATION OF SURGICAL PROCEDURE IMAGES: EFFECTS OF OCCUPATIONAL RELEVANCE AND INDIVIDUAL TRAITS

Juliana Paes¹, Leticia Oliveira¹, Rita Alves², Murtes Pereira¹, Isabel David¹, Walter Machado-Pinheiro¹ & Izabela Mocaiber¹
¹Federal Fluminense University, ²IBMR University Center

Descriptors: emotion, empathy, heart rate

There is evidence that health professionals are less emotionally reactive when viewing painful scenes and that the empathy trait plays a critical role in emotional reactivity. The objective of this study was to investigate the emotional reactivity to images of surgical procedures. In the experiment, 27 nursing students visualized 4 blocks of 20 images: surgical procedures, mutilated and 2 paired neutral blocks, while their electrophysiologic activity was recorded. The empathy trait was also measured. Results: it was observed that the cardiac (decelerating) response curve for the mutilated images differed from the paired neutral curve from point 4 (visualization in 2s) to point 12 (6s). The curve for the images of surgical procedures differed from the neutral paired curve only from point 6 (3s) to point 9 (4.5s), suggesting an attenuated cardiac response and/or bradycardia recovery. A correlation was observed between the empathy trait and the magnitude of the cardiac deceleration, with higher levels of empathy associated with the greater amplitude of the deceleration in the surgical procedures block. Together, the data shows the importance of the occupational relevance of the images in their subjective evaluation and cardiovascular impact.

SKIN HARDNESS-BASED HUMAN THERMAL SENSATION ESTIMATION

Sunghyun Yoon, Jai Kyungsim, Noeul Park & Young-Ho Cho
Korea Advanced Institute of Science and Technology (KAIST)

Descriptors: skin hardness, human thermal sensation, physiological signs

It is a world’s first attempt to propose skin hardness as a physiological sign for human thermal status estimation and to verify its effectiveness and independency compared to the two conventional signs of skin temperature and skin conductance. The skin hardness increases or decreases due to the contraction or expansion of “arrector pili muscles” depending on the human subjective thermal status. We survey individual thermal sensation from 30 subjects in 4 different thermal conditions (i.e. normal, warm, hot, cold), while measuring skin hardness with the two conventional physiological signs. The maximum difference of the skin hardness, measured from individual subject in the 4 different conditions, results in an average value of 6.32 ± 2.31 duro00. From the individual thermal sensation survey, the skin hardness shows the coefficient of determination ($R^2$) of 0.6302; thus demonstrating its effectiveness is equivalent to that of skin temperature ($R^2$ of 0.5414) and skin conductance ($R^2$ of 0.6176). Variance Inflation Factors (VIFs) for the combination of skin hardness, skin temperature and skin conductance are in the range of 1.68–2.04, indicating that the skin hardness is a physiological sign, independent of other two signs. It is verified experimentally that the skin hardness, independent of the conventional signs of skin temperature and skin conductance, is an effective physiological sign for human thermal status estimation. A new physiological sign of skin hardness is capable to improve the human thermal status estimation models based on the two conventional signs.

VIRTUAL ANGRY FACES GENERATED IN A REVERSE-CORRELATION PROCEDURE MODULATE THE LATE POSITIVE POTENTIAL - A CROSS-VALIDATION USING EEG IN VIRTUAL REALITY

Christopher Stolz, Dominik Endres & Erik Mueller
University of Marburg

Descriptors: affective faces, event-related potentials, virtual reality

Previous studies on virtual faces demonstrated different methods to generate emotional expressions. Here, we investigated a highly economic reverse-correlation procedure to generate angry faces and cross-validated them using an online-questionnaire (sample 1) and a highly immersive Virtual Reality (VR) while assessing EEG (sample 2). The reverse-correlation procedure consisted of a random face generation (I), affective face selection (II) and cross-validation (III): Based on the Facial Action Coding System (FACS), avatars’ skeleton bones were selected that drive Facial Action Units (AUs) involved in anger expression. (I) In 300 trials (50 eye, 150 mouth area), avatars bones were randomly positioned (horizontal[x], vertically & depth[z]) and (II) their positions were saved whenever the resulting virtual faces corresponded with FACS anger expression according to an experienced rater. This resulted in 10 angry face avatars. (III) The set of faces was validated for their emotional expression via online-questionnaire in sample 1 ($N = 41$). Based on these results, one pair of a neutral and angry face was selected for the VR study (sample 2; $N = 25$). In the VR study, angry faces were perceived as more threatening compared to neutral faces and elicited a larger late positive potential (LPP; 300–600 ms) when presented in a safe context. These findings replicate results of previous studies using pictures of faces and thus demonstrate a successful and economic method to generate virtual emotional faces.
THE EFFECTS OF PRE-GOAL AND POST-GOAL POSITIVE EMOTIONS ON CARDIOVASCULAR RECOVERY FROM A SOCIAL THREAT
Lukasz Kaczmarek1, Brian Hughes2, Przemyslaw Guzik3, Maciej Behnke3 & Michal Kosakowski1
1Adam Mickiewicz University, 2National University of Ireland - Galway, 3Poznan University of Medical Sciences

Descriptors: cardiovascular activity, approach motivation
Several studies documented that positive emotions facilitate cardiovascular recovery from a social threat. However, little is known whether this undoing effect is the same for all positive emotions. Motivational Dimensional Model of Affect distinguished between pre-goal (e.g., enthusiasm) and post-goal (e.g., amusement) positive emotions that differ in approach motivation intensity; a key process in mobilization of action-oriented physiological resources. Based on this theory, we hypothesized that post-goal positive emotions would be more effective in cardiovascular recovery facilitation. Healthy individuals (N = 171) completed a laboratory social threat induction procedure. In the recovery period they watched a presentation with a set of standardized affective pictures that were of equal arousal and positive valence but elicited high approach motivation or low approach motivation. These two groups were compared against a control group that watched neutral valence pictures of equal arousal. Hemodynamic activity was measured with a beat-by-beat blood pressure monitor (Finometer). Replicating previous findings we found that positive emotions facilitated systolic blood pressure recovery compared to neutral controls. Yet, there were only marginal differences between the effects of pre-goal and post-goal positive emotions. This suggests that the valence rather than motivational intensity of positive emotions is the key factor responsible for the undoing physiological effects of positive emotions.

SELF-REPORTED INDICES OF SLEEP QUALITY AND THEIR RELATIONSHIPS TO ATTENTION, COGNITIVE REAPPRAISAL AND EVENT-RELATED POTENTIALS
Andrew Wiese, Seung-Lark Lim & Diane Filion
University of Missouri - Kansas City

Descriptors: emotion regulation, ERPs, sleep
Disturbances in sleep quality are a hallmark feature found across many psychopathologies. Also common are difficulties regulating emotions, which is why emotion regulation is a component of many treatments. The aim of this study is to examine how self-reported indices of sleep quality relate to ERPs sensitive to attentional and emotional processes in an emotion regulation task. Participants viewed IAPS images of negative and neutral valence, and reappraised a subset of negative images. Images were accompanied by an imperative, auditory stimulus at an SOA of 1, 2, 3, 4, or 5 seconds, that required participants to respond with a button press. Reaction time (RT) served as an index of task-related attentional demands, while LPP and SPN served as measures of attentional and emotional processes (Critchley, 2005; Garfinkel et al., 2014, 2015). High IA reduced the inhibition of information processing induced by baroreceptor activation (Garfinkel et al., 2013), which challenges the traditional view of cardiac timing effects (Lacey & Lacey, 1978). There is a dynamic balance between the processing of cardiac afferent information and task-relevant sensory stimuli, or accessory stimuli (Yang et al., under review). It is unclear how IA influences this balance in information processing through affective mechanisms. Sixty-five college students performed a reaction time (RT) task or a choice RT task with two choices. In both tasks, auditory stimuli served as the imperative RT stimuli, while neutral and fear face images were delivered as visual accessory stimuli. The auditory and visual stimuli were presented at cardiac systole or diastole. IA was assessed by a heartbeat tracking task (HTT, Katkin et al., 1982). RT data were submitted to repeated measures analyses of covariance (ANCOVA), in which the HTT score was the covariate. Results showed an interaction between emotional valence and the HTT score on RTs, F(1, 62) = 9.71, p < .01, ηp² = .135. These data indicate that high IA attenuates the effect of fear on RTs. These findings further highlight the role of interoception in affective processes and embodied cognition.

DISTURBANCES IN SLEEP QUALITY AND THE EFFECTS OF PRE-GOAL AND POST-GOAL POSITIVE EMOTIONS ON CARDIOVASCULAR RECOVERY
Lukasz Kaczmarek1, Brian Hughes2, Przemyslaw Guzik3, Maciej Behnke3 & Michal Kosakowski1
1Adam Mickiewicz University, 2National University of Ireland - Galway, 3Poznan University of Medical Sciences

Descriptors: cardiovascular activity, approach motivation
Several studies documented that positive emotions facilitate cardiovascular recovery from a social threat. However, little is known whether this undoing effect is the same for all positive emotions. Motivational Dimensional Model of Affect distinguished between pre-goal (e.g., enthusiasm) and post-goal (e.g., amusement) positive emotions that differ in approach motivation intensity; a key process in mobilization of action-oriented physiological resources. Based on this theory, we hypothesized that post-goal positive emotions would be more effective in cardiovascular recovery facilitation. Healthy individuals (N = 171) completed a laboratory social threat induction procedure. In the recovery period they watched a presentation with a set of standardized affective pictures that were of equal arousal and positive valence but elicited high approach motivation or low approach motivation. These two groups were compared against a control group that watched neutral valence pictures of equal arousal. Hemodynamic activity was measured with a beat-by-beat blood pressure monitor (Finometer). Replicating previous findings we found that positive emotions facilitated systolic blood pressure recovery compared to neutral controls. Yet, there were only marginal differences between the effects of pre-goal and post-goal positive emotions. This suggests that the valence rather than motivational intensity of positive emotions is the key factor responsible for the undoing physiological effects of positive emotions.
S82

Poster 2-044

MOTOR REACTIONS UNDER POTENTIAL THREAT: SEVERITY OF PTSD SYMPTOMS AND MOTOR PREPARATORY ACTIVATION ARE U-SHAPED CORRELATED.

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Descriptors: PTSD, EEG/ERP, LRP

The study of human defensive motor reactions under threat is important to the understanding of Posttraumatic Stress Disorder (PTSD) vulnerability. We explored if pictures of mutilated human bodies (a cue for potential threat) would prompt differential motor reactions in 41 students who have experienced traumatic events, based on the severity of PTSD symptoms. Participants judged the orientation of two peripheral bars, indicating whether their orientation was the same, while ignoring a central picture (mutilated or intact bodies) presented by 200ms. PTSD symptoms severity was assessed using the PTSD checklist (PCL). The Lateralized Readiness Potential (LRP) component, time-locked to the response, indexed the motor preparatory activity. LRP-R latency was established by cross-correlation between individual and grandaveraged LRP (template). We found a U-shaped relationship between PTSD symptoms severity and LRP latency during the potential threat condition but not during the control. Under potential threat, participants with moderate PTSD symptoms required less time for reaction readiness than participants with minor and severe PTSD symptoms, reflecting a delayed motor preparatory activity in the latter two. These results suggest that PTSD symptoms severity would modulate the interaction between threat perception and motor reactions. As severity increases, more intense activations of the defensive behaviours are expected, possibly varying from attentive immobility to tonic immobility.

Poster 2-045

DIFFERENCES BETWEEN MALE AND FEMALE SMOKERS IN BRAIN RESPONSES TO CIGARETTE-RELATED AND EMOTIONAL VISUAL STIMULI

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Descriptors: nicotine, addiction, sex differences

Studies have shown that sex differences play an important role in addictive behaviors, including smoking. The presence of cigarette-related cues often trigger smoking relapse. Preclinical models suggest that males might be more vulnerable than females to cue-induced drug seeking behavior. To investigate sex differences in human cue reactivity, we used event-related potentials (ERPs) to measure brain responses to cigarette-related and emotional images in 222 smokers (54% males). Participants watched a slideshow that included 6 picture categories covering high and low emotionally arousing pleasant and unpleasant, cigarette-related, and neutral contents. We used the amplitude of the late positive potential (LPP), a component sensitive to the motivational properties of visual stimuli, recorded from 10 centroparietal sites between 400 and 800 ms post-picture onset as an index of reaction readiness. By cross-correlation between individual and grandaveraged LRP (template), we found a U-shaped relationship between PTSD symptoms severity and LRP latency during the potential threat condition but not during the control. Under potential threat, participants with moderate PTSD symptoms required less time for reaction readiness than participants with minor and severe PTSD symptoms, reflecting a delayed motor preparatory activity in the latter two. These results suggest that PTSD symptoms severity would modulate the interaction between threat perception and motor reactions. As severity increases, more intense activations of the defensive behaviours are expected, possibly varying from attentive immobility to tonic immobility.

Poster 2-046

ADOLESCENTS WITH RISK BEHAVIOR SHOW ALTERED PSYCHOPHYSIOLOGICAL EMOTIONAL REACTION

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Descriptors: risk behavior, psychophysiological emotional-reaction, adolescence

Psychophysiology of emotional reaction in adolescence is a crucial factor in understanding risk and deviant behaviors. The objective of the present work was to compare specifics of psychophysiological emotional reaction and emotional interference on working memory between adolescents with risk behavior and controls. Method, the measures consisted in risk behavior (RB) characterization of the sample, and heart rate (HR) electromyography (EMG), skin conductance (SC) and temperature variations during emotional visual stimuli presentation and emotional valence. Results show significant differences between adolescents who present RB compared to non-risk group; signs of major psychophysiological reaction to emotionally loaded stimuli in RB when compared with control group. The control group was characterized by an initial bradycardia which was more expressed than the risk behavior group, however both groups showed the most pronounced HR deceleration to unpleasant stimuli, with no differences between them. Higher levels of EMG response to pleasant stimuli in the risk behavior group were also observed, as well as higher indicators of skin conductance to the three types of stimuli. A significant interference of emotional stimuli over working memory was found compared to non-emotional visual stimuli, and it was more expressed to pleasant, compared to unpleasant stimuli. Cohort study is needed to compare the actual findings in RB and psychophysiological emotional reaction between adolescents groups.

Poster 2-047

PHYSIOLOGICAL INDICES OF ALCOHOL USE: THE MODERATING ROLE OF POSITIVE AND NEGATIVE EXPECTANCIES

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Descriptors: alcohol consumption, alcohol outcome expectancies, physiological measures

Previous research indicated that alcohol use is positively associated with increased heart rate. However, light social drinkers showed a significant decrease in heart rate during a task. Also, alcohol addicted participants manifested lower skin conductance responsivity. This study examines physiological reactivity in relation to alcohol use and the role of positive expectancies regarding alcohol use. Ninety-six community participants in Cyprus (55 female; age range: 18–47 years old) completed a tone-cued affective imagery experiment where they imagined sadness, relaxation, fear, joy scenes in 8 second trials. The AUDIT and Alcohol Outcome Expectancies Scales were administered to assess alcohol consumption and positive and negative expectancies regarding alcohol use, respectively. Skin conductance, Heart Rate and Zygomatic activity were measured during emotional imagery. Alcohol use predicted lower heart rate across emotions, which was significant during joy, fear, sadness and relaxation imagery. The expectation of participants that alcohol use will lead to greater fun and increased sexuality was associated with lower zygomatic responses across emotions. Also, the expectation for increased socialization due to the alcohol use predicted lower skin conductance reactivity in joy, sadness and relaxation imagery. Results indicate that the positive outcome expectancy to alcohol use can be linked to the quantity of alcohol consumption and a potentially effect on physiological reactivity.
THE STIMULUS-PRECEDING NEGATIVITY IS ENHANCED BY UNCERTAIN THREAT
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Yale University

Descriptors: uncertainty, anticipation, anxiety
Uncertainty has been shown to elicit anxiety and heighten physiological responding. Despite these taxing effects, uncertainty is commonplace in daily life and is often protracted. “Will she text me back?” and “What grade will I get on this exam?” are examples of questions that arise regularly but are not possible to resolve immediately. Thus, individuals are often in a state of anticipating uncertain outcomes. Anticipation of uncertainty is particularly important to understand because of its relevance to psychopathology – aberrant anticipatory responding to uncertainty has been conceptualized as a key factor in the development of anxiety disorders (Grupe & Nitschke, 2013). While previous work has characterized discrete responses to uncertainty, little work has focused on measuring the anticipation of uncertainty. We examined the stimulus-preceding negativity (SPN), an event-related potential (ERP) component that indexes anticipation. Participants (n = 31) anticipated uncertain threat, certain threat, and safety. The SPN was largest when anticipating uncertain threat (M = −6.52, SD = 5.02) compared to certain threat (M = −4.77, SD = 7.09) and safety (M = −2.41, SD = 4.49), F(2, 58) = 6.90, p = .002. Together, these results show that the SPN is sensitive to uncertainty and provides a useful tool to measure the anticipation of uncertainty, which is key to understanding the effects of uncertainty on cognition and emotion. Future work will investigate individual differences in anticipation as measured by the SPN to understand whether they are associated with risk for anxiety.

INDIVIDUAL DIFFERENCES IN INHIBITORY CONTROL PREDICT LPP MODULATION BY COGNITIVE REAPPRaisal
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Descriptors: LPP, emotion regulation, inhibitory control
Research has indicated that the emotion regulation strategy of cognitive reappraisal can modulate the late positive potential (LPP) to emotional images. The current research explored the extent to which the effects of reappraisal are modulated by individual differences in inhibitory control. Participants completed the stop-signal task as part of a larger study; later, they reappraised negative emotional images while electroencephalographic activity was recorded. We quantified the LPP as mean activity in the time windows 500–1000 ms, 1000–1500 ms, and 1500–2000 ms after picture onset. We found that performance on the stop-signal task negatively predicted the extent to which reappraisal modulated the LPP. Participants who performed more poorly on the stop-signal task (i.e., took longer to successfully inhibit responses) exhibited greater LPP modulation when engaging in cognitive reappraisal, particularly at the later time windows (i.e., 1500–2000 ms). Results suggest that individuals with poorer inhibitory control are especially likely to benefit by using cognitive reappraisal as an emotion regulation strategy.

CARDIOVASCULAR CHANGES IN EMOTION UP-REGULATION DURING GOAL PURSUIT
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Descriptors: emotion, emotion regulation, heart rate variability
People choose valence-specific stimuli when pursuing goals, which indicates an intention to up-regulate an emotion. The physiological concomitants of these actions, however, are not clearly understood. The current study was aimed to gain insight into this phenomenon by assessing changes in vagally-mediated heart rate variability (HRV) when listening to music selected to facilitate goal pursuit. Fifty students (35 female; Mean age = 19.43) role-played as a Student Government Association member preparing to negotiate solutions to current student-parking issues. Subjects were given a negotiation goal (confrontation, collaboration, or no goal) and then chose an emotion-inducing song (angry, happy, or neutral) to listen to in preparation for negotiation. After listening to the song, subjects wrote a goal-driven message to the Director of Parking. Repeated measures ANOVA revealed that subjects who chose a neutral song in pursuit of a confrontation goal showed the greatest decrease in high frequency HRV (HF HRV) during music listening and writing, while subjects who chose a neutral song in pursuit of a collaboration goal showed the greatest increase in HF HRV (F(4, 39) = 4.11, p = .004). The results suggest that, when less engaging music was chosen (i.e., neutral music), subjects in the confrontation and collaboration groups were better able to regulate their emotions to fit their goal. Music with a more polarized valence (i.e., angry and happy music) may demand more attentional resources, which interferes with emotion regulation processes.

PREPARING FOR PUNISHMENT: EXPECTATION AND EVALUATION OF CONSEQUENCE
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Descriptors: stimulus-preceding negativity, behavioral adaptation, expected value
Human’s expectation process on decision-making has not been well studied as much as evaluation process. In terms of the prospect-theory, the present study focused on the effect of manipulating expected-value on neural-activity during the expectation and evaluation periods by using the stimulus-preceding negativity (SPN) and the feedback-related negativity (FRN). Twenty-three healthy participants performed a modified monetary-incentive delay (MID) task under reward-approach and punishment-avoidance conditions. Each condition was characterized by the type of possible monetary outcome (reward only, punishment only). Task difficulty was regulated at 75% correct rate. This regulation enabled secure expectation, although not fully, to the outcome based on the internal response prior to feedback. The results showed that SPN on the 25% error trial was larger than the 75% correct trial and it was left hemisphere predominant. Furthermore, pleasant scale was higher under the reward-approach condition. SPN was increased under the punishment-avoidance condition on error trial at left frontal and right parietal sites, and FRN was larger under the punishment-avoidance condition. These results confirm that expecting-punishment draws more attention toward feedback for behavioral-adaptation such as reducing errors.

CALLOUS-UNEMOTIONAL TRAITS IN CHILDREN: DISTURBANCES IN AUTONOMIC REGULATION AND EMOTION VALENCE SYSTEM (EVS)
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Descriptors: callous-unemotional traits, heart rate variability, facial electromyographic activity
Children high in callous unemotional (CU) traits are characterized as “unemotional” due to reduced affective responses while processing emotional stimuli. The current study examines the associations between CU traits with resting heart rate variability (HRV) and facial electromyographic (EMG) activity toward emotional stimuli to clarify whether these traits are associated with disturbances in autonomic regulation and EVS. Eighty-eight children participated in a picture viewing task, whereas resting HRV and facial EMG activity during the presentation of emotional and neutral pictures were recorded. Ratings of self-reported arousal and valence for each picture separately were obtained. Positive correlations were observed between CU traits with RMSSD, which reflects parasympathetically mediated HRV and SDNN, an index of overall HRV. CU traits were associated with reduced corrugator supercilii muscle activity during the presentation of sad images, indicating less expression of unpleasant emotions during aversive stimuli. CU traits were positively correlated with more self-reported positive valence during the presentation of fear pictures and more negative emotional valence in response to pleasant ones. Findings suggest that children with higher CU traits may exhibit a greater ability to tolerate stress, remain calm and regulate their affective states more effectively. The deficits in EVS may help understand why these children experience less distress by the impact of their violent behaviors, explaining at some extent their tendency to engage in behaviors that may harm others.
EXTERALIZING AND ANXIETY PROBLEMS IN CHILDREN: AUTONOMIC “OVER-FLEXIBILITY” VS AUTONOMIC “RIGIDITY”?  
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Descriptors: heart rate variability, anxiety, externalizing problems  
Autonomic nervous system is involved in the generation and modulation of physiological arousal in accordance with situational demands to maintain homeostasis. The current research examined whether externalizing and anxiety problems in children are associated with disturbances in the generation of physiological emotional states and autonomic regulation. Eighty-eight children completed a picture-viewing task, while resting heart rate variability (HRV) and heart rate (HR) in response to fearful and neutral pictures were measured. Child Behavior Checklist was used to assess children’s externalizing and anxiety symptoms. Externalizing problems predicted negatively SDNN and RMSSD which reflect overall and parasympathetically mediated HRV, respectively. In contrast, anxiety was negatively associated with SDNN and RMSSD. Further, children low in externalizing symptoms exhibited greater HR during the presentation of fear stimuli relative to neutral ones, whereas those with high scores presented the opposite pattern, supporting under-reactivity toward highly arousing aversive stimuli in children with behavioral problems. Findings indicate that externalizing symptoms may be associated with greater autonomic flexibility, while anxiety symptoms may relate to more autonomic rigidity and thus reduced emotion regulatory capacity. Hypo- arousal and greater ability to regulate unpleasant emotions may facilitate disruptive behavior in children with externalizing problems, whereas reduced autonomic flexibility may explain at some extent disinhibition and behavioral avoidance in anxious children.

PHYSIOLOGICAL MEASURES OF EMOTIONAL REACTIVITY IN PREADOLESCENTS DURING AN AFFECTIVE PICTURE TASK: AN EVALUATION OF THE REVISED REINFORCEMENT SENSITIVITY THEORY (R-RST)  
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Descriptors: revised-reinforcement sensitivity theory, preadolescents, skin conductance  
The Revised-Reinforcement Sensitivity Theory (Gray, 1970) provides a framework for explaining how differences in sensitivities to punishment and rewards are reflected in behavioral and emotional responses. The present study evaluates how the Revised Reinforcement Sensitivity Theory (r–RST) applies to preadolescents by examining their emotional physiological and subjective responses during an affective pictures paradigm. Eighty-eight preadolescents viewed affective pictures (fearful, joyful, sad and neutral) while heart rate, skin conductance, corrugator and zygomatic activity were recorded. Parents completed the Sensitivity to Punishment and Sensitivity to Reward Questionnaire Child Revised and the Child Behavior Checklist to assess characteristics related to the Behavioural Inhibition and Behavioural Activation systems and internalizing and externalizing symptoms respectively. As expected the results indicated that high sensitivity to reward correlates with externalizing problems, whereas high sensitivity to punishment with internalizing. Preadolescents with higher sensitivity to rewards had significantly higher zygomatic reactivity to joyful images (compared to low sensitivity to reward) indicating the association between positive emotion and sensitivity to reward. Participants with higher sensitivity to punishment (compared to low sensitivity to punishment) had significantly higher skin conductance and heart rate reactivity during sad images. The results are interpreted in light of the interactive relationship of the motivational systems proposed in the revised-RST.

IMAGINE THE EMOTION! SOCIALLY ANXIOUS HYPERSCAN IMAGINED AND SEEN FACES  
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Descriptors: emotional facial expressions, mental imagery, social anxiety  
Socially anxious scan emotional faces intensively. It is not well understood whether such hyperscanning is driven by top-down processes or if it occurs in response to specific facial features. The present study examined gaze behavior while imagining emotional facial expressions. Fifty participants were instructed to imagine neutral faces becoming angry, fearful, or happy. Neutral faces served as cues, which were replaced by a blank mask, in which participants had to imagine the instructed emotional expressions. As control task, clock times were to be imagined. The second half of the experiment consisted of freely viewing previously imagined expressions and clocks. Fixation durations and scanpath lengths served as indicators of hyperscanning. Overall, participants displayed longer fixation durations and shorter scanpaths during mental imagery compared to free viewing of both faces and clocks. Regarding facial emotions, imagining angry faces led to longer fixation durations and shorter scanpath lengths relative to fearful and happy faces. Interestingly, high socially anxious participants showed shorter fixation durations and longer scanpaths indicating hyperscanning. Such differences were not observed while imagining and viewing clocks. Thus, gaze behavior when viewing or imagining emotional expressions, indicate social anxiety related top-down processes specifically to faces. The present paradigm constitutes a novel approach to further the understanding of biased information processing in social anxiety during the perception and imagination of facial expressions.

AVERSIVE AUDITORY STIMULI IMPROVE RESPONSE INHIBITION AND ERROR MONITORING: AN EVENT-RELATED POTENTIAL STUDY  
Magdalena Senderecka  
Jagiellonian University  

Descriptors: response inhibition, error monitoring, event-related potentials  
The present study investigated the effect of emotion on response inhibition and error monitoring using event-related potentials. Thirty-two right-handed students (25 females and 7 males) performed an emotional stop-signal task that required response inhibition to aversive and neutral auditory stimuli. The behavioral data revealed that unpleasant, arousing sounds facilitated inhibitory processing by decreasing the stop-signal reaction time and increasing the inhibitory rate relative to neutral tones. The perceptual processing of affectively significant stop-signals resulted in a larger N1 auditory component. The N2 component was reduced in the emotional stop-signal condition, suggesting there was a smaller conflict between the go and inhibitory responses. Aversive sounds evoked a stronger and faster P3 relative to neutral tones, indicating an improvement in cognitive control operations. The P3 latency in failed stop trials correlated with inhibitory performance, especially in the emotional condition. The Pe component associated with error monitoring was markedly larger and faster in negative than neutral trials, suggesting a more effective conscious evaluation of errors, or more intense affective processing related to erroneous responses. Prioritized perceptual processing of the stop-signal was associated with better conscious error monitoring. These results support the hypothesis that unpleasant, arousing sounds improve inhibitory performance and suggest a positive influence of short-duration affective states, induced by aversive stimuli, on error monitoring.
### Poster 2-057

**ELECTING AN EMOTIONALLY EMBODIED CANDIDATE: INVESTIGATING THE RELATIONSHIP BETWEEN AROUSAL, EEG, AND CANDIDATE PREFERENCE IN THE 2016 U.S. PRESIDENTIAL ELECTION**

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**Descriptors:** emotion, politics

How might a politician’s non-verbal emotional displays impact voters’ emotional responses? Biopolitics, a framework in political science, suggests that politicians’ non-verbal displays impact voters’ responses in ways that might impact voting preferences. This study tested correlations between psychophysiological indicators of arousal (skin conductance / EEG) evoked by non-verbal emotional displays of Hillary Clinton and Donald Trump and preferences for both candidates. Participants (N = 26) were undecided voters who viewed video of Hillary Clinton and Donald Trump making 2016 campaign speeches. Videos of each candidate were coded for 11 specific non-verbal displays consisting of facial expressions and gestures. After viewing the videos, participants completed a candidate preference task. Correlation analysis was performed on the level of arousal evoked by each candidate’s emotional displays and preference points. The level of arousal evoked by the full range of Donald Trump’s emotional displays were found to be significantly positively correlated with preference for him. Hillary Clinton’s emotional displays evoked fewer significant correlations between arousal and preference but four of her emotional displays evoked stronger correlations between arousal and preference compared to all of Donald Trump’s displays. This pattern of results indicates that the range of non-verbal emotional displays by Donald Trump may have made him a more “embodied” candidate evoking a more consistent relationship between voters’ responses to his non-verbal expressions and voting preference.

### Poster 2-058

**ALTERED EFFECTIVE CONNECTIVITY DURING INFANT CRYING PROCESSING IN NEGLECTFUL MOTHERS**

Immaculada Leon¹, Maria José Rodrigo¹, Ileana Quinnones², Cristian Modroño¹, Juan Andrés Hernandez-Cabrera² & Wael El-Deredy³  
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**Descriptors:** crying faces, maternal neglect, dynamic causal modeling

Several studies have demonstrated alterations in emotional face processing in adults who have suffered childhood maltreatment. However, the extent to which face-processing-related anomalies lead to neglectful motherhood are poorly understood. We used Dynamic Causal Modelling to test for a possible abnormal functional integration between two key regions in face processing, amygdala and fusiform gyrus (FG) that would underlie the neglectful mothers’ neural insensitivity to crying faces. We demonstrated an anomalous inhibitory modulation of the top-down amygdala to FG connection in neglectful mothers, specifically conditioned to the presentation of infant crying, and not observed in any other condition (infant neutral, or adult crying and neutral faces). We also found a reliable association between the amygdala-FG effective connectivity and the inferior longitudinal fasciculus volume obtained from a previous study with the same mothers, adding anatomical plausibility to the DCM results. We conclude that the inhibition of the connectivity between emotional and visual processing structures could be responsible for the poor perceptual enhancement of infant crying faces in neglectful mothers, that subsequently lead to their insensitive responding to infant needs. Cognitive-behavioral interventions targeting the connectivity between those brain areas might help reverse or diminish the neglectful behavior.

### Poster 2-059

**FIXATION-RELATED BRAIN ACTIVATIONS: EMOTIONAL VALENCE INTERACTS WITH HIGH AND LOW-LEVEL IMAGE PROPERTIES**

Michal Kuniecki, Kinga Wolozyn, Aleksandra Domaglik & Joanna Pilarczyk  
Jagiellonian University

**Descriptors:** fMRI, eye movements, emotion

Temporal and spatial characteristics of fixations are affected by image properties, including high-level scene characteristics and low-level physical characteristics. The influence of these factors is modulated by emotional content of an image. Here, we aimed to establish whether brain correlates of fixations reflect these modulatory effects. We scanned participants and measured their eye movements, while presenting negative and neutral images in various image clarity conditions, with controlled object-background composition. The fMRI data were analyzed using novel fixation-based event-related (FIBER) method, which allows tracking brain activity linked to individual fixations. Fixating an emotional object was linked to greater deactivation in the lingual gyrus than fixating the background of an emotional image, while no difference was found for neutral images. Deactivation in the lingual gyrus might be linked to inhibition of saccade execution. This was supported by longer durations of fixations falling on the object than on the background in the negative condition. Furthermore, increasing image clarity was correlated with fixation-related activity within the lateral occipital complex. This correlation was significantly stronger for negative images. Overall, emotional value of an image changes the way low- and high-level scene properties affect characteristics of fixations as well as fixation-related brain activity.

### Poster 2-060

**ANTICIPATION AND THE CORTISOL AWAKENING RESPONSE WITHIN A DYNAMIC PSYCHOSOCIAL WORK ENVIRONMENT**

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**Descriptors:** cortisol awakening response, heart rate variability, psychosocial-demand

The cortisol awakening response (CAR) is a distinct element of the diurnal pattern of cortisol release, believed to be partly driven by the anticipation of the demands of the upcoming day. Although evidence suggests that the response may be associated with various ergonomic factors, the influence of temporal variation in anticipated workplace characteristics upon the CAR remains unclear. The current study examined the CAR on two work days of differing levels of anticipatory demand (high/low) and a single weekend day through repeated assessment of healthy higher education employees (N=15). Participants provided saliva samples immediately upon awakening and thirty minutes thereafter on all three assessment days. A paired t-test confirmed that the two work days differed significantly in terms of perceived acute demand and a repeated measures ANOVA revealed a significant main time effect, confirming the presence of a distinct rise in salivary cortisol over the thirty minutes post awakening. This response was found to differ according to the type of day being greater on the “high” compared to the “low” demand day, or the weekend. These findings suggest that the CAR is influenced by the relative perceived level of acute anticipatory work-related demand of the assessment day, highlighting the importance of attending to the dynamics of the environment when employing real-world psychoneuroendocrine assessments.
THE MODULATORY EFFECT OF AGE, GENDER AND CYTOMEGALOVIRUS (CMV) PERSEVERANCE ON PERIPHERAL BLOOD IMMUNE CELL SUBSETS IN PARTICIPANTS OF THE BERLIN AGING STUDY II

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Descriptive: aging, immunology, neuroinflammation

The central nervous and immune systems represent two adaptive physiological systems of the body, which extensively communicate with each other throughout the lifespan. Given their multifaceted interactions and tight interdependency, it is to be expected that peripheral immunosenescence and inflammaging contribute to neuroinflammation. Age-associated changes and impact of CMV latency are well described for T- and B- cells, but our knowledge of these changes in such peripheral subpopulations as NK-, NKT-cells and monocytes still remains limited. In a cross-sectional study of older (62-85 yr, n=129) and younger (23-35 yr, n=62) individuals, we phenotypically characterized peripheral immune cell populations including monocytes, NKT-like cells and NKG2-expressing T- and NK- cells. We found that both age and CMV jointly and separately modulate these peripheral pools. Whereas the frequency of NKG2A-expressing (inhibitory receptor) T- and NK- cells seems to be mostly influenced by aging with a minor contribution of CMV infection, cells expressing NKG2C (activating receptor) were mostly modulated by CMV. We found inverse age- and CMV-related alterations in frequencies of classical monocytes and an age-dependent increase in frequencies of both intermediate and non-classical monocytes. Some of these changes were gender-specific. These data support the hypothesis that aging and CMV persisten- tence are associated with significant alterations in the peripheral blood immune signatures and might be a driving force of peripheral inflammation.

NEURONAL CORRELATES OF FEEDBACK PROCESSING IN A REVERSAL LEARNING TASK IN RELATION TO THE NEED FOR COGNITIVE CLOSURE

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Descriptive: FRN, need for cognitive closure, probabilistic reversal learning

The need for cognitive closure (NFCC) refers to a motivational state in which people seek to close open decision situations and fill knowledge gaps quickly, in order to escape from the ambiguity associated with such situations. This need cannot only be conceptualized as a state, but also as a stable personality trait. Participants with a high NFCC initially show more information seeking behavior (seizing) and subsequently stick to the resulting decisions and inferences longer (freezing). The present study investigated neuronal correlates of freezing in relation to NFCC. Twenty-seven participants completed a probabilistic reversal learning paradigm. The feedback-related negativity (FRN) and P300 were analyzed as neuronal correlates of feedback processing. We found no relation between NFCC and the number of perseveration errors. However, the FRN difference between negative feedback following rule reversal and valid positive feedback correlated positively with NFCC. An additional exploratory analysis of response-related event-related potentials showed a significant negative correlation between the error positivity and NFCC. Taken together, the electrophysiological results sug- gest that participants with increased NFCC are less aware of their errors, which fits with an increased freezing tendency. Nevertheless, they can still use external feedback to appropriately adapt their behavior.

RELATIONSHIP BETWEEN PHASE- AND NON-PHASE-LOCKED ODDBALL THETA/DELTA ACTIVITY AND ALCOHOL USE

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Descriptive: time-frequency analysis, medial frontal theta, alcohol use

Time-frequency (TF) analysis indicates that the oddball P3 is primarily comprised of theta- and delta-band power, and recent work suggests that theta/delta may be more sensitive indices of individual differences, such as alcohol use, than P3 amplitude. It is unclear to what degree oddball-related theta and delta reflect phase-locked (evoked) activity present in the ERP, or modulation of band-limited non-phase-locked (induced) oscillatory activity that is, by definition, not reflected in the ERP. The present study examined the relationship between phase- and non-phase-locked theta/delta power and alcohol use during a visual oddball task in a large twin sample (N=765). Non-phase-locked power was isolated by sub-tracting the time-domain average ERP from each trial before transforming the single-trial data into the TF domain, and phase-locked power was calculated by subtracting the non-phase-locked power from the total power. Parietal delta power was phase-locked to target stimulus onset and highly correlated with P3, while midfrontal theta power reflected non-phase-locked activity that was sepa-rate from the ERP. Heavier drinking was negatively associated with both theta and delta, but only non-phase-locked theta accounted for unique variance beyond that accounted for by P3. Results suggest that midfrontal signals relevant to target detection and individual differences in alcohol misuse reflect non-phase-locked power that cannot be obtained by ERP analysis alone, and demonstrate the utility of spectral analysis of EEG data as complement to standard time-domain ERP methods.
IS GENDER AN INFLUENTIAL FACTOR IN TYPE-1 DIABETES NEUROFUNCTIONAL EVOLUTION?

University of Guadalajara

Descriptors: gender differences, Type 1 diabetes, neurofunctional study

Type-1 Diabetes Mellitus (T1DM) is commonly associated with microvascular changes that disturb brain metabolism and that might lead to a wide range of cognitive disorders. Even though several findings have described sexual differences in incidence, severity, progression and symptoms in neurological diseases, the impact of gender in cognitive processing in T1DM patients remains unexplored. A sample of 14 young T1DM patients with adequate glycemic control and 14 healthy participants were evaluated with fMRI techniques, comparing BOLD activations while performing a visuospatial working memory task. Behavioral results show no significant between or within-group gender differences in accuracy rates and reaction times. The analyses of functional activation patterns resulted in no significant between or within-group gender differences in accuracy rates and reaction times. The analyses of functional activation patterns showed that females had cortical activations involving more brain regions with larger clusters. Most significantly, the Cumulative BOLD signal was higher in female patients and progressively declined with years of evolution while paradoxically, the Cumulative BOLD signal was higher in male patients and progressively declined with years of evolution while paradoxically increasing in females. Our findings suggest gender might play a significant role in brain metabolism in T1DM patients. These sex-related differences may be explained by the interaction of several factors, nonetheless, the neuroprotective effect of female hormones on microvasculature should be further investigated in this clinical population.

ABNORMAL FEEDBACK-RELATED NEGATIVITY FOR PARTNER’S ERRORS IN CHILDREN WITH AUTISM SPECTRUM DISORDER

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Descriptors: feedback-related negativity (FRN), autism spectrum disorder (ASD), children

Children with autism spectrum disorders (ASD) have difficulties in social interaction, and often exhibit indifference and/or hypersensitivity to others in daily life. However, little is known about neural mechanisms that underlie their monitoring processes of others’ behaviors. The present study aimed to reveal their neural abnormalities in monitoring of others by examining feedback-related negativities (FRNs) associated with partner’s errors. Twenty healthy adults, 21 normal children, and 19 children with ASD performed a two-player-flanker task that consisted of partner and participant’s turns. During the partner’s turn, the participants were asked to observe feedback stimulus (correct or incorrect) and points (gain or lose) given to the partner’s response. In the cooperating condition, points given to two players were summed up together, while those in the independent condition were counted up separately for each player. As a result, healthy adults and children showed larger FRNs to partner’s errors in the cooperating condition than in the independent condition, which was reversed in the children with ASD. These results indicate that neural processes underlying the monitoring of others can be modulated by the social context (i.e., cooperating vs. independent). Moreover, the reduced FRN in the cooperating condition may reflect altered neurological bases of monitoring others’ behavior in children with ASD, which might account for their marked indifference to other people.
Pupil dilation in response to unexpected sounds in infants and adults
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Descriptors: pupil dilation, attention, infants
Unexpected sounds occurring outside the current focus of attention can involuntarily capture attention. The present study focuses on the impact of such deviant sounds on the pupil size as a marker of auditory involuntary attention in infants. We presented an oddball paradigm including four types of deviant sounds (noise, baby cry, phone ring, pitch deviant) within a sequence of repeated standard sounds to 14-month-old infants and to adults. Environmental and noise deviant sounds elicited a strong biphasic pupil dilation response (PDR) in both age groups. In contrast, pitch deviants elicited a significant PDR in adults only. A principal component analysis revealed two components underlying the PDR that differ, depending on deviant types, between the age groups. In infants, baby cry and the noise deviant sounds selectively enhanced the slower component (associated with the parasympathetic inhibition) but not the faster component (associated with the sympathetic activation) but not the faster component (associated with the sympathetic activation) in parasympathetic inhibition) of the PDR. Results indicate age effects in attention to sounds with high arousing potential as indexed by parasympathetic (with sympathetic activation) but not the faster component (associated with the sympathetic activation) but not the faster component (associated with the sympathetic activation) but not the faster component (associated with the sympathetic activation) of the PDR. Results indicate age effects in attention to sounds with high arousing potential as indexed by parasympathetic inhibition and sympathetic activation. Infants are more sensitive to high arousing unexpected sounds than adults. Moreover, results demonstrate that the PDR is a sensitive tool for the investigation of involuntary attention to sounds in preverbal children.

Electrophysiological correlates of attention processing of emotional faces in anxious children
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Descriptors: attention, emotion, event-related potentials
Anxiety disorders (AD) are characterised by selective attention biases towards threat due to a deficit of attentional control. There is an increasing interest for the electrophysiological correlates of these biases. Notably, the P100 is a positive deflection indexing early visual perception processing that appears to be consistently increased in anxious individuals. Accordingly, the P100 has been suggested to be an endophenotype of AD in adults but the question to know if it can index attention biases in anxious children remain controversial. To address this issue, we recorded event-related potentials (ERPs) in sixteen 8 to 12 year-old children with anxiety disorder and 15 age-matched controls. Participants completed an emotional cuing task in which they had to detect a target preceded by a single face displaying disgust or a neutral expression. 50% of the trials were considered as valid since the target appeared in the same location than the face and the remaining 50% were not valid. At a behavioural level, we found that anxious children detected valid target preceded by disgusted faces faster than neutral faces (p = .013) confirming the presence of AB towards threat in AD. We hypothesised the increase attention towards negative faces should be indexed in larger P1 and P2 amplitudes in anxious children. Electrophysiological data are currently submitted to ICA analyses in BrainVision Analyzer and results will be fully developed. We will discuss the implication of our findings and consider the applicability of the attentional control theory in the framework of pediatric AD.

Parasympathetic nervous system functioning predicts changes in self-regulatory behaviors in children exposed to early life stress
Karen Smith, Stephanie Dimitroff, Kelly Faig, Freddy Rockwood & Greg Norman
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Descriptors: early life stress, autonomic cardiac regulation, self-regulatory behavior
Early life stress is associated with emotional and behavioral difficulties. Some evidence suggests autonomic regulation, particularly parasympathetic regulation of cardiac functioning, predicts the effects of early life stress on emotional and behavioral outcomes, as well as children’s susceptibility to interventions on these outcomes. This study examined whether children’s parasympathetic cardiac functioning is associated with social and emotional behavioral responses to a preschool program targeting children exposed to early life stress. 26 children’s behavior and physiological functioning were assessed daily in the classroom via teacher ratings and ambulatory physiological monitors. The study found that children’s regulatory behaviors improved over the program. This change was predicted by children’s parasympathetic functioning at the program’s start. Children with low initial parasympathetic activity had more regulatory difficulties at the start of the program, but demonstrated greater improvement in regulatory behaviors during the program. Further, we explored interactions between parasympathetic activity and behavioral change during the program to determine if behavior changes were paralleled by changes in parasympathetic activity. Overall, these findings suggest that while low parasympathetic activity is associated with initial behavioral difficulties in children exposed to early life stress, these children maintain the capacity to improve social and emotional behavioral regulation, and indeed demonstrate the most improvement during the program studied.

Assessment of the gaze following ability in preterm infants
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Descriptors: prematurity, eye-tracking, gaze following
Previous studies revealed that signs of oculomotor behavior in infants can be considered as the earliest markers of atypical social learning. In particular, preterm infants demonstrated less success in performing gaze following tests compared with normal children. The aim of this study was to investigate the influence of prematurity on the ability to follow the sight of another person with the help of eye-tracker. 19 preterm infants (7 boys, 12 girls) have been examined. The participant’s mean corrected age was 9.97 ± 3.19 weeks. The mean birth weight was about 1664 ± 368 g. The control group included 26 term infants (24 boys, 2 girls). The mean age in the control group was 9.77 ± 3.07 weeks, the mean birth weight was 3379 ± 453 g. Both groups were comparable at the corrected age. Eye-tracker SMI RED-500 with contactless remotely controlled by the infrared camera was used for detecting eye movements. The protocol, procedure and stimuli of gaze following task were identical to those used by Bedford et al. (2014), six videos. The significant differences in the percentage of complete trials were found: premature infants have shown a lower result (49.63% vs 60.50 %, p=0.049,44 p=0.04). The results are consistent with findings of studies where delayed maturation and atypical variants of visual attention in infants with prematurity were obtained. There were no significant differences between groups in fixation duration on model’s face (121,33 ± 2076,24 vs 752,40 ± 487,38 milliseconds, p=0.281). Thus, preterm infants demonstrated the same facial recognition abilities with normative infants.
EVENT RELATED POTENTIALS DURING WORKING MEMORY OPERATION IN ATTENTION DEFICIT CHILDREN AND ADOLESCENTS

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Descriptors: working memory, attention deficit, event related potentials
Working Memory (WM) operation can be assessed by means of the Delayed-Match-to-Sample Tests (DMTS). During the coding and matching phases, a sequence of Visual Event Related Potentials (ERPs) appears, and a slow wave is present during the retention phase. Children presented a higher amplitude than adults in most of these components. During the retention phase, adults presented a negativity extending most of the scalp, while children presented a slow negativity in posterior sites and a positivity in anterior sites. As WM impairment has been considered a core feature of the Attention Deficit Disorder (ADD), it would be important to define the neurophysiology of the DMTS tasks in ADD children. Thirty-two ADD diagnosed subjects and thirty-eight controls (6–17 years old) were recorded during a DMTS visual task. The ERPs amplitudes of ADD and control subjects were compared in the whole period (encoding, retention and matching phase) by means of the cluster mass permutation test. Results showed statistically significant differences between both groups in ERPs amplitude for the slow wave, starting in the last part of the coding phase and continuing during the retention phase; ADD children presented lower amplitude than the control group. Electrodes C6, P4 and P8, located on the right side of the posterior area, showed these significant differences. The lower amplitude of the slow wave in ADD children suggests a dysfunctional activation of the WM, possibly related to the difficulty to focus attention during the coding and retention phases.

EFFECTS OF TRAINING ON PERFORMANCE IN A STREAMING-BASED P300 BRAIN-COMPUTER INTERFACE PARADIGM WITH AUDITORY AND TACTILE STIMULATION

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Descriptors: P300 brain-computer interfaces, study design, training effects
P300 brain-computer interfaces (BCIs) enable people to operate computer programs via electroencephalographic signals and have been applied in various contexts. Despite practical successes, there are still limitations that are in the focus of current research, like the challenge of developing eye-gaze independent BCIs, for example by using auditory or tactile stimuli instead of the common visual stimulation. Recent studies could show that auditory or tactile BCIs using the classic P300 paradigm can be intuitively used and that performance can be improved by training. A promising alternative approach to the classic P300 paradigm has been developed by Hill and colleagues (2014), who arranged auditory stimuli in two streams, thereby altering the classical idea of presenting stimuli sequentially in one stream. In the present study two variations of this streaming paradigm were designed, one version with two auditory and the other with two tactile streams, and the effects of training were examined. 20 healthy participants (age M = 25.30, SD = 5.17, 11 female) absolved three training sessions in 7 days on average. To ensure that the paradigm was engaging, we included the principles pointed out by Lotte, Larrue, and Muehl (2013), as well as ideas from BCI gaming literature. The training effects found in former studies using sequential paradigms could be replicated with both variations of the streaming paradigm, average performance significantly improved during the three sessions. Individual differences, limitations and implications for future research and application are discussed.

HEART RATE AND ELECTRODERMAL ACTIVITY DURING PSYCHOTHERAPY – CAN CHANGES OF BIOSIGNALS BE OBSERVED DURING SIGNIFICANT PSYCHOTHERAPEUTIC EVENTS?

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Descriptors: psychotherapy
Emotion dysregulation is a core symptom of Borderline Personality Disorders (BPD). These patients can be affected by easily triggered, strong as well as prolonged negative emotional reactions. This bias can be problematic in the therapeutic process. Moreover, it can be hypothesized that psychotherapeutic change itself is facilitated by specific emotional preconditions. The aim of this study is to investigate emotional arousal as a mediator variable in the psychotherapeutic process. Our hypothesis states that analysis of heart rate (HR) and electrodermal activity (EDA) constitutes a valuable perspective on emotional arousal during psychotherapy. Adolescent patients with Personality Disorders are treated with Adolescent Identity Treatment (AIT). Significant psychotherapeutic events (SPE; i.e. Ruptures and Resolutions as well as Generic Change Moments) are identified based on video recordings of the psychotherapeutic sessions. EDA and HR are recorded using wearable biosensors. Using a case study approach, biomarker behaviour related to SPE will be investigated. Results will show whether specific biomarker behaviour can be found related to SPE. We are interested in the psychophysiological activity before, during and after SPE. Vice versa, video episodes with strong emotional arousal according to biomarker analysis will be collected to explore what happens during such episodes. Clinical as well as scientific usefulness of psychophysiological markers in psychotherapy will be discussed while considering limitations of the method.

THE ROLE OF MINDFULNESS MEDITATION FOR PSYCHOLOGICAL WELL-BEING AND QUALITY OF LIFE

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Descriptors: self compassion, meditation, progressive muscle relaxation
As it was intended to gain initial results for Mindful Self Compassion (MSC) in clinical surroundings, a Randomized Controlled Trial was conducted in 200 psychiatric inpatients testing the efficacy of a specially designed 6-weeks MSC program as compared with a control intervention of Progressive Muscle Relaxation (PMR). A change in the Self Compassion Scale (SCS) total score, the summary scores on the physical and mental components of the Medical Outcomes Study 36-item Short-Form Health Survey (SF-36), as well as the Global Severity Index (GSI) of the Brief Symptom Inventory (BSI-18) and subjective feeling of happiness were conducted. After six weeks, the MSC group (114 inpatients) showed an increased improvement in SCS, as mean (∙ standard deviation) baseline and six week SCS total for the MSC group were 2.55 ± 0.62 and 2.90 ± 0.51 respectively, versus 2.57 ± 0.54 and 2.57 ± 0.62 for the PMR group (p < 0.01). Mean (± standard deviation) baseline and six week subjective feeling of happiness for the MSC group was 4.25 ± 2.12 and 5.68 ± 2.05 versus 4.30 ± 2.08 and 5.53 ± 2.16 for the PMR group (p < 0.05). Physical and mental components from the SF-36 as well as the GSI from the BSI-18 improved independently of the study group (p < 0.01) at week six. As improvements were maintained at 24 weeks by letter, the higher score of the MSC group concerning SCS remained stable (between group difference in SCS score: -0.50 points; p < 0.001). MSC turned out as to be a beneficial intervention to increase Self Compassion in clinical surroundings.
The present experiment tested this hypothesis. Specifically, participants practiced golf putting with the expectation of teaching another participant how to putt the next day or being tested on their putting the next day. We recorded participants’ EEG and analyzed the 3-s prior to and 1-s after they initiated putter movement. Specifically, we assessed theta power at frontal midline and suppression of upper-alpha power over motor cortex to assess cortical resources allocated to working memory and motor programming, respectively. One day later, all participants completed putting posttests. Behavioral results showed participants who expected to teach exhibited better posttest performance, indicating superior learning. EEG results revealed a linear decrease in frontal midline theta and a linear increase in motor upper-alpha suppression during the time window surrounding put initiation in practice, but no group differences with respect to these measures. EEG results suggest participants progressively withdrew cortical resources allocated to working memory and increased resources allocated to motor programming during the time window surrounding put initiation. However, these processes failed to explain the effect of expecting to teach on motor learning.

Poster 2-080
ALPHA-2 ADRENOCEPTOR ANTAGONIST YOHIMBINE MODULATES CONSOLIDATION OF CONDITIONED FEAR
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Descriptors: fear conditioning/extinction, noradrenaline, yohimbine
Pharmacological and genetic research has identified a significant role for the catecholaminergic system, particularly noradrenaline and dopamine, in acquiring emotional memories. The aim of the present study was to investigate whether the noradrenergic alpha-2 adrenoceptor antagonist yohimbine and the dopaminergic D2 receptor antagonist sulpride modulate long-term fear conditioning and extinction. Fifty-four participants underwent a two-day fear conditioning and extinction paradigm, and received yohimbine (10 mg, n = 18), sulpride (200 mg, n = 18), or placebo (n = 18) prior to an extinction session on day 1. Fear and extinction recall was assessed one day later. We confirmed a successful manipulation of yohimbine on central noradrenergic release by increased alpha-amylase activity for the yohimbine group before and after the extinction session. Importantly, yohimbine treatment prior to fear extinction enhanced fear recall on the following day, as indicated by potentiated fear bradycardia for the yohimbine group. In conclusion, our findings show that the noradrenergic substance yohimbine modulated consolidation of conditioned, but not extinguished fear. We did not find dopaminergic effects on cardiac signatures of fear and extinction consolidation.

Poster 2-079
EXAMINING MOTOR PREPARATORY NEURAL ACTIVITY WHEN PRACTICING WITH THE EXPECTATION OF TEACHING
Marcos Daou, Keith Lobhe & Matthew Miller
Auburn University

Descriptors: motor learning, expecting to teach, cortical resources allocation
Practicing a motor skill with the expectation of teaching it enhances learning, but mechanisms underlying this effect are unknown. It has been hypothesized that expecting to teach increases cortical resources allocated to working memory and motor programming in the moments surrounding skill execution during practice.
Poster 2-082

NEURAL CORRELATES OF INTRUSIVE MEMORY FORMATION AFTER ANALOGUE TRAUMA: THE ROLE OF INDIVIDUAL FEAR CONDITIONABILITY AND EXTINCTION MEMORY
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Descriptors: intrusive memories

Intrusive memories represent a core feature of Posttraumatic Stress Disorder (PTSD). The present study refined the conditioned intrusion paradigm (Wegerer et al., 2013, 2014) to induce analogues of intrusive memories within the fMRI environment with a focus on individual differences in fear conditionability as predictor for subsequent intrusive memories. After fear conditioning using faces as CS and highly aversive 20-sec films depicting interpersonal violence as US, we assessed intrusive memories event-based for three consecutive days via smartphone application. Based on our previous results we expected that intrusive memory formation will be predicted by deficient fear extinction as indexed by exaggerated amygdala responses to CS+ during extinction. Therefore, the modulatory role of extinction on intrusive memory formation was additionally tested via a comparison between subgroups of participants with vs. without an extinction phase immediately following acquisition. Results demonstrated successful fear acquisition, reflected by differential fear network activity and US expectancy ratings. Moreover, neural patterns of individual fear conditionability were linked to intrusive memory formation. Results suggest that extinction memory does not play a prominent role in intrusive memory formation. Rather, episodic memory coupled with accentuated associative fear acquisition memory appears to produce intrusive memories, which is also reflected by neural activity during analogue trauma. Results highlight novel processes potentially related to PTSD vulnerability after trauma.

Poster 2-083

SOCIAL CONDITIONING: INVOLVEMENT OF THE AMYGDALA INDEPENDENT OF STIMULUS VALENCE
Bettina Gathmann, Maximilian Bruchmann, Marie Roth, Maimu Rehbein, Constantin Winker & Thomas Straube
University of Muenster

Descriptors: social conditioning, fMRI, amygdala

The current fMRI study investigated behavioral and neural correlates of social conditioning and whether the learned association might be transferred to ambiguous stimuli. For this purpose, participants were presented with a cover story of a job interview in which they learned which member of the panel talks positively (positive CS+) about the applicant and which person talks negatively (negative CS+) about the applicant after the job interview. Moreover, they learned that two other members of the panel were rather neutral (two CS-) and not involved in this discussion. After this learning phase participants saw faces of these persons as well as ambiguous faces (morphed faces) which were not presented in the learning phase. Raising data demonstrate that the conditioning was successful. Imaging data demonstrate an increased activity in the amygdala to conditioned stimuli (negative as well as positive CS+) compared to unconditioned (CS-) and ambiguous stimuli. This finding suggests that the amygdala is involved in processing emotional relevance independently of stimuli’s valence.

Poster 2-084

GENERALIZING CONTEXT-DEPENDENT FEAR: DOES VAGUS NERVE STIMULATION PREVENT FEAR RELAPSE IN HUMANS?
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Descriptors: fear generalization, transcutaneous vagus nerve stimulation

In animals, vagus nerve stimulation (VNS) improves fear extinction and stabilizes extinction memory preventing fear relapse. We applied a combined cue in context conditioning paradigm in humans and investigated the effects of transcutaneous VNS (tVNS) on context-dependent fear generalization. During acquisition on Day 1, participants received sham tVNS and were guided through 2 virtual offices in which 2 colored lights were alternately switched on. In one office (CTX+), a painful electric stimulus (unconditioned stimulus, US) was administered at the offset of one light (conditioned stimulus, CS+) but not of the other (CS–). In the second office (CTX–), both CSs were presented, but no US. During extinction, 21 participants received tVNS, 20 sham tVNS. The procedure was identical to acquisition, without US delivery. During test on Day 2, sham tVNS was applied. After 3 USs for reinstatement, participants saw the CSs in CTX+, CTX– and an additional generalization context (G-CTX, consisting of 50% CTX+ and 50% CTX–). Analyses of startle responses indicated successful cue and context conditioning and extinction. On Day 2, startle responses were potentiated in CTX+ vs. CTX– and G-CTX. Interestingly, the tVNS group showed slightly lower startle responses to CS+ vs. CS– in G-CTX indicating reduced fear generalization. Sham stimulated participants showed potentiated startles for CS+ vs. CS– in G-CTX. Current results underline the importance of a strong extinction memory to reduce context-dependent fear generalization. Therefore, tVNS might be a promising addition to exposure therapy.

Poster 2-085

WILL YOU MISS ME? NEURAL CORRELATES OF MEMORY ENCODING PREDICT LATER RECOGNITION OF FACES ACROSS THE ATTRACTIVENESS SPECTRUM
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Descriptors: facial attractiveness, event-related potentials, Dm effects

Previous studies showed that attractive faces are less well remembered than unattractive faces, and recognition memory is even worse for medium-attractive faces—less so than of distinctiveness. To investigate whether these differences in face recognition are rooted in encoding, we inspected differences due to memory (Dm) effects in terms of EEG activity for subsequently remembered vs. forgotten items. We tested face memory of 26 participants for attractive, medium-attractive and unattractive faces in an old/new recognition task while simultaneously recording EEG. Memory was best for unattractive faces, followed by attractive and medium-attractive faces. For medium-attractive faces only, early Dm effects were found in the occipitotemporal P2 (200–260 ms), a component thought to reflect aspects of elaborate perceptual analysis, with larger amplitudes for subsequent hits than misses. In the N250 time range (260–400 ms), Dm effects emerged for medium-attractive and attractive faces, but not for unattractive faces. Finally, all faces yielded Dm effects in the late positive component (LPC, 300–700 ms) indicating elaborative mnemonic processing. We conclude that poorer memory performance for medium-attractive, and to a lesser extent attractive faces, may already be rooted in early perceptually driven stages of encoding. Encoding of unattractive faces may be more efficient and effortless during these stages, indexed by absent Dm effects.

Poster 2-086

CORTICAL OSCILLATION INDICATE DIFFERENT MENONOMIC PROCESSES DURING CONTINUOUS RECOGNITION TASK
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Descriptors: EEG, item repetition, cross-frequency coupling

Mnemonic processes are accompanied by changes in oscillatory brain activity, e.g. in the theta (4–7 Hz) and gamma band (> 25 Hz). Recent studies applied “old/new” recognition designs and revealed that gamma oscillation might reflect the activation of object-related memory traces, while theta band activity is attributed to executive control functions. We intended to increase the validity of these findings by repeating “old” items not only once but several times. To that end, we performed high-density EEG recordings during a continuous “old/new” recognition task with up to four repetitions per item (mean item repetition at ~10sec). We examined spectral amplitudes and cross-frequency coupling between theta phases and gamma amplitudes with repetition count as independent variable. We found an increase of theta amplitudes from the initial presentation to the first repetition. Interestingly, theta amplitudes dropped to the level of the initial presentation after the second repetition. In contrast, the coupling of theta phase to gamma amplitudes at fronto-central sites decreased with the second repetition but linearly recovered to its initial values with further presentations. Conclusion: (1) Theta power does not merely mirror genuinely retrieval-related control functions but changes in response behavior from a “new” to an “old” reaction. (2) Cross-frequency coupling might not only indicate the interaction of executive control functions on cortical object representations but also a transition from explicit to implicit processing strategies after multiple item repetitions.
Poster 2-087

ASSESSMENT OF SPATIAL MEMORY USING VIRTUAL ENVIRONMENTS

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Descriptors: spatial representations, memory, virtual reality

In previously studied it was shown the existence of two types of spatial mental representations: egocentric spatial representations (ESR) which encode self-to-object spatial information and allocentric spatial representations (ASR) encoding object-to-object spatial information. In our study the accuracy of ESR and ASR systems has been investigated using the CAVE virtual reality technology. 6 unique virtual scenes consisting of 7 objects located in different 3D positions were constructed. 36 observers were tested. The participant’s task was to remember virtual objects and their locations and then to reproduce a memorized scene in a virtual space using one of three imagined viewer’s positions: 1) the front view (as if they would view the scene from the original view point), 2) the left one (the scene viewed from the left) and 3) the above one (viewed from above). To complete the task the participants chose virtual objects from the object’s library and placed them in a virtual space using a flystik. During the execution object’s locations in virtual space were recorded. The accuracy of spatial representations (perceived metric, topology and depth) was evaluated for each of three imagined viewer’s positions. The results showed the topological accuracy was much better than the metric and depth accuracy. The ESR characteristics (the front view) were more accurate than ASR ones (left and above views). The developed method may be effective to measure the features of two types of spatial representations.

Poster 2-088

DO UNCONSCIOUSLY REGISTERED ITEMS TAKE UP SPACE IN VISUAL WORKING MEMORY?

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Descriptors: continuous flash suppression, working memory, unconscious

The contents of working memory (WM) have been conventionally equated with conscious awareness. Recent experimental findings regarding unconscious visual perception indicate that suppressed items may be retained in WM, much like conscious items. If so, do unconscious items compete with visible items for space? To test this possibility, we analyzed the contralateral delay activity (CDA) while subjects viewed an array of memory items (Gabor patches) within a dichoptic display. Some memory items were suppressed from conscious sight using continuous flash suppression while others remained visible. After an 800-ms delay during which the screen was blank, a test probe appeared at the location of one of the previously displayed items. The participant decided whether the probe matched the orientation of the memory item. Although invisible memory items interfered with memory for visible items (a reduction of K scores from 1.2 to 0.8 items), they were not themselves recalled (K = 0). However, comparison of the CDA waveforms between conditions suggested that invisible items did not decrease the total number of items retained during the delay interval. In fact, CDA amplitudes tended to be larger when invisible items supplemented the visible array. These findings suggest that a degraded representation of invisible items might have been incorporated into working memory. However, these items lacked detail with regard to location and orientation. Consequently, performance was at chance levels when they were probed.

Poster 2-089

EFFECTS OF ACUTE EXERCISE ON MEMORY RETRIEVAL OF INTENTIONALLY REMEMBERED AND INTENTIONALLY FORGOTTEN ITEMS

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Descriptors: acute exercise, event-related potentials (ERPs)

Although previous studies have confirmed the beneficial effects of acute exercise on memory function associated with intentionally remembering items, the relationship between acute exercise and unintentionally remembering remains unclear. According to a neuromaging study examining the roles of the dorsolateral prefrontal cortex (DLPFC; Hoppstadter et al., 2015), exercise may reduce activity of the DLPFC during retrieval of intentionally remembered items. In this study, we tested retrieval processes of both intentionally remembering and intentionally forgetting after acute exercise. Participants (N = 17) performed a memory task during both study and test phases after 20 min of moderate intensity exercise or sedentary condition with order counterbalanced across participants. During the study phase, they were asked to remember pictures following the to-be-remembered (TBR) instruction and to forget pictures following the to-be-forgotten (TBF) instruction. During the test phase they determined whether or not each picture was presented during the study phase. We found that negative deflections at frontal sites (250–400 ms post stimulus) were smaller for correctly rejected new items than both TBF and TBR items in the sedentary condition and TBF items in the exercise condition. Given that memory performance did not differ between the exercise and sedentary conditions, exercise might induce efficiency of the DLPFC activity during retrieval of intentionally remembered items.

Poster 2-090

PREFRONTAL CORTEX ACTIVATIONS AND WORKING MEMORY TASK LOAD: A FNIRS STUDY

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Descriptors: working memory, fNIRS, prefrontal cortex

Previous neuroimaging studies observed correlation between bilateral Prefrontal regions activation and Working Memory (WM) task load. dorsolateral Prefrontal Cortex (DLPFC) activation has been commonly associated with information encoding and response processes, whereas Ventrolateral Prefrontal Cortex (VLPC) activity has been linked with maintenance periods. Most studies have used fMRI to measure those WM related brain activations. We used functional near-infrared spectroscopy (fNIRS) to measure Prefrontal cortex activations across a WM task. 47 healthy right handed female participants took part in this study. Subjects performed a task based on the classic Sternberg Working Memory Task, which involves encoding, maintenance and retrieval phases. Trials consisted in a string of upper case consonant letters followed by a mask and then eight probe letters one by one. Subjects had to answer whether the probe letter was in the previous string or not by pressing the corresponding button. Three different WM task difficulties were presented to each participant (Easy = 4 letters, Medium = 8, Hard = 12). Nine trials were presented pseudorandomly, three for each difficulty. Results indicate more activation in DLPFC and VLPC between Easy and Medium/Hard difficulties. Medium/Hard difficulty trials also reported more activation on Medial Prefrontal Cortex (MPFC) compared to the Easy ones. These results confirm the correlation between WM task load and bilateral Prefrontal activations. It is still open to discuss the role of the MPFC in WM processes.
TWO-VALUE, MODIFIED MONETARY INCENTIVE DELAY (MID) TASK

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Descriptors: ERPs, reward processing, monetary reward

The monetary incentive delay (MID) task has been used to investigate the dynamics of reward processing, and can be utilized to assess multiple anticipatory (cue-P3, CNV) and consummatory (RewP, fb-P3) ERPs. Previous studies have shown that valence (gain vs. loss) can modulate consummatory ERPs, with larger amplitudes for rewards relative to losses. In anticipatory ERPs, incentive cues (possibility of gain/loss) elicit larger amplitudes relative to non-incentive cues. However, previous versions of the MID task do not consider potential feedback magnitude effects, independent and in interaction with reported valence effects. In the current study, we modified the MID task to include two degrees of incentive trials (big win/loss vs. small win/loss) where participants could potentially win $1 or lose 50¢, and win 20¢ or lose 10¢. EEG was collected from undergraduate students at Purdue University (N = 28). There was a significant main effect of feedback magnitude (p < .05) on consummatory ERPs (RewP and fb-P3) where big trials elicited larger amplitudes than small trials. In anticipatory ERPs, we found that big trials elicited a larger but non-significant amplitude in the cue-P3 when compared to small trials, and no differences between incentive trials were found for the CNV. Initial analyzes showed no significant effects of valence on either anticipatory or consummatory ERPs and no significant magnitude x valence interactions. These preliminary analyses suggest that the magnitude of incentive may further modulate consummatory ERPs, and should be considered in future studies.

SUCCESS, ONE STEP AT A TIME: APPROACH-MOTIVATED STATES ENHANCE THE REWARD POSITIVITY DURING PROGRESSIVE GOAL PURSUIT

Hunter Threadgill & Philip Gable
The University of Alabama

Descriptors: reward positivity, approach motivation, goal pursuit

Past research has demonstrated that the reward positivity (RewP) indexes a performance monitoring system sensitive to positive outcomes in approach-motivated states. Presumably, this performance monitoring system signals the evaluation of whether goal pursuit was successful or not, in order to determine if one needs to modify future goal-directed behaviors. However, recent advances in theoretical models of reinforcement learning have suggested that behaviors are not isolated events, but are comprised of action sequences in the pursuit of some goal. The present study sought to go beyond simple stimulus-response paradigms to examine how approach-motivated states occurring in sequential goal pursuit influence neural correlates of performance monitoring. Using a modified monetary incentive delay paradigm, participants played a reaction time game where multiple goal pursuit trials were required to attain a reward. Results revealed that the RewP was larger to positive feedback leading to goal completion and on win feedback as compared to no-win feedback for trials leading to a reward. This difference was not observed on trials where a reward was not possible. Approach-motivated pregoal states appear to enhance performance monitoring for successful goal pursuit throughout the stages leading to a goal.

EFFECTS OF STIMULUS REPETITION ON EARLY AND LATE BRAIN RESPONSES TO CIGARETTE CUES IN SMOKERS AND NEVER-SMOKERS

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Descriptors: event-related potentials, nicotine dependence, emotion

While findings that smokers reliably show higher reactivity to cigarette versus neutral cues are theoretically supported, it is unclear why never-smokers also show enhanced brain responses to these cues. Using a repetitive picture viewing paradigm, in which responses evoked by affective cues are more resistant to habituation, we assessed the effects of stimulus repetition on event-related potentials (ERP) evoked by pleasant, unpleasant, cigarette and neutral images in 34 smokers (SMO) and 34 never-smokers (NEV). We examined the late positive potential (LPP) and early posterior negativity (EPN) components, which are sensitive to a picture’s motivational qualities. During initial picture viewing, emotional cues produced greater LPP amplitude than neutral cues in all subjects. Following repetition, cigarette cues evoked greater LPPs than neutral cues among SMO in the first two repetition blocks. For NEV, cigarette cues evoked greater LPPs than neutral only in the second repetition block. The EPN was modulated by all emotional stimuli, but not by smoking status. While there were no group differences in stimulus ratings of pleasure and arousal, NEV rated smoking cues as unpleasant. Together, these data suggest that cigarette cues are motivationally relevant to both SMO and NEV, but for different reasons.

GUIDED SOURCE SEPARATION FOR PHASE-AMPLITUDE COUPLING USING GENERALIZED EIGENDECOMPOSITION IN A SAMPLE OF CONTACT COLLISION ATHLETES

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Descriptors: concussion, cross-frequency coupling, EEG source

Coordination between brain regions is crucial for healthy cognition, and may be impaired following closed-head injuries that athletes experience during contact sports. One manifestation of inter-regional coordination is phase-amplitude coupling (PAC), which refers to interactions between slower and faster brain rhythms. Based on this idea, and on previous studies linking theta-gamma PAC to performance in response-conflict and other cognitive tasks, we predicted weaker PAC in athletes who have experienced head injury. We recorded EEG during a flanks task in 23 athletes with a history of concussion, and in 16 concussion-free athletes. PAC was identified using a recently introduced source-separation method termed generalized eigendecomposition-based cross-frequency coupling (GEDCFC). This method has several advantages over other techniques including improved signal-to-noise ratio, which is important for our dataset (relatively small trial counts and potentially small effect sizes). We first created a spatial filter that optimized theta-band activity, and then created a second spatial filter that identified networks more active during theta-band troughs (1/4-cycle window surrounding each local minima) relative to other theta phase regions. GEDCFC successfully extracted theta-gamma PAC, and component maps were suggestive of a distributed theta-gamma PAC network. Consistent with our hypothesis, individuals with concussion history had significantly weaker PAC. Results suggest that PAC may be a sensitive measure of brain health, and that PAC mediates inter-regional coordination.
**Poster 2-095**

EFFECTS OF MIGRAINE ON INTERICTAL EEG DURING EYES-OPEN AND EYES-CLOSED REST

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Descriptors: migraine, EEG

EEG changes over the course of the migraine cycle have been widely studied, but many reports omit the details of the conditions under which the EEG was acquired (e.g., eyes open or closed, resting or active). We compared the EEG between small samples of migraineurs (not currently experiencing a migraine; n = 11) and controls (n = 14; similar in age and sex) during eyes-closed rest (ECR) and eyes-open rest (EOR), with particular emphasis on alpha activity. The order of the conditions was counterbalanced. When performing a power spectral density analysis, alpha-theta power was generally higher during EOR than ECR in both groups. Although power was lower in migraineurs than in controls, the difference was not statistically significant; neither was the interaction between factors. The three migraineurs who reported they did not experience aura with their headaches had significantly lower theta-alpha power, specifically in the EOR condition. Analysis of alpha peaks from a fast-Fourier transform showed no significant amplitude differences between groups (although the amplitudes were greater in ECR). However, a chi square analysis indicated that significantly more migraineurs demonstrated a discernible alpha peak in the ECR than in the EOR condition, which was not the case in controls. These preliminary findings suggest that important (although perhaps subtle) differences may exist between ECR and EOR conditions in migraineurs.

**Poster 2-096**

COMPARISON OF THE VISUAL AND AUDITORY EVENT RELATED POTENTIALS OF PARKINSON’S DISEASE PATIENTS WITH AND WITHOUT COGNITIVE IMPAIRMENT

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Descriptors: EEG, Parkinson, P300

Mild cognitive impairment or dementia also occurs along with Parkinson’s Disease (PD). In the present study we aimed to compare P300 components of Visual and Auditory event related potentials (VERP and AERP) of Parkinson’s disease (PD) patients with and without dementia. 12 PD patients without cognitive impairment, 12 PD patients with mild cognitive impairment (MCI) or dementia and 13 healthy volunteer controls (HC) were included in the study. Visual and Auditory oddball paradigms were used as cognitive stimulation. Electroencephalography (EEG) recording was recorded in electrically isolated room and amplified with BrainAmp 32Channel DC System. ERP responses for target and non-target stimulation were filtered between 0.5-30Hz. Repeated measures of ANOVA was used for statistical analysis. P300 peak to baseline amplitude of HC were significantly higher than PD patients without cognitive impairment and PD patients with MCI/dementia in frontal locations upon presentation of visual target stimulation(p<.05). There was also gradual decrease in P300 amplitudes in frontal location from healthy controls to the PD patients with MCI/dementia during auditory target stimulation. However, this difference was not statistically significant (p>.05). The results of our study show that cognitive impairment of PD could be represented with ERP components. This cognitive impairment was represented with decreased P300 component of ERP. However decrease of P300 was mostly seen in response to visual stimulus. There were no statistically significant results in responses to auditory stimulus.

**Poster 2-097**

ABOLISHMENT OF THE LOCKED-IN STATE WITH A BRAIN-MACHINE-INTERFACE (BMI)

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Descriptors: brain machine interface, amyotrophic lateral sclerosis, communication

Completely locked-in patients (CLIS) cannot communicate with any motor response despite intact cognitive and emotional response systems. Four ALS (amyotrophic lateral sclerosis) patients in CLIS learned to respond with a brain oxygenation and deoxygenation change of frontal brain areas using portable NIRS (near infrared spectroscopy) to short questions requiring a yes or no response presented auditorily within 15 seconds. CLIS duration in the four patients has lasted from 4 months to eight years and was validated with EOG measurement during all sessions. Questions with known answers were used to train a support vector machine classifier (SVM). After achieving 70% correct answers open questions were asked and feedback of the classified answer was provided to the patients. EEG from 6 electrodes served to control sleep and vigilance decrement: questions were interrupted if sleep-like patterns appeared. 16 to 60 sessions over several months assured stability of communication with an average correct response rate of more than 70% to known and 90% correct answers to open questions. Among open questions quality of life questions were asked on a weekly basis to three of the patients with longer CLIS duration, all patients report good quality of life as previously reported by our group. Open questions answers are validated by stability over time, information of family and care takers, sentences with semantic errors and face validity. These results suggest that brain machine interfaces using metabolic brain signals may end the unbearable silence of CLIS.

**Poster 2-098**

DIFFERENTIAL EFFECTS OF COGNITIVE LOAD ON AUTONOMIC ACTIVITY IN HEALTHY YOUNG ADULTS DURING A DISHABITUATION TASK

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Descriptors: stressors, autonomics, recovery

The Orienting Reflex (OR), a fundamental biological mechanism that directs an organism’s attention, is sensitive to stimuli novelty, intensity, and salience. OR investigations exploring salience effects have largely focused on magnitude differences between “indifferent” and “significant” stimuli without exploring possible response gradients to differing levels of salience/cognitive load. We investigated the effects of differing cognitive loads on skin conductance response (SCR) and heart rate (HR) in young adults. Two between-subjects cognitive load groups (low [count the stimulus events] and high [form the summed running total of the stimulus events], each n=20) completed an auditory dishabituation task, with two within-subjects conditions: indifferent (listen to a series of pure tones: no task) and significant (cognitive load manipulation). SCRs and HR were greater across trials for the high cf. low cognitive load group and significant cf. indifferent stimuli. Over repetitive trials, SCR decremented and HR increased; these trends were steeper for the high cf. low cognitive load group, and for significant cf. indifferent stimuli for HR only. SCR showed response recovery and dishabituation; this did not differ with cognitive load or stimulus significance. HR reduced to the deviant; this was greater for significant stimuli, but did not differ with cognitive load. Findings suggest that differential cognitive loads influence response adaptation to repetitive stimuli, but do not affect all aspects of OR response patterning including response recovery and dishabituation.
Electro-cortical Responses to Food and Non-food Stimuli Among Individuals With Eating Disorders and Sub-clinical Abnormal Eating Behaviours: A Systematic Review and Meta-analysis

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Descriptors: event related potential, eating behaviour, cognitive processes

A systematic review was conducted to investigate event-related potentials (ERP) in response to food and non-food pictures and words among clinical and subclinical samples with abnormal eating behaviours. Following PRISMA guidelines, 28 research papers were identified from a systematic search in PubMed, Ovid, and Web of Science in March 2017. Higher amplitudes to food stimuli compared to non-food stimuli were found in early processing (early posterior negativity –EPN, N200, P100, P200) among individuals with binge- and restrictive-eating, and controls. EPN amplitudes were higher among participants with bulimia nervosa compared to controls, and P100 and P200 amplitudes were higher among overweight/obese participants compared to controls. Higher amplitudes to food stimuli compared to non-food stimuli were also found in late processing (P300 and late positive potential –LPP) among all groups. Among participants with anorexia nervosa, P300 response to low-calorie food pictures was greater than response to neutral and high-calorie food pictures. Moreover, P300 amplitudes were greater among high versus low external eaters. The results of the meta-analysis are in progress. This review suggests that food stimuli are associated to increased attentional allocation and processing compared to non-food stimuli. More research among clinical populations is needed in order to draw firm conclusions.

Poster 2-100

Brain Activities During Hypnosis-Induced Blockade of Vision: Analysis of Neural Frequency Bands, Dynamics and Coherences

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Descriptors: hypnosis, EEG, cognitive neuroscience

We investigated early and late ERP responses (N1, P2, P3), the cortical dynamics, and coherence between different neural sources in frontal and posterior visual brain areas, and counting errors in 60 participants with different levels of suggestibility exposed to a 3-stimulus visual oddball task. Participants counted one of the rare stimuli. While hypnotized, their vision was suggested being blocked by a virtual wooden board in front of their eyes. Responses were compared to a control condition without visual blockade. Data analyses revealed a significant increase of counting errors and a significant suppression of late ERP amplitudes in the hypnosis condition. This was not observed in the control condition. These effects revealed being a function of suggestibility. Furthermore, while in the hypnotic state, dynamic EEG activity was only reduced significantly in the gamma band as compared to other bands. In addition, a significant change of neural coherence between frontal brain areas and posterior visual areas and a significant change of directed frequency coupling between DLPPC/VLPPC and occipital, parietal and temporal visual areas indicated that gamma oscillation in these visual brain areas became reduced and even partially blocked by slow frontal oscillations in DLPPC/VLPPC. Data are embedded into a framework of executive control, suggesting that the effects of hypnosis might be organized by activities in frontal executive brain areas that control the activity of neural structures in posterior visual areas relevant for correct stimulus recognition and categorization.

Poster 2-102

Stress Reduction via Hypnosis? Influence of Hypnosis on the Physiological Stress Response

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Descriptors: hypnosis, EKG, cognitive neuroscience

Hypnosis and self-hypnosis are assumed to have positive long-term effects for successful stress coping. However, so far it is unclear where hypnosis can instantaneously influence the physiological stress response. To examine this, 48 participants underwent an acute stressor and a control condition in balanced order. Beforehand, sixteen participants were hypnotized inducing enhanced stress coping and posthypnotic suggestions (PHS) are able to reduce the interference of color word meaning with processing print color. It is unclear, however, whether hypnosis alone would also affect the Stroop effect and what are the functional mechanisms underlying hypnosis-related modulation. In our first study highly hypnotizable participants performed the Stroop task in a control condition without hypnosis, after hypnosis alone, and after hypnosis including PHS that words had lost their meaning. Confirming previous reports, after the PHS the Stroop effect was absent. Interestingly, the effect was large and significant in the no hypnosis control but also in the hypnosis alone condition. Neural mechanisms underlying the effects during the Stroop task were addressed with multichannel EEG analyses. Compared to the other conditions PHS increased both frontal theta and frontal beta activity, indicating the additional investment of cognitive control in this condition. In our other study, we address the functional locus of the PHS effect, at the letter perception, lexical access or semantic access during word recognition or the response level. To reach this goal, we utilized different categories of neutral words to systematically investigate and compare the PHS effects, and further, we compare manual and verbal Stroop task versions. Of special interest is to use PHS to explore the word production in the verbal Stroop.
Poster 2-103
QUIET EYE AND EYE QUIETNESS: ELECTROOCULOGRAPHIC METHODS TO STUDY OCULAR ACTIVITY DURING MOTOR SKILLS
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Descriptions: electrophysiology, golf putting
Camera-based eye tracking research has revealed that experts make longer fixations on the target of an action (e.g., the ball in golf putting) prior to and following movement onset, compared to novices. Yet it is not clear how ocular activity affects motor performance. It is possible that the limited temporal resolution of camera systems has held back progress on this issue. We analysed horizontal EOG (512 Hz, 0.1–30 Hz filtered) from ten expert and ten novice golfers as they putted 60 balls to a 2.4 m distant hole. We used multiple voltage thresholds to measure the duration of the final fixation (quiet eye; QE) with its pre- and post-movement onset components. We also measured ocular activity across time as the standard deviation of the EOG. A 2.4 m distant hole. We used multiple voltage thresholds to measure the duration of the final fixation (quiet eye; QE) with its pre- and post-movement onset components. Lower values correspond with greater quietness. Finally, we measured ball address and club swing durations using infrared and sound sensors. Total QE duration did not differ between groups. However, experts had shorter premovement QE and longer post-movement QE than novices. Experts had less QE before movement onset and greater EQ after movement onset. EQ was inversely correlated with QE duration, concurrently validating EQ as an index of ocular activity. Experts had longer swing durations than novices. Swing duration correlated positively with post-movement QE and negatively with post-movement EQ. Our findings provide new evidence that expert-novice differences in ocular activity may reflect differences in the kinematics of how experts and novices execute motor skills.

Poster 2-104
NETWORK ANALYSIS OF UNIQUENESS IN BRAIN BIOMETRIC DATA
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Descriptions: network analysis, biometrics, electrophysiology
Network analysis is an emergent technique that is permeating a variety of fields, from mathematics to social science. Neuroscience is not immune to this trend, where the application of network analysis to understand the interaction of different areas of the brain is increasing drastically, even though it is still a very young field and many challenges need to be overcome before network analysis becomes a reliable tool in neuroscience. The present work explores the application of network analysis to assess the brain biometric uniqueness of brain networks across different subjects in response to the same stimulus in a biometric identification protocol. The network is constructed by measuring phase synchronization between nodes, which in this case corresponds to electrode sites. For each subject, the network is characterized using traditional network measurements, such as average clustering, degree distribution and shortest path length. These characteristics are compared across participants to determine how unique their brain networks are. Results of the network analysis are compared to other methods of analysis for brain biometrics, including convolutional neural networks and a simple cross-correlator. Perhaps surprisingly, neither the network analysis nor the convNet are able to out-perform the simple cross-correlator on a maximal dataset.

Poster 2-105
CEREBRAL BLOOD FLOW VELOCITY COMPLEXITY DURING PAINFUL STIMULATION IN PATIENTS WITH FIBROMYALGIA
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Descriptions: fibromyalgia, cerebral blood flow velocity, complexity
Fibromyalgia syndrome (FMS) is a chronic disorder with unknown etiology characterized by abnormal pain responses with excessive sensitivity. Previous studies using transcranial Doppler (TCD) monitoring have revealed increased cerebral blood flow velocities (CBFV) during painful stimulation in FMS patients. The aim of this study was to evaluate if acute pain induction has any influence on the complexity of the CBFV signals in FMS patients and healthy individuals. Twenty-five female patients with FMS and 25 healthy females participated in the study. Ten warm stimuli (45°C) with a duration of 20 s each were applied to the left forearm of the participants. Each stimulus was preceded by a 60-second baseline (32°C). Lempel-Ziv complexity (LZC) and sample entropy (SampEn) of CBFV signals from middle and anterior cerebral arteries were calculated using Matlab. Results showed that the changes in complexity during painful stimulation were restricted to specific arteries in the case of FMS patients. In the case of the healthy group, a decrease of LZC was observed in the four monitored arteries. In the FMS group, however, the effect was just observed in both anterior cerebral arteries (all p < .045). There was also a significant SampEn decrease in all four arteries in the healthy group, and just in the left anterior cerebral artery in the FMS group (all p < .046). These results are in accordance with previous studies, which showed blunted responses to pain stimulation and stress exposure in several peripheral cardiovascular parameters in FMS patients.

Poster 2-106
EVOKE POTENTIAL AMPLITUDES DURING EMOTIONAL FACE PROCESSING IN PATIENTS WITH FIBROMYALGIA SYNDROME
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Descriptions: fibromyalgia syndrome, emotion, event related potentials
Fibromyalgia syndrome (FMS) is a chronic condition of widespread pain accompanied by symptoms such as depression, fatigue and sleep disturbance. In addition to central nociceptive sensitization, emotional dysregulation may play a role in FMS pathogenesis. This is indicated, for example, by altered reactivity to affective stimuli, selective processing of negative information, and deficits in affective communication and emotion-based decision-making. This study explored the central nervous processing of facially expressed emotions in FMS. Event-related potentials (ERPs) of the EEG were recorded in 34 FMS patients and 38 pain-free controls during exposure to 160 images of faces, which had to be classified according to their emotional content (fear, anger, disgust, or sadness). While patients exhibited an overall weaker early positive potential shift (100-250 ms) than controls, no group differences were found for later potential components, i.e. the P300 or late positive slow wave. Patients rated the emotional faces as less arousing than did controls; classification performance did not differ between groups. ERP results indicate that differences between FMS patients and controls were restricted to early processing stages. The weaker response may reflect less pronounced allocation of processing resources during decoding of the facial expressions. The lack of group difference for later potentials suggests that patients did not differ from controls in the magnitude of the central nervous affective response, which stands in contrast to their lower subjective emotional reactivity.

Poster 2-107
ACCEPTANCE-BASED STRATEGIES REDUCE HEAT PAIN PERCEPTION
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Descriptions: pain regulation, acceptance, emotion regulation strategies
Previous studies showed that emotion regulation strategies such as distraction or reappraisal are capable of decreasing pain. Similarly, acceptance-based strategies, which focus on the welcoming of unwanted thoughts and emotions, were also found to reduce pain. However, studies often lack a suitable control condition making the evaluation of the effectiveness of acceptance rather difficult. Therefore, in the present study we investigated whether acceptance can reduce pain perception in comparison to a neutral condition. To this end, participants were told to react to the pain as they normally would and not to use any regulation strategies during control trials. During acceptance trials, participants should fully experience any responses to the pain. The experiment consisted of 12 randomized trials per condition. A condition cue was presented on a screen, followed by 10 seconds of heat pain. After each trial, pain intensity and monitored unpleasantness ratings were gathered. Additionally, heart rate (HR) and skin conductance response (SCR) were recorded. Results showed significantly decreased pain intensity and unpleasantness ratings for acceptance compared to control trials. In addition, HR was significantly lower for acceptance compared to control trials. However, there were no differences between conditions for the SCR. These results demonstrate the successful reduction of pain by acceptance even compared to neutral control condition. Future studies should compare acceptance with other established emotion regulation strategies in addition to a neutral reference condition.
Poster 2-108

PSYCHOPATHIC MEANNESS AND EMOTIONAL PROCESSING DEFICITS WITHIN THE CONTEXT OF A SOCIAL SUPPORT TASK
Stephany Molina, Meghan Pierce & Stephen Benning
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Descriptors: psychopathy, postauricular reflex, startle blink reflex

The Inventory of Psychopathic Meanness (IPM) is a new measure designed to specifically capture psychopathic meanness in three factors: Malice (agentic disaffiliation),Coldness (lack of emotionality and empathy), and Imperviousness (unreactivity to social censure). In psychopathy, meanness may be driving the maladaptive behaviors that lead to negative interpersonal interactions. Thus, this study sought to validate the IPM through the use of an interpersonal task. Participants were presented with a series of letter cues and informed they may be shocked during one of two letter colors. Participants were instructed to either attend to the color of the letter (threat focus; TF) or the letter case (alternative focus; AF). For half the task, a friend placed a hand on the participant’s shoulder as a form of social support. Postauricular reflex potentiation (CS− vs. CS+) in the TF condition was negatively related to Coldness and positively related to Malice. These findings are theoretically consistent with the lack of emotionality in Coldness and the excessive approach processing in Malice. Reduced startle blink potentiation (CS− vs. CS+) in the AF condition and in the absence of social support (i.e., no friend present) were associated with Malice. Thus, Malice is associated with deficit fear responding. No relationships were found with Coldness and the startle blink. Results suggest that those high in Coldness and Malice show alterations in emotional processing of relief cues, with those high in Malice also displaying deficits in fear processing when alone.

Poster 2-109

THE EFFECT OF IMPULSIVE TENDENCIES ON THE EXPERIENCE OF BOREDOM
Joseph Baschnagel & Ciara Lutz
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Descriptors: impulsivity, boredom, extraversion

Boredom has been found to correlate with impulsivity and extraversion, and its physiological signature is posited to differ across individuals. It is possible that traits such as impulsivity and extraversion lead people to experience boredom differently. Participants (n = 32) completed measures of impulsivity, ADHD symptomology, and extraversion. Participant skin conductance levels (SCL) and heart rate variability (HRV) were measured during a boring and an engaging task. After each task, a balloon analog risk task (BART) was completed. Highly impulsive participants were expected to exhibit lower arousal and HRV overall relative to non-impulsive individuals and during the boring task compared with during the engaging task. Participants with low arousal and HRV during the boring task were also expected to exhibit greater risk-taking after the boring task than after the engaging task. Extraverts were expected to be impulsive and thus show a pattern of low arousal and HRV. Overall participants rated the boring task significantly more boring and negative, and less arousing than the engaging task. SCL did not differ across task condition. A main effect was found for greater HRV during the boring task but this did not differ by impulsivity group. There was no significant difference on the BART across conditions or groups. Extraversion was neither correlated with impulsivity nor did it lead to lower arousal or HRV. It is possible that risk-taking has more to do with an inability to regulate one’s emotion than impulsivity, and future research should further explore this.

Poster 2-110

PSYCHOPATHY AND PSYCHOSOCIAL STRESS: A PHENOTYPIC APPROACH
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Descriptors: psychopathic traits, psychosocial stress, heart rate variability

Introduction: Psychopathic features have been associated with a low reactivity of the autonomic nervous system (ANS), showing a lower potentiation of the startle response to aversive stimulation (Benning et al., 2005). In the present study, we intend to characterize the Boldness, Meanness and Disinhibition phenotypes of the Triarchic Model of Psychopathy (Patrick et al., 2009) in terms of their influence on autonomous activity in response to psychosocial stress.

Methods: 57 healthy young subjects (28 women), aged between 18–36 years (mean age = 23 years old) were evaluated. During the experimental session, heart rate (HR) and HR variability (HRV) were continuously measured. Participants were assessed with the Trier Social Stress Test (TSST) followed by a recovery phase. Statistical analysis focused both on global Psychopathy effects and on the effects of different phenotypes on HRV. Results: Total Psychopathy was associated with a lower HR response to the TSST. Regarding the phenotypes, Boldness was positively associated with the parasympathetic response to the TSST, more specifically to the arithmetic task whereas Meanness was positively associated with the sympathetic response to the same task. Conclusion: This study clarifies the association between Psychopathy and the ANS response to psychosocial stress, highlighting the relevance of the dimension of low fear for the understanding of Psychopathy.

Poster 2-111

NICOTINE DOSE AND DOSE EXPECTANCY FACILITATE STIMULUS CATEGORIZATION, BUT NOT AUTOMATIC AFFECTIVE EVALUATION, OF CIGARETTE STIMULI
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Descriptors: attention, emotion/affect, pharmacology

We investigated the effects of nicotine dose and expected dose on automatic motivational responses to smoking cues to determine whether they influence automatic evaluations of cigarette stimuli. Overnight nicotine-deprived smokers (n=40; 22 women) completed an Implicit Association Test (IAT) at 4 sessions in a balanced-placebo design that crossed cigarette nicotine dose (Given-NIC vs. Given-DENIC) with instructed dose expectancy (Told-NIC vs. Told-DENIC). During the IAT, participants were instructed to quickly classify target pictures (cigarette [CIG] vs. neutral [NEU]) and words (pleasant vs. unpleasant) into one of two paired categories, classified as either congruent (i.e., smoking/bad) or incongruent (i.e., smoking/good). We measured reaction time (RT) and the early posterior negativity (EPN) component of the event-related potential (ERP) to the target pictures and words. Congruent trials resulted in greater accuracy, reduced RT latency, and greater EPN compared to the incongruent trials. Given-NIC showed increased accuracy, increased latency, and decreased EPN compared to Given-DENIC. Similarly, Told-NIC produced increased accuracy and decreased EPN compared to Told-DENIC, but latency was reduced. CIG produced greater EPN than NEU pictures. There were no significant EPN findings for word targets. Both the RT and EPN results support the notion that smokers have negative attitudes toward smoking. While both nicotine dose and expected dose facilitated stimulus categorization, there was no evidence that either factor altered automatic evaluations of cigarette stimuli.
METHYLPHENIDATE SPECIFICALLY MODULATES ONE SUB-COMPONENT OF THE P3 NO-GO ERP COMPONENT
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Descriptors: pediatric ADHD, medication response, independent component analysis

Stimulant medication has a large effect on the P3 no-go ERP component in pedi- atric ADHD stimulant responders. While Independent Component Analysis (ICA) has revealed that the P3 no-go in adults consists of at least two sub- components, a similar decomposition has not yet been performed in children. This study applied ICA to ERPs from 57 (17 girls, 40 boys) children and adolescents (mean age 11.9 years, SD = 2.5 years), with ADHD and classified as clinical methylphenidate (MPH) responders, to investigate whether possible sub- components of the P3 no-go show differential effects of MPH. All participants completed 19-channel EEG-registration on and off medication while performing a 20-minute cued go/no-go task. Group ICA (Infomax) was conducted on the ERPs from both recordings in the time frame of 0-700 ms after no-go stimulus onset. Of the 19 independent components, only two showed midline positivity in the P3 no-go time interval, and were selected for analysis. One component peaked around 385 ms, and the other 425 ms after the no-go stimulus onset. MPH had a significantly larger effect (F(1,56) = 15.47, p < .001, partial η² = .22) on the shorter (mean difference 2.35 μV +/- 0.73) than the later (mean difference 0.46 μV +/- 0.52) latency P3 no-go sub-component. This differential effect indicates functional differentiation of the two sub-components, and that the shorter latency sub-component may shed light on how MPH alleviates the symptoms of ADHD in medication responders.

BRAIN ACTIVATION AFTER AYAHUASCA INTAKE: EMOTIONAL RESPONSE PATTERN DECODED BY MACHINE LEARNING ALGORITHMS
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Descriptors: psychedelic, pattern recognition, fMRI

Ayahuasca is an amazon psychedelic brew used by many different communities for religious purposes. Besides, it has been previously studied as potentially thera- peutic by its anxiolytic and antidepressant effect that is partially explained by its serotonergic synergism. However, few studies have investigated their effect on brain emotional processing. Here we investigate the effect of ayahuasca on brain activation using the pattern recognition analysis (PRA). The PRA has been used to discover regularities in neuroimaging data and discriminate patterns of brain activation from nineteen regular ayahuasca users in two fMRI sessions before and after an oral ingestion of ayahuasca. Pictures of disgust and happy faces were presented to the subjects during each fMRI session. Patterns of brain activation were obtained by contrast images between disgust and happy conditions. PRA used Gaussian Process Classification (GPC) model and “leave-one-subject-out” cross-validation strategy. In GPC model, the algorithm was trained to discrimi- nate aversive face processing before ayahuasca intake from after ayahuasca intake and successfully discriminated patterns of brain activation between those conditions (68.4%, p=0.01). These results suggest that PRA can effectively discrimi- nate both activation before and after ayahuasca intake. A possible explanation is that ayahuasca could down modulate brain activation to aversive stimuli (disgust vs happy, comparing to neutral faces) in a pattern similar to emotion regulation process by reducing defensive response to aversive stimuli.

AFRAID OF EVALUATION OR NUMB TO IT? NEURAL, PSYCHOPHYSIOLOGICAL AND EXPERIMENTAL REACTIVITY TO SOCIAL EVALUATIVE VIDEOS IN SOCIAL ANXIETY DISORDER
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Descriptors: social anxiety disorder, autism spectrum disorder, event-related potentials

Hyperreactivity to negative evaluation is a hallmark of social anxiety disorder (SAD). Whether similar sensitivity exist toward positive evaluative stimuli is equivocal, as is the existence of a psychophysiological basis for such response patterns. The use of naturalistic, jet standardized stimuli might help here. We exposed 35 adult patients with SAD (12 males, age=24.7, SD=8.05) and 35 matched controls (12 males, age=23.8, SD=4.95) to 3-sec. evaluative video clips delivering positive, neutral and negative evaluative statements (32 videos each) directed at the observer. Experiential, electrocortical and psychophysiological responses to the videos were recorded. Results revealed hyperreactivity on unpleasantness ratings to both negative and positive evaluative videos in SAD. By contrast, facial muscular responses (zygomaticus muscle) showed reduced reactivity to both balanced (negative and positive) relative to neutral videos in SAD. Long-latency event related potentials and cardiac responses to the videos did not reveal condition or group differences. The results underscore the rele- vance of fear of positive evaluation – alongside fear of negative evaluation - for subjective stress reactivity in SAD in confrontation with naturalistic stimuli. However, such evaluation fears might be primarily cognitive constructs as psychophysiological reactivity demonstrated equivalent or even attenuated differential responding.

EVENT-RELATED POTENTIALS REVEAL IMPAIRED PAIN EMPATHY PROCESSING IN AUTISTIC INDIVIDUALS
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Descriptors: social cognition, empathy, event-related potentials

Deficits in the social domain are a hallmark of autism spectrum disorder (ASD). Autistic individuals are often described as lacking empathy, yet little is known about empathy processing in ASD. We recorded event-related potentials (ERPs) to compare the dynamics of brain activity during pain empathy in adult individu- als diagnosed with ASD and healthy control participants (HC). Both groups included 21 subjects and did not significantly differ in age, sex, handedness and intelligence. The stimuli were pictures of needle-syringe injections into hands and the background color indicated the ability of the target to feel pain (pain-sen- sitive vs. pain-insensitive condition). We found that individuals with ASD and HC did not differ in the ratings of pain intensity attributed to the target. In con- trast to HC, however, ASD individuals reported no increase in negative affect when observing hand injections in the pain-sensitive compared with the pain- insensitive condition. The analysis of ERPs revealed that a frontocentral positive wave (P2, peaking 180 ms following picture onset), linked with pain and negative emotions in previous studies, was significantly attenuated in ASD individuals. Furthermore, P2 had higher amplitude in the pain-sensitive relatively to the pain- insensitive condition in HC, but this was not found in ASD. Our findings indicate that ASD is associated with an impairment of emotional processing and its regu- lation in response to others’ pain.
FUNCTIONAL CONNECTIVITY OF AMYGDALAR SUBREGIONS DURING EXPOSURE TO DISGUST AND ANGER FACES IN PATIENTS WITH BORDERLINE PERSONALITY DISORDER

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Descriptors: psychophysiological interactions analysis, amygdala subregions, borderline personality disorder

Individuals with borderline personality disorder (BPD) are often overwhelmed by intense and subjectively uncontrollable emotions. This emotional hypersensitivity especially occurs when they are confronted with different types of social threat, such as attack and rejection. The amygdala is one crucial brain area that responds to social threat. However, the amygdala is not a uniform structure, as it can be divided into the superficial (SFA), laterobasal (LBA) and centromedial (CMA) amygdala. Functional connectivity patterns with other brain regions important for affective processing still need to be elucidated for BPD. We investigated 25 females with BPD and 25 healthy women matched with respect to age, handedness and educational level. In a functional magnetic resonance imaging experiment participants were exposed to pictures showing disgusted, angry and neutral facial expressions. To obtain information about the underlying functional connectivity we conducted a psychophysiological interactions analysis. Relative to controls, BPD patients showed higher coupling between the SFA (seed) and the inferior parietal cortex in both emotional conditions, and reported enhanced arousal. When exposed to disgusted faces BPD patients displayed a heightened connectivity between the SFA (seed) and the secondary somatosensory cortex. In the anger condition, the patients exhibited a stronger coupling between the LBA (seed) and the insula, the SFA and the secondary somatosensory cortex. The increased amygdala coupling might be the neuronal basis for the affective hypersensitivity in BPD.

DEFENSIVE MOBILIZATION TO INTEROCEPTIVE THREAT IN PANIC DISORDER PATIENTS: EFFECTS OF EXPOSURE BASED TREATMENT

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Descriptors: panic disorder, startle, symptom provocation

Several studies have suggested a hypersensitivity of the defensive system in panic disorder patients. To test whether this hypersensitivity decreases with successful psychotherapeutic intervention panic disorder patients were psychophysiological monitored during a symptom provocation task before and after an exposure-based treatment (n=40) or after an equivalent waiting period (n=20). Startle response magnitudes, as an indicator of mobilization of central defensive networks, were assessed during a standardized guided hyperventilation procedure and a non-aversive normal breathing control condition. During first assessment both patient groups were characterized by a comparable potentiation of startle response magnitudes in the symptom provocation condition as compared to the control condition, indicating defensive mobilization to the evoked symptoms. The intervention group, but not the control group, was characterized by a clear reduction of the potentiation of starlite eye-blink responses during second (post therapy vs. post waiting period, respectively) assessment. The present results indicate a reduction of increased defensive mobilization in the context of psychotherapeutic intervention.

AUTONOMIC ADAPTIVITY TO STRESS AND PSYCHOTIC SYMPTOMS

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Descriptors: heart rate variability, stress, recovery

A parameter that reflects autonomic adaptivity, the vagal heart rate variability (HRV), is found to be reduced in patients with psychosis. In line with vulnerability-stress-models, high autonomic arousal could be a vulnerability characteristic leading to psychotic symptoms via a diminished adaptivity in the face of stressors. To test this assumption, the present study investigates the psychophysiological responses of participants with differing levels of subclinical psychotic symptoms in different phases of a stress-experiment (i.e., baseline, stressor, recovery). Data acquisition will be accomplished by the time of the conference. Up-to-date, data was analyzed for two extreme groups with elevated levels of subclinical psychotic symptoms. In the preliminary analyses comparing n=28 participants with low HRV (HRV-low) to n=28 participants with high HRV (HRV-high), a significant interaction effect of physiological adaptivity during the experiment, p.<.001, n_s=22, was found. While the HRV-low group showed no significant HRV differences between the phases, the HRV-high group showed the expected reduction of HRV from baseline to stressor, as well as increase in HRV from the stressor to recovery. The implications for psychotic symptoms, perceived control, and subjective stress will be analyzed in the total sample with a larger variance of symptoms. Findings will be discussed in light of a line of research of HRV in psychotic symptoms, of possible mechanisms of symptom formation, and of treatment prospects.

DIFFERENTIAL DYSFUNCTIONS IN STOP-RELATED N2/P3 BETWEEN TIC-RELATED AND TIC-FREE OBSESSIVE-COMPELLUSIVE DISORDER

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Descriptors: obsessive-compulsive disorder, cognitive control, N2/P3

Co-occurring obsessive-compulsive disorder (OCD) with tic disorder (TD) differs from uncomplicated OCD: the former is associated with an earlier age-of-onset and with more miscellaneous and symmetry/ordering OC-symptoms, and affects more males. Little is known whether differences also exist in underlying psychophysiological correlates. To address this question, we recorded event-related potential data from the stop signal reaction time (SSRT) task, a measure of behavioral (SSRT) and neural (stop-signal related N2/P3) cognitive control processes. Preliminary results of 20 OCD patients (ten OCD patients with/without co-occurring TD each), and ten controls are presented. Controls showed a condition effect of increased N2 and P3 amplitudes for correct versus failed stop trials. For tic-free OCD, no condition effect was observed, neither for the P3 nor the N2. Tic-related OCD showed no condition effect for P3 but for the N2. The overall absent modulation observed in tic-free OCD might indicate dysfunctional regulation of cognitive control processes, as it is often found in other action monitoring components. In tic-related OCD, this dysfunction seems to be related only to P3-related processes whereas N2-related processes seem intact. This could reflect dysfunctional inhibitory, response related processes whereas regulation of conflict monitoring appears intact. These differential dysfunctions of cognitive control processes indicate differences in underlying psychophysiological processes and provide further support for tic-related OCD subtype.
NON-LINEAR HEART RATE COMPLEXITY PREDICTS DEGREE OF ANXIETY PROBLEMS IN CHILDREN WITH INTERNALIZING DIFFICULTIES AND HEALTHY CONTROLS

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Descriptors: dynamical systems, cardiac entropy, non-linear cardiac complexity
Objective: Anxiety can be modelled as a dynamical system of negative and positive feedback loops out of balance resulting in overgeneralization of the threat response. Such a system should present with a loss of complexity in output. Sample entropy (SampEn) gives an estimate of non-linear signal complexity in cardiac time series through pattern matching and can give information beyond linear heart rate variability (HRV). Therefore, this study investigates whether cardiac SampEn relates to clinical symptoms of anxiety. Method: Participants were 36 adolescents (9–13 years) with internalizing difficulties and 27 matched controls. Parents filled out the “Anxiety Problems” subscale in the Child Behavior Checklist. SampEn and root mean square of successive differences (RMSSD), a linear measure of HRV that has shown relevance for emotional dysregulation, were computed at rest. The study investigated the predictive power of SampEn and RMSSD on “Anxiety problems” in a Generalized linear model. Results: The full model with SampEn and RMSSD as predictors of Anxiety, and age, gender, group, BMI and group x SampEn as controlling variables was significant (p < .001). SampEn (p = .030) was a significant predictor of anxiety, while RMSSD (p = .92) was not. There was no group x SampEn interaction (p = .13). Conclusions: Lower cardiac complexity as indexed by SampEn is a potential marker of dysregulation in the underlying dynamical processes contributing to anxiety. SampEn is an important complementary measure to linear cardiac indices, outperforming RMSSD as a predictor of anxiety in this study.

LONGITUDINAL DEVELOPMENT OF HEART RATE VARIABILITY AND BORDERLINE PERSONALITY DISORDER SYMPTOMS IN ADOLESCENTS WITH NON-SUICIDAL SELF-INJURY

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Descriptors: borderline personality disorder, heart rate variability, non-suicidal self-injury
Resting state high-frequency heart rate variability (HF-HRV) is reduced in borderline personality disorder (BPD). In adolescents with non-suicidal self-injury (NSSI), HF-HRV is inversely correlated with BPD symptoms. The study aimed to investigate if longitudinal changes in BPD symptoms are associated with changes in HF-HRV in adolescents with NSSI over time. HF-HRV was recorded in female adolescents with NSSI (n = 17) according to DSM-5 section 3 diagnostic criteria who completed a baseline assessment and a one-year follow-up. Physiological data, structured clinical interviews and self-reports on psychopathological distress were obtained at both time points. Patients showed clinical improvements indicated by a reduction of depressive symptoms (z = 3.74, p < .001), NSSI frequency (z = 3.79, p < .001), and increases in the level of functioning (z = 2.87, p = .004). No significant differences were observed on resting state HF-HRV (z = 0.94, p = .348) recorded at baseline and follow-up. Changes in BPD symptoms were significantly associated with changes in resting HF-HRV (r(17) = -.516, p = .033). Longitudinal changes in BPD symptomatology in adolescents engaging in NSSI are associated with changes in resting state HF-HRV. Results bear promise with respect to the implementation of measures of HF-HRV in the monitoring of patients and outcome assessment within psychiatric research. Future clinical studies are necessary to investigate the utility of HF-HRV to track treatment outcomes in adolescents with BPD.

ABERRATIONS TO CEREBELLAR-CORTICAL EFFECTIVE CONNECTIVITY IN SCHIZOPHRENIA DURING SENSORIMOTOR SYNCHRONIZATION

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Descriptors: schizophrenia, cerebellum, timing
Sensorimotor synchronization, a temporal processing task dependent on the cerebellum and previously shown to reveal robust impairments in individuals with schizophrenia, can serve as an ideal behavioral and neural probe of cerebellar function. We assessed cerebellar connectivity to associated cortical and subcortical circuits and cerebellar contributions to cognitive processes dependent on temporal processing using this task. Participants (N = 40 healthy, 31 schizophrenia) underwent three 6-minute fMRI scan sessions during a sensorimotor synchronization finger-tapping task including synchronization (tone-paced) and continuation (self-paced) tapping at a 500ms intertap interval (ITI). Behavioral data revealed impaired timing in schizophrenia, represented by shorter and more variable ITIs during continuation, greater clock (vs. motor) variance, and greater force of tapping. During continuation, we observed decreased effective connectivity between cerebellum and primary motor cortex and increased connectivity between cerebellum and thalamus in the schizophrenia group. Further, cerebellar activation in this task was correlated with Digit Symbol performance in the healthy group. Consistent with previous studies, findings suggest that the cerebellum is heavily involved in sensorimotor continuation, particularly in the millisecond range, as well as other cognitive processes. Moreover, findings point to disrupted temporal processing in schizophrenia related to observed aberrations to direct cerebellar-cortical connections and indirect connections to cortex via subcortical structures.

ANXIETY ON THE BRAIN: EMOTIONAL SCENE VIEWING AND NEURAL ACTIVATION

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Descriptors: emotion, anxiety, fMRI
Neural activity (measured using functional magnetic resonance imaging; fMRI) is enhanced when viewing emotional, compared to neutral, scenes in brain regions associated with general motivational engagement (i.e., amygdala, anterior insula) as well as specific regions associated with appetitive motivation (i.e., striatum, medial-prefrontal cortex). Here, we investigated functional brain activity during picture viewing in a large sample of patients (n = 133) covering the spectrum of anxiety/mood disorders (e.g., social phobia, generalized anxiety, post-traumatic stress disorder, panic disorder, specific phobia, and depressive diagnoses), plus 24 healthy controls. Participants were engaged in a free-viewing task in which each 6 s trial presented 18 pictures depicting either violence, disgust, traumatic stress, neutral objects, neutral people, families or erotica at a rate of 3 pictures per second. Each hedonic-content was presented 3 separate times, with a total scan time of 5 minutes. Despite the rapid presentation and the limited number of trials per condition, we replicated previous data finding enhanced BOLD reactivity for highly arousing emotional contents (either pleasant or unpleasant) compared to neutral stimuli in regions classically associated with emotional processing (i.e., amygdala, insula, striatum). Overall, this effect of increased activation is more pronounced in patients than controls, and among patients, greater activation was associated with increased comorbidity.
VISUAL SYMPTOM PROVOCATION IN SKIN Picking DISORDER: AN FMRI STUDY
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Skin-picking disorder (SPD) is a common mental disorder, characterized by recurrent and excessive picking of dermatological irritations. Only little is known regarding the underlying neuronal mechanisms. This functional magnetic resonance imaging study tested whether SPD might be conceptualized as pathological grooming motivated by increased disgust proneness. The current study used a visual symptom provocation design. Twenty-five women with SPD and 19 matched controls viewed and rated images depicting skin irregularities and smooth skin, without engaging in picking behavior. Relative to controls, SPD patients reported more disgust and urge to pick when looking at skin irregularities. This was accompanied by greater activation in the amygdala and insula, and stronger insula–putamen coupling. Disgust feelings elicited by viewing skin irregularities were positively correlated with activation of the insula, the amygdala, and the putamen, in the clinical group. On personality questionnaires, the SPD patients reported elevated self-loathing and problems in regulating their disgust feelings. The current study provides first evidence for elevated body-focused disgust on a trait and state level in SPD patients.

UNIQUE AND SHARED VARIANCE ACROSS EXTERNALIZING DISORDERS AND RELATIONSHIPS WITH ERROR MONITORING
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A prominent characteristic of externalizing psychopathology is insensitivity to negative consequences incurred by harmful behaviors. This tendency has been associated with deficits in error processing (ERN and Pe). The present study examined the level of concordance between symptom information and neurocognitive indices of this potential vulnerability across externalizing conditions (e.g., substance use, antisocial, conduct disorder). A bifactor model was estimated to generate a general externalizing latent factor, representing shared variance, and condition-specific latent factors, representing unique variance across DSM-IV Externalizing Personality Disorder, Conduct Disorder, Alcohol Dependence, and Drug Dependence symptom counts in community participants with criminal histories (N = 465). A subsample (N = 56) had their brain activity monitored during a letter flanker task to examine relationships between error-related negativity (ERN) and positivity (Pe) with the general and unique factors. Consistent with hypotheses, analyses revealed modestly smaller mid-frontal ERN (but not Pe) among individuals higher in externalizing. The unique variances associated with conduct disorder and drug dependence, respectively, were related to modest decreases in frontal ERN and increased average Pe across midline sites. These findings provide preliminary support that error monitoring is one potential vulnerability across externalizing symptoms, whereas enhancements in error awareness account for some of the unique variance in drug dependence beyond the influence of externalizing tendencies.

ACUTE PSYCHOSOCIAL STRESS REDUCES THE MAGNITUDE OF THE REWARD POSITIVITY
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Abnormal neural responses to rewards have been implicated in multiple forms of psychopathology, but how these reward processing deficits arise is not entirely clear. Neural systems mediating reward processing appear to be acutely sensitive to psychosocial stressors, but few studies have demonstrated direct effects of stress on neural responses to rewards. To that end, this study examined the effect of stress on the reward positivity (RwP), an event-related potential that is maximal 250–350ms following the receipt of rewarding feedback, in an unscreened sample of adult males. The RwP was recorded while participants completed a simple monetary reward task both before and after the Montreal Imaging Stress Task (MIST), a computerized arithmetic test commonly used to induce stress in a laboratory setting. In the experimental condition, the difficulty of the MIST was calibrated to be beyond participants’ ability, and was completed under conditions of social evaluative threat; in the control condition, the MIST was easy, and no social stressor was involved. Results suggest that in the experimental condition, acute psychosocial stress significantly reduced the magnitude of neural response to monetary reward compared to baseline. No such effect was evident in the control condition. These data suggest that abnormal reward responding may represent a mechanism by which stress leads to the emergence of multiple forms of psychopathology.

EFFECTS OF MISSSPECIFYING RESPIRATORY FREQUENCIES ON COMPUTATIONS OF RSA ACROSS DEVELOPMENT
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Low resting respiratory sinus arrhythmia (RSA) and/or excessive RSA reactivity mark most psychiatric disorders that are characterized by emotion dysregulation, including both internalizing (e.g., depression) and externalizing (e.g., conduct disorder) syndromes. In both cases, deficiencies in RSA become more pronounced with age. To date, however, many studies have used respiratory bands that are appropriate for adults—not children. This is problematic given that young children breathe at twice the rate of adults. Thus, apparent developmental shifts in resting RSA and RSA reactivity could be methodological artifacts. To examine effects of misspecifying respiratory frequencies across development, we reanalyzed resting RSA and RSA reactivity to emotion evocation in a longitudinal sample of middle school children (N = 204), ages 8–12 years at study entry. All were assessed on three occasions, one year apart. RSA was calculated using FFT (with and without age-appropriate respiratory frequencies) and autoregressive (AR) spectral analysis. Consistent with previous cross-sectional findings, adult frequency bands overestimated resting RSA and underestimated RSA reactivity at all time points, especially among the youngest participants. These findings suggest possible literature-wide biases in resting RSA and RSA reactivity, and in developmental trajectories of both.

DYNAMIC CHANGES IN RELATIVE PULSE TRANSIT TIME DURING MENTAL EFFORT
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Pulse transit time (PPT) is a simple, non-invasive measurement and an appropriate parameter for stress measurement, but few quantitative data are available with respect to the psychophysiological significance of the pulse transit time relative to the RR intervals. Objective: The aim of this study was to investigate the effect of the mental effort test on the pulse transit time relative to the RR intervals. Methods: In a crossover design, 13 subjects (19 ± 1.5 years of age) evaluated the effect of the mental stress test on the PPT-onset and PPT-peak absolute and relative to the RR intervals obtained by ECG and pulse tonometric signal in poligraphy device (AD Instruments Powerlab 8B) for 5 min of rest and during 5 min of responses to mental stress (arithmetic test). Results: Examining changes over time there was a finding in significant increase in the difference (p = 0.006) between PPT-onset and PPT-peak relative to the RR intervals which were greater in the absolute PTT (p = 0.001) during the mental stress test. Conclusion: These results suggest that pulse transit time, relative to the RR intervals could be more suitable for showing cardiovascular changes, during psychophysiological stress.
OBJECT SUBSTITUTION MASKING IMPAIRS PERCEPTUAL INTEGRATION OF HUMAN FACES

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Descriptors: perceptual integration, object substitution masking

Traditional models of visual processing assume a strict hierarchical bottom up processing stream from ocular to higher order regions. However, recent evidence points to the importance of top down influences from higher to lower order areas in perceptual integration. Perceptual integration of two-tone Mooney faces has been associated with increased EEG and MEG gamma band responses (>30 Hz, [1, 2]). Critically, we have reported a top down modulation of visual cortex gamma band responses by higher order cortical areas [2]. Interestingly, behaviorally studies have shown that Object Substitution Masking (OSM) seemingly disrupts these top-down interactions. However, there is no study so far that showed that OSM indeed impairs top down influences during visual perceptual integration as indexed by reduced neuronal processing. Therefore, we evaluated induced MEG gamma band responses during a Mooney face detection task and OSM. OSM significantly reduced Mooney face detection at the behavioral level (p < 0.05). Importantly, as shown by cluster based permutation tests, OSM almost abolished MEG gamma band responses at right fronto-parietal and occipital sensors between 274 and 811 ms post-stimulus onset (cluster p < 0.05). Using an lcmv beamformer, this effect was localized to right frontal and occipital cortex (p < 0.001, uncorrected). Our study shows that OSM disrupts top down feedback to visual cortex indexed by reduced fronto-occipital cortical gamma band responses and impaired Mooney face detection.


THE EFFECTS OF POLYMODAL INTEGRATION ON THE PATTERN OF BRAIN ACTIVITY

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Descriptors: polymodal, ERP, source localization

Brain mechanisms of polymodal integration were researched. Experiment consisted of 5 sessions. Photos and bleating of sheep were used as stimuli. Such material molds into polymodal images naturally and does not represent personal experience of the participants. In the first two sessions visual and acoustic stimuli were presented separately. In the third session they were presented simultaneously (each photo was linked to a matching bleat) to form associative connections. In the last two sessions at first only one part of the image was shown then after a pause the other part was shown. The participants (N = 20, age 17–20) were asked either the parts were matching. Throughout the sessions EEG was registered (19 active electrodes). Five EPRs were averaged (one for each session). Then sources of brain activity were computed using dSPM (Dale et al., 2000) algorithm. The sources’ coordinates were applied to averaged brain surface anatomy model (ICB-M152) using BrainStorm SoftWare (Tadel et al., 2011). Activation of every brain structure was calculated according to the Desikan-Killiany algorithm. When the polymodal image was formed activation of the complementary part of the polymodal image. This activation did not depend on whether the stimulus was visual or acoustic. Neither did it depend on the place of the stimulus in the sequence. In control sessions activation of this area was not present.

DIFFERENT FEATURE BINDING BRAIN MECHANISMS ARE RESPONSIBLE FOR THE MEANINGFULNESS OF THE PRESENTED VISUAL STIMULI, DEPENDING ON THE OBJECT CATEGORY

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Descriptors: visual perception, magnetoencephalography, representational similarity analysis

Recent studies using representational similarity analysis (RSA) have characterized the spatial patterns of brain activity in the processing of the distinct object categories through their relations to computational models. Nevertheless, highly dynamic processes, through which brain forms a meaningful representation of objects, remain not discovered. In the present study, using magnetoencephalography (MEG), we examined how category structure emerges in spatiotemporal patterns of brain activity. For this, we developed the novel approach for region-based pattern classification analysis, which allowed keeping spatial specificity of data entering into the time pattern classifiers. In the study participants viewed binocular images either meaningless or representing objects from two meaningful categories (faces and tools). The main finding was the two distinct spatiotemporal patterns characterizing the meaningfulness of the images. The face specific pattern discriminating the faces from both the tools and nonsense stimuli was related to bilateral activation of ventral occipito-temporal areas at 140–170 ms, while the tool-specific activation was shifted to the later time window of 190–220 ms and comprised parietal regions of the left hemisphere. The “supra-category” brain network whose activity started at 250 ms was common for both meaningful categories and included the sparse assemblies within parietal, temporal and prefrontal regions. The results suggest that the brain might use distinct feature binding mechanisms to form meaningful representations of different categories of objects.
Poster 2-133

VARIABLE EAR STIMULATION AND VISUAL ATTENTION INTERFERE WITH BINAURAL INTERACTION IN HUMAN AUDITORY BRAINSTEM RESPONSE

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Descriptors: binaural interaction, auditory brainstem response, attention
Binaural interaction in the auditory brainstem response (ABR) denotes the waveform discrepancy between a binaural response and the sum of monaural responses. The DN1 is a typical binaural interaction component (BIC) in the human ABR that represents binaural amplitude reduction in reference to the summed monaural amplitude occurring at wave-V latency. The current study examined the effects of variable sound delivery to ears and of intermodal attention on the DN1. Tone bursts (1000 Hz) and clicks at 35 dB sensation level were presented to participants by monaural left, monaural right, and binaural stimulation (stimulus onset asynchrony at 180 ms). The experimental group received the three kinds of lateral stimulation randomly during a session. The control group received only one kind of lateral stimulation per session. The DN1 in response to tone bursts was absent for the experimental group during both auditory and visual attention, whereas it was present for the control group during auditory attention. The DN1 in response to clicks became weak for the experimental group during visual attention compared to auditory attention, while it was robust for the control group during visual attention. The above outcomes in humans suggested that (1) the DN1 evoked by tone bursts was vulnerable in comparison with the click-evoked DN1 and (2) variable ear stimulation and visual attention both interfered with the DN1 occurrence.

Poster 2-134

THE INFLUENCE OF STIMULUS ROTATION SPEED ON VECTION PERCEPTION IN VIRTUAL REALITY

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Descriptors: vection, virtual reality, eye movements
Vection describes the sensation of ego-motion induced by moving visual stimuli that cover a large part of the visual field. This experiment investigated whether perception of visually induced circular vection is changed if rotational velocities of 20, 40 or 60 °/s of stimuli are used. In the present study we used the eye tracking to examine parameters of optokinetic nystagmus (OKN) during vection perception. Vection was evoked by the rotating optokinetic drum with black and white stripes in CAVE virtual reality system. 16 participants with healthy vestibular systems took part in this study. Subjects passively observed rotating stimulation and pressed the button to indicate the vection appearance. Several dependent measures were obtained: vection onset latencies, vection intensity, Simulator Sickness Questionnaire (SSQ) scores to evaluate motion sickness. Moreover we analyzed durations of OKN slow phases in period of 10 seconds after pressing a button. It was found that for all stimuli velocities OKN slow phases were longer than for all. SSQ scores to evaluate motion sickness. Moreover we analyzed durations of OKN slow phases in period of 10 seconds after pressing a button. It was found that for all stimuli velocities OKN slow phases were longer than for all. It is suggested that the increase in OKN slow phases durations reveals the attention shift from moving stimuli perception to self-motion illusion perception. Therefore the OKN dynamics may be used as objective indicator of vection periods identification.

Poster 2-135

GENERATORS OF THE FREQUENCY-FOLLOWING RESPONSE TO SOUNDS OF DIFFERENT FREQUENCIES: AN MEG STUDY

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Descriptors: auditory, frequency-following response, magnetoencephalography
The auditory frequency-following response (FFR) to periodic complex sounds provides a non-invasive measure of the neural transcription of sounds, as well as how auditory experiences transform these representations. Since seminal studies, it has been assumed to originate from subcortical structures of the auditory pathway. Yet, the single study published so far using magnetoencephalography (MEG) to locate the sources of the FFR challenged this assumption, demonstrating that FFR receives major contribution from the auditory cortex. Based on frequency-specific phase-locking capabilities along the auditory hierarchy, we hypothesized that FFRs to higher frequencies would receive less cortical contribution than those to lower frequencies, hence supporting subcortical involvement for these high-frequency sounds. We recorded simultaneously electroencephalographic (EEG) and MEG FFRs to pure tones of 89 and 333 Hz, delivered with a jittered stimulus onset asynchrony ranging 241–265 ms. To allow a more precise source separation, individual anatomical MRIs of all the participants were obtained. FFRs elicited to high and low frequency sounds are observable on both MEG and EEG recordings. By using distributed source modelling; midbrain, thalamic, and cortical contribution to FFR is analyzed and described. These findings are relevant for our understanding of the neural encoding of sounds along the auditory hierarchy, and suggest a hierarchical organization of periodicity encoding.

Poster 2-136

ACTION-RELATED AUDITORY ATTENUATION IN YOUNGER AND OLDER ADULTS

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Descriptors: action, auditory, ERP
The processing of stimuli presented in close temporal proximity to actions is often attenuated. The present study investigated whether action-related auditory ERP attenuation differed between younger and older adults. Healthy younger (19–26 y) and older (61–73 y) adult women applied force impulses on a force sensitive resistor in an interval production task. In Motor-Auditory blocks, actions resulted in the presentation of 1 kHz, 100 ms tones with an intensity individually adjusted to 50 dB above hearing level. In Motor blocks, actions did not result in tone presentation. In Auditory blocks no actions were performed, only a tone sequence previously produced in a Motor-Auditory block was replayed. The auditory ERP elicited in the Motor condition was estimated by subtracting the ERP recorded in the Motor condition from the ERP recorded in the Motor-Auditory condition. EEG was recorded with nose-reference. The comparison of the Auditory ERPs showed no difference between-group N1 or P2 amplitude differences, but the N1 polarity-inversion at the mastoid leads was stronger in the older adult group. Action-related N1-attenuation (i.e. the difference between the estimated auditory N1 from the Motor-Auditory, and the N1 elicited in the Auditory condition) was present, but its amplitude did not differ between the two groups. Similarly to the N1 itself, the attenuation-effect showed a stronger polarity-inversion at the mastoids in the older adult group. No action-related P2 attenuations were found, but the N1 attenuation effect persisted longer in older than in younger adults.
MODIFICATION OF THE PSYCHOPHYSICAL MODEL OF THE SIGNAL DETECTION THEORY FOR SOLVING SENSORY TASKS WITH SIGN-ALTERNATING DIFFERENTIAL STIMULI

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Descriptors: sensory task, sign-alternating differential signal, psychophysical model of the sign-alternating differential signal detection theory

The construction of functions connecting the objective world of stimuli with their subjective experience is the main task of psychophysics. The classical works of Weber, Fechner, and Stevens, as well as a common psychophysical model of the signal detection theory, are devoted to resolving this problem. The model has 4 outcomes and is intended for a quantitative description of the sensory task solution for detecting the presence of a signal, but not a signal sign. This circumstance limits the scope of the model. Purpose: To propose a modified model of a sign-alternating differential signal detection theory. The differential signal is represented by a differential stimulus in the form of two single stimuli. The subject must answer the question if he discovers the difference in the stimuli and, if so, which stimulus is “more intense”. In other words, the subject is presented with a differential signal, which can be negative, zero or positive. The subject answers what signal he detects: negative, zero, or positive. Thus, there are nine possible outcomes in the modified model. In particular, this refined model takes into account the presence of outcomes when a positive signal is presented but a negative signal is detected and vice versa. We designate these outcomes as inversions. Such events are not foreseen by the common model. The proposed modified model of the sign-alternating differential signal detection theory with nine outcomes is a more general case and can be used to construct more precise psychophysical functions.

FACIAL EXPRESSION PERCEPTION: HOLISTIC AND ANALYTIC STRATEGIES OF EYE MOVEMENTS

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Descriptors: facial expressions, eye movements, analytic and holistic strategies

Perception of facial expressions is very important in individual social interactions. The aim of our study was to reveal individual types of eye movement strategies that people use when perceiving composite facial expressions. Term “composite face” means a specific stimulus: human face which is generated from two photos of the same person showing one basic emotion in the upper part of the face and another basic emotion in the lower part. We constructed 30 composite faces: 15 male faces, 15 female faces which were images of six basic emotional expressions of a male and a female poser, combining Happiness and Anger in upper or lower face with other 5 expressions. 20 participants (9m, 12f) volunteered to take part into the study. The stimuli were demonstrated on an LCD-display (23 inches, 1920x1080px) at a distance of 0.75m. In each probe the fixation cross in the lower left part of the display was presented for 1500ms and then composite faces for 3000ms. The participants were asked to choose out the expression of the presented face using the list of seven basic emotions (neutral, sadness, disgust, happiness, fear, anger, surprise). During the performance eye movements were recorded by iView X Hi Speed 1250. The heat maps and scanpaths were analyzed to classify the holistic and analytic strategies of eye movements. Our data showed that approximately 25% of the participants tend to use holistic eye movement strategies and have a long fixation in the nose region, while the other 75% show a clear analytic type with the hottest spots on eyes and mouth.

THE EFFECT OF SLEEP DEPRIVATION ON INTER-TRIAL COHERENCE OF THE P100, ERN AND CRN

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Descriptors: sleep deprivation, inter-trial coherence, EEG/ERP P100 CRN ERN

Sleep deprivation is known to impair brain function and leads to increased variability in tasks requiring a timed response. Jackson et al. (2008) found that 27 hours of sleep deprivation had no effect on the P100 amplitude, but diminished the P300 amplitude, concluding that the effects of sleep deprivation occur during cognitive processing. Instead of examining averaged ERP amplitudes after sleep deprivation, we examined the inter-trial coherence (ITC), a measure of phase angle alignment across trials in components CRN, ERN, P100 and N170. The CRN and ERN are response locked and produced after correct and error responses, respectively, and the P100 and N170 are stimulus locked and elicited during early stages of visual processing. Participants (N=11, mean age=20 y) were tested after 2 hours and after 20 hours of wakefulness (counterbalanced). A blink task was presented during each session and 128 channel EEG was recorded. ICA was used to eliminate movement artifacts. Trials were bootstrapped 1000 times with 20% trimmed means to produce the ITC results. The ITC for the CRNs was higher in the alert condition, but the ERNs showed no difference in ITC (but of course there were few errors compared to correct responses). The sleep depritive condition ITCs were significantly higher at 150 ms, i.e., during the descending arm of the P100 leading into the N170. These results provide evidence that effects of sleep deprivation occur during both cognitive decision making and during some stages of early visual information processing.

SLEEP LOCUS OF CONTROL, ANXIETY, AND AUTONOMIC REACTIVITY AS PREDICTORS OF SLEEP IMPROVEMENT FOLLOWING A BRIEF SLEEP HYGIENE EDUCATION PRESENTATION

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Descriptors: locus of control, autonomic nervous system, anxiety

Previous studies examining sleep education programs for college students have produced mixed results. The focus of the current study was to investigate sleep locus of control, anxiety, and autonomic measures as predictors of sleep improvement following a brief sleep hygiene education presentation. Undergraduate volunteers wore Fitbit activity bands for a two-week period. They then returned to the lab where they underwent a sleep hygiene assessment, received feedback, and viewed a sleep hygiene presentation while we recorded Heart Rate (HR) and Skin Conductance (SC). They then wore Fitbit bands for an additional two weeks. We hypothesized that participants with a more internal sleep locus of control, lower trait anxiety, higher HR Variability at baseline, and greater autonomic responses to the sleep education intervention would benefit the most in terms of improved sleep quantity and sleep efficiency. Preliminary results indicate both sleep locus of control and trait anxiety as significant predictors of improved sleep efficiency. In addition, size of the skin conductance response to the sleep hygiene assessment was also positively related to improved sleep efficiency. Parallel analyses with HR and HRV variables will be presented. Overall, these results suggest a valuable role for sleep locus of control, anxiety, and autonomic measures as potential mediators of the effect of sleep education on improved sleep outcomes in a college student sample. Benefits and limitations of using wearable technology for objective sleep assessment and improving sleep self-efficacy will also be discussed.
Poster 2-141
FACIAL TRUSTWORTHINESS JUDGEMENT AFFECTED BY FACIAL EMOTION AND FACE GENDER: AN ERP STUDY
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Rennin University of China

Descriptors: trustworthiness, EPN, LPP
Judging the trustworthiness of strangers from facial appearance is a vital process in the first impression formation. Evidence has indicated that facial emotion and face gender biased facial trustworthiness judgment. However, it is unclear when such effect occurs. The present study focused on the time course of the effect of facial emotion and face gender on trustworthiness by measuring the event-related potentials (ERP) elicited by faces perceived as (un)trustworthy. Nineteen undergraduate students participated in a facial trustworthiness judgment task that consisted of two blocks. The emotion block included happy and neutral male faces, while the gender block included neutral female and male faces. Results showed that the effect of facial emotion occurred earlier than the effect of gender. That is, happy faces were judged as more trustworthy and elicited larger ERP (200–350ms) than neutral faces. In addition, female faces were perceived trustworthy and elicited larger LPP (300–500ms) than male faces, whereas male faces were perceived more untrustworthy and elicited larger LPP. These findings suggested that both facial emotion and gender can influence trustworthiness judgment, but the effects occur at different stages of processing.

Poster 2-142
SOCIAL EXCLUSION ENHANCES LATE POSITIVE POTENTIAL AMPLITUDES DURING A VIRTUAL CYBERBALL TASK
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Descriptors: social exclusion, late positive potential
Social exclusion is a major threat to human need satisfaction and emotional well-being. Evolutionary theories argue that as an adaptation to cope with the survival threat of social exclusion a sensitive monitoring system to perceive and process cues of exclusion has evolved. Despite accumulating behavioral data, few studies have investigated the neurobiology of this emotional monitoring system using EEG. Here, we examined posterior late positive potential (LPP) reactions, which presumably reflect an ERP measure of emotional salience, to being excluded during a so-called Cyberball game. Ninety-three female participants underwent a virtual ball tossing game consisting of an inclusion phase, which was characterized by frequent passes to the participant, and a subsequent exclusion phase, in which the participant only received few passes from ostensible co-players. In response to being omitted, late LPP reactions (at 1000–1300 ms) were significantly stronger in the exclusion vs. inclusion phase (i.e., when omission should be particularly aversive). Stronger LPP reactions to omission vs. reception trials were also associated with stronger feelings of being excluded after the game. These results show that the LPP is sensitive to cues of social exclusion and is associated with emotional reactions to social exclusion. We conclude that the neural systems involved in the detection of emotional salience and LPP generation are linked to neural mechanisms underlying a monitoring system for social exclusion.

Poster 2-143
MIDFRONTAL THETA POWER REACTIVITY TO UNEXPECTED PEER REJECTION – AN INDIVIDUAL DIFFERENCES APPROACH
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Descriptors: EEG, social rejection, theta power
Monitoring social threat is essential for maintaining healthy social relationships. Recent studies suggest that midfrontal theta (4-8 Hz) power might act as a neural correlate of this social threat monitoring system, by being particularly reactive to unexpected social rejection. Here we examined whether this theta response to social rejection might differ in those individuals who vary in trait rejection-sensitive personality constructs. Sixty-five undergraduate female participants (mean age = 19.69) participated in the Social Judgment Paradigm, a fictitious peer-evaluation task in which participants provided expectations about being liked/disliked by peer-strangers. Thereafter, they received feedback signaling social acceptance/rejection. We observed a significant burst in theta power after unexpected social rejection feedback. Further, a community structure detection analysis yielded evidence of two subgroups that differed (hypo- vs. hypersensitivity) on trait rejection-sensitive personality constructs. One group scored high on attachment-related anxiety and fear of negative evaluation, whereas the other group scored high on attachment-related avoidance and low on fear of negative evaluation. These subgroups did not differ in their theta response to social feedback. Our findings confirm the sensitivity of midfrontal theta oscillations to social feedback processing, and suggest that this social threat monitoring system behaves similarly in individuals that differ in trait rejection-sensitive personality constructs.

Poster 2-144
GENDER AND SEXUAL PREJUDICE AS PREDICTORS OF MFN RESPONSES TO GAY AND LESBIAN SEXUAL IMAGERY
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Descriptors: event-related potentials, medial-frontal negativity, reward
The ventral striatum (VS) plays a key role in the processing of rewarding stimuli, and recent fMRI evidence suggests that patterns of VS activation to sexual images vary across individuals’ sexual orientation and gender. This study used event-related potentials (ERPs) to demonstrate that VS activity can also be used to index homonegative attitudes. We utilized a validated reward prediction task using medial frontal negativity (MFN), which indexes expected value, and is most sensitive to unexpected punishments and most positive to unexpected rewards. We placed same-sex and other-sex pornographic images in the outcome position of the passive-viewing task, and measured MFN amplitude after S2 trials. We predicted that the MFN would be most negative to punishing outcomes (i.e., symbols that predicted unexpected gay or lesbian photos), and that this would be moderated by participants’ scores on a modern measure of sexual prejudice (the MHS; Morrison & Morrison, 2002). Consistent with our hypothesis, in a pilot sample of 29 heterosexual female and male participants, the MFN was most negative in response to unexpected images of gay men (for male participants) or lesbians (for female participants). Sexual prejudice predicted more negative-going MFN amplitudes to the trials for men, suggesting that the MFN can be used as a psychophysiological index of implicit sexual prejudice, especially for men.

Poster 2-145
YOU THINK YOU MADE AN ERROR? ELECTROPHYSIOLOGICAL RESPONSES TO OBSERVED ACTIONS ARE MODULATED BY TRAIT EMPATHY
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Descriptors: action observation, error, empathy
The processing of observed actions can involve multiple cognitive processes. For example, we can evaluate observed actions in terms of accuracy, distinguishing between correct responses and errors. It has been proposed that observed errors elicit a negative event-related potential (ERP) component. At the same time, we build expectations on upcoming actions performed by observed persons, and recent studies suggest that ERPs time-locked to such actions are more negative, if the actions are unexpected. In the present study we examined the processing of observed actions in a “shell game” task where both correct and erroneous responses could be expected or unexpected. Importantly, errors were expected in a condition in which the observed person was tricked and did not have access to the same information as the observer. Due to this discrepancy between the observer’s and the observed person’s knowledge we hypothesized that the processing of the observed responses would be modulated by trait empathy. Indeed, we found that in high but not low empathic individuals a negative ERP component between 250 and 400 ms was significantly more pronounced for correct responses in the “trick” condition which corresponded to error responses from the observed person’s point of view. No effect of empathy was seen for processing in the “no-trick” condition in which there was no dissociation between observed person and observer in the definition of errors. These findings strongly suggest that empathy plays an important role when an observed action is evaluated from the observed person’s perspective.
QUANTIFYING EARLY VISUAL EXPECTATION EFFECT FOR FACIAL ATTRACTIVENESS —A SOURCE ERP STUDY

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Descriptors: facial attractiveness, expectation, source localization

Expectation can transform the immediate reality, as was shown for the modulation of pain and taste perception. While fMRI studies reported expectation effects in frontal, temporal, and parietal regions where higher level neural processing takes place, relatively less is known for the role of early sensory areas in neural processing of expectation and perception. In an fMRI experiment, the participants were asked to indicate whether a blurry face, but otherwise indistinguishable in terms of facial attractiveness, is attractive (A) or unattractive (U). The choice response is followed by a fixed (800ms) delay before a clear A or U face is displayed as feedback. We analyzed ERPs during both expectation and perception (prior and after the onset of the clear face). In order to directly investigate the involvement of early visual processing area, we took a novel approach to ERP studies by first extracting the time course of a source that is occipital gyri (OCG) in origin using a previously established blind source separation method, called second order blind identification (SOBI). In all participants we were able to localize an OCG source using BESA (GoF: 95.8 (0.7)%; xyz: second order blind identification (SOBI). In all participants we were able to localize an OCG source using BESA (GoF: 95.8 (0.7)%; xyz: +/−28 (2.5)).

NEUROCOGNITIVE MECHANISMS UNDERLYING INTERPERSONAL DECEPTION

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Descriptors: deception, cognitive control, feedback negativity

The present study investigated the neurocognitive processes when liars deceive others with both true and false statements. ERPs related brain potentials were recorded during an interpersonal deception game in which participants could either lie or tell the truth with an intention to deceive their opponents. We focused our analyses on two separate stages: the decision-making stage and the outcome evaluation stage. Results showed that in the decision-making stage, intentions to deceive had elicited larger N200s and smaller P300s than a control condition in which participants had no intention to deceive. Moreover, whether telling a lie or a true statement did not further modulate this N200/P300 effect. During outcome evaluation stage, feedbacks after both truthful and false statements had elicited a larger Feedback Negativity FN) and feedback-P300 than feedbacks after honest responses, while there were no significant differences for FN and feedback-P300 between truthful and false statements. Taken together, these results suggest that during interpersonal deception, having an intention to deceive engages cognitive control processes regardless of statements’ veracity. Moreover, giving a truthful or a deceptive statement modulated subsequent outcome evaluation processes.

EMOTIONALLY SUPPORTIVE MESSAGES REDUCED ATTENTION TO SOCIAL EXCLUSION CUES: AN EVENT-RELATED BRAIN POTENTIAL (ERP) STUDY

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Descriptors: social exclusion, emotional support, ERP

The aim of this study was to examine effects of emotionally supportive messages on attentional allocation to social exclusion cues by using P3 ERP. Thirty-two participants performed a ball-tossing game called Cyberball with two computer-generated opponents. This study consisted of three conditions (observation as a control, inclusion, and exclusion) as a within-participants factor and two groups (support and non-support) as a between-participants factor. In the observation condition, participants merely observed ball-toss between the other opponents. In the inclusion condition, they joined in the game equally with the other players. In contrast, the others excluded the participant in the exclusion condition. As a manipulation of support, supportive messages were presented before each toss in the support group. Experimental instructions as non-supportive messages were presented in the non-support group. The exclusion cue indicated that participants would not receive the ball. P3 amplitudes which were elicited by the cue were analyzed. Although the interaction between group and condition was marginal, post-hoc tests revealed that the group effect was observed only in exclusive condition, i.e., P3 amplitude was smaller in the supportive group. This result suggests that emotionally supportive messages make people pay less attention to the exclusionary situation. However, in this study, mitigation effects of emotional supportive messages on the subjective distress during social exclusion were not observed. Based on these results, we discuss emotional support as “messages”.

EARLY-ONSET CANNABIS USE IS ASSOCIATED WITH ALTERED NEURAL CORRELATES FOR CANNABIS RELATED AND NEUTRAL WORD RECOGNITION

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Descriptors: ERPs, early-onset cannabis use, word recognition

Cannabis related stimuli are motivationally salient and bias resource allocation compared to neutral stimuli in cannabis users. To date neural correlates of responses to cannabis and neutral words in early-onset cannabis users have not been investigated. ERPs were collected from 18 early-onset cannabis users (Mage=22.33, SD=3.53) and 22 controls (Mage=22.41, SD=4.49) in a word recognition task. Targets were either cannabis related or neutral words presented for 24ms or 50ms which were then presented paired with either a same or different distractor. Mixed measures ANOVAs were run with Group (control, cannabis) as the between subject factor and Target (cannabis, neutral), Time (24ms, 50ms), Distractor (cannabis, neutral) as the within subject factors on P3 peak and latency, and N400 mean amplitude. P3 peak amplitude was overall lower in the early-onset cannabis group compared to the control group and was significantly lower in response to target words seen for 24ms and then presented with different distractors. The P3 latency differed significantly between the groups and was significantly shorter for neutral compared to cannabis words in the control group and significantly longer for neutral compared to cannabis words in the cannabis group. No theoretically relevant results were found for the N400 mean amplitude. P3 peak amplitude was overall lower in the early-onset cannabis group compared to the control group and was significantly lower in response to target words seen for 24ms and then presented with different distractors. The P3 latency differed significantly between the groups and was significantly shorter for neutral compared to cannabis words in the control group and significantly longer for neutral compared to cannabis words in the cannabis group. No theoretically relevant results were found for the N400 mean amplitude. Correlations run on ERP data showed that significantly longer P3 latencies for cannabis words were associated with earlier age of onset, greater lifetime cannabis use, and greater number of years of cannabis use.

ERP EFFECTS OF ORTHOGRAPHIC NEIGHBORHOOD IN A PICTURE TYPING TASK

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Descriptors: orthographic neighborhood, N400, production

Orthographic neighbors (e.g., cake, take) are words that look similar to a target word (e.g., cake). A number of ERP studies on visual word recognition have found that words with many neighbors elicit larger amplitude N400s than words with fewer neighbors. This increase in negativity has been attributed to co-activation of the neighbors’ lexicosemantic representations, either via feedforward activation from shared sublexical units (e.g., the letters a, k, and e) or via spreading of activation at the lexical level. Production studies with picture stimuli have the potential to dissociate between these two alternative mechanisms. This is because feedforward sublexical activation is unlikely to occur when the forms of the words are not overtly presented. In the present study, we used ERPs to track the time course of the effect of orthographic neighborhood in a picture typing paradigm. We found that pictures with names that had many neighbors elicited larger negativeities within the N400 window than pictures with names that had fewer neighbors. The timing of this effect is consistent with lexicosemantic co-activation of neighbors during production and is therefore suggestive of interaction among neighbors at a lexical level.
Posters

Poster 2-151

DISSOCIATION OF IMPLICIT AND EXPLICIT SYSTEMS OF THEORY OF MIND: EVIDENCE FROM MANDARIN-ENGLISH BILINGUALS AND CANTONESE-MANDARIN DIGLOSSIAS

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Descriptors: theory of mind, bilingual, diglossia

Apperly proposed that theory of mind includes two systems, the implicit and the explicit systems. But the dual-system theory is mainly supported by the evidence from western subjects. Studies on Chinese adults’ theory of mind with both explicit and implicit measurements are limited, without covering the characteristics of bilinguals and diglossias. This research aimed to provide evidence for the two systems of theory of mind among subjects with different language abilities. 24 mandarin monolinguals, 20 Mandarin-English bilinguals and 22 Cantonese-Mandarin bilinguals have participated the present experiments. Combined behavioral and eye-tracking technology, the study conducted two experiments. In Experiment 1, identity test was adopted to measure participants’ implicit eye movement and explicit behavioral performance. Results showed that implicit system made more mistakes in the complex situation. Compared with monolinguals, Mandarin-English bilinguals and Cantonese-Mandarin bilinguals have more accurate first looks and longer looking times to the correct position. In Experiment 2, location test was applied to record implicit and explicit reaction of participants with different language abilities. Results showed that the two systems can be efficient in the simple situation. There is no significant difference among the three groups. In conclusion, participants showed significant dissociation between their implicit and explicit behaviors in the theory of mind tasks, which lend further support to the dual-system view upon theory of mind.

Poster 2-152

LINGERING PREDICTIONS: A PSEUDO-REPETITION EFFECT FOR PREVIOUSLY EXPECTED BUT NOT PRESENTED WORDS

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Descriptors: prediction, repetition, EEG

Predictions might support rapid language processing, as long as they are realized. But when a prediction is disconfirmed, is it suppressed, or does it linger? This study manipulated whether words were actually seen or were only expected and probed their fate in memory by presenting the words (again) a few sentences later. 36 EEG participants read weakly constraining sentences (“The proofreader asked her to replace the word hot”; cloze probability 0.01). In the Previously Seen condition, the final word had been seen previously in a different weakly constraining sentence (“He was surprised when he found out that it was hot”; cloze 0.01). In the Expected But Not Seen condition, a likely prediction of the word had previously been disconfirmed (“Be careful, because the top of the stove is very dirty”; cloze “dirty” 0.01, cloze “hot” 0.86). In the Not Previously Seen condition, the word had not been presented before. Two sentences intervened between initial presentation/expectation and the experimental sentence. Fillers ensured that only 14% of the final words constituted a repetition. As expected, Previously Seen words elicited a strong N400 decrease relative to Not Previously Seen words (a repetition effect). Critically, a reliable N400 decrease was also observed in response to Expected But Not Seen words. In addition, late repetition effects were observed in the form of LPC enhancement and alpha power decreases, but only for Previously Seen words. The “pseudo-repetition effect” on the N400 suggests that disconfirmed predictions can linger at some stages of processing.

Poster 2-153

AGE-RELATED CHANGES AND INDIVIDUAL DIFFERENCES IN LANGUAGE COMPREHENSION

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Descriptors: sentence processing, aging

This study aimed to investigate age-related changes in using contexts during auditory sentence comprehension. Young and old participants listened to sentences completed by predicted and unpredicted (but plausible) words, and made a plausibility judgment to the final word. Half of the sentence contexts were highly constrained. Effects were examined by measuring ERPs responding to the onset of ending words. Both age groups showed constraint main effect on N1, highly constrained sentences elicited enhanced N1 than low constraint sentences. Besides, predictability effect on N400 is observed in both groups – predicted words elicited smaller N400s than unpredicted words. The N400 effects were smaller and later for older adults. The results indicate that both young and older adults use the top-down information provided by the context to facilitate the semantic processing. In addition, only young adults displayed a post-N400 frontal positivity for unpredicted words embedded in high constraint sentences, indicating the cost of mispredicting the word. Analyses of individual differences revealed that older adults with higher verbal fluency were more likely to show the frontal positivity. Overall, although older adults may seem to show preserve functioning of using context information, they are less likely to automatically recruit meaning revision mechanisms.

Poster 2-154

DO 18-MONTH-OLD INFANTS SHOW ADULT-LIKE NEURAL PROCESSING OF LANGUAGE?

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Descriptors: language development, electroencephalography (EEG), functional near-infrared spectroscopy (fNIRS)

Single steps during language development are accompanied by different neuronal processing mechanisms. Infants below 12 months display frontal negativities in the electroencephalography (EEG) as well as more bilaterally distributed brain activations during acoustic word processing. The present study aimed at investigating 18-month-olds in the midst of the vocabulary spurt learning several words per day. A relevant linguistic feature supporting word learning is phonotactics, which defines possible phoneme combinations within syllables. Pseudowords corresponding to native and non-native phonotactic rules were acoustically presented to the infants while neuronal correlates were simultaneously assessed by the EEG and the functional near-infrared spectroscopy (fNIRS). The former method excellently tracks fast processing mechanisms, whereas the latter reveals brain areas recruited. Event-related potentials showed an increased negativity for native, although older adults may seem to show preserve functioning of using context information, they are less likely to automatically recruit meaning revision mechanisms.
THE VISUAL MISMATCH NEGATIVITY QUIZ: RELATIONSHIPS BETWEEN DEVIANTS AND STANDARDS

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Descriptors: visual mismatch negativity

A simple quiz was sent to experts in the field of visual mismatch negativity (vMMN). The question was whether the vMMN will be stronger if the standard and the deviant are similar (e.g., lines differing only by orientation) or if they are very different (e.g., a line and a picture). Out of the fourteen interpretable responses, half supported the former, and half the latter notion. As responses were evenly distributed among the experts, we conducted and conducted an experiment with six oddball conditions to examine this question. In the first two conditions (‘simple’) the standard and the deviant were lines with different orientations, in the second two (‘mixed’) one of the stimuli was a line and the other a complex image (a snowflake), and in the last two (‘complex’) both stimuli were simple (a snowflake and a butterfly). Each stimulus was a standard in one of the two conditions and a deviant in the other. Two equal probability control conditions were also included. Event-related potentials (ERPs) to the stimuli were measured and analyzed. The results were unequivocal. In the ‘simple’ conditions the expected early vMMN was observed for deviancy in orientation. In the case of ‘mixed’ conditions a late vMMN appeared only when the complex image was deviant to the line standard, but not in the reverse condition. The ‘complex’ conditions also showed an asymmetry: the butterfly image elicited a late vMMN as a deviant, but for the snowflake deviant no vMMN was observed. The most straightforward explanation of the results is that the vMMN is elicited by the salience of the deviant.

NEURAL CORRELATES OF ERROR PROCESSING IN A NON-MOTOR SIMON TASK

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Descriptors: EEG, error processing, error-related negativity

The error related negativity (Ne/ERN) and the error positivity (Pe) are two well-known neural correlates of error processing. Both can usually be observed after an erroneous response in speeded-choice tasks with the Ne/ERN peaking around 50 ms, and the Pe peaking around 300 – 400 ms after the response. The aim of our study was to investigate whether these neural correlates of error processing can be observed in a similar way for mental responses that occur without any overt response. This allows us to determine whether motor activity or motor conflict is a necessary precondition for these components to emerge. To this aim, we used a vertical Simon task where participants had to respond either in mind, thinking the words “up” or “down”, or with a corresponding button press. The participants had to indicate whether the response was correct or not after each trial. As event-related potentials cannot be time-locked to mental responses, we identified the Ne/ERN and Pe in stimulus-locked potentials. Our results indicate that the Ne/ERN and Pe can also be observed for non-motor responses, and therefore, that motor activity or motor conflict is not necessary for these neuronal correlates of error processing to emerge.

THE N2 COMPONENT AS AN INDICATOR OF A TEACHING SIGNAL IN A GONOGO LEARNING TASK: EFFECTS OF MOTIVATIONAL CUES, REINFORCEMENT SENSITIVITY AND REASONING

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Descriptors: N2 component, learning, reinforcement sensitivity

The N2 component in Go/NoGo tasks may indicate a teaching teaching signal in the context of avoidance learning. However, the conventional Go/Nogo task might not be regarded as a learning task because all information is available from the outset. We therefore investigated whether the N2 component also occurs when the Go and Nogo reactions are learned during the task. Moreover, we analyzed the effect of motivational cues and whether the N2 amplitude correlates with individual differences in reinforcement sensitivity and reasoning. The electroencephalo-
gram (64 active electrodes, Biosemi) was recorded in a sample of 124 German students, who learned to react to some numbers and to withhold their reaction to others. The participants completed Carver and White’s BIS/BAS scales and a reasoning test. Motivating versus neutral words (cues) were presented through sound boxes prior to each trial. Temporal Principal Components Analysis with subsequent Varimax rotation yielded an N2 component with a peak at 270 ms that was more negative for Nogo than for Go numbers and for correct versus incorrect trials. Higher Trait-BAS individuals showed a more pronounced difference of the N2 amplitude between correct and incorrect trials, indicating that they had a more pronounced teaching signal on correct in comparison to incorrect trials. Higher numerical reasoning resulted in a more negative N2 amplitude on correct versus incorrect Go trials only for the condition without motivational cues. This might suggest that motivational cues affect cognitive processes of avoidance learning.

Cogntive control is associated with greater coordination between sympathetic and parasympathetic activity: within-person evidence for the neurovisceral integration model

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Descriptors: neurovisceral integration, within-person, autonomic nervous system

The neurovisceral integration model posits that higher-order cortical systems regulate brainstem regions to influence both sympathetic and parasympathetic autonomic output in a coordinated manner. However, many studies seeking to test this model have examined parasympathetic activity alone, rather than examining the coordination between parasympathetic and sympathetic indices. We examine the neurovisceral integration model from a within-person perspective in a sample of 259 children in order to determine whether fluctuations in cognitive control (P3b ERP), are associated with dynamic changes in the coupling of parasympathetic (RSA) and sympathetic (PEP) measures. Cardiac physiology was measured in 30s epochs across a Go/No-Go task, in which differential reward structures induced changes in affective reactivity (frustration) across 3 blocks. These measures were used to examine the extent of dynamic coupling between RSA and PEP, and whether this coupling was moderated by P3b. On average, the children exhibited significant dynamic coupling between RSA and PEP (γ = 0.02); when parasympathetic tone increased, sympathetic tone decreased. Although between-person differences in P3b were not related to strength of coupling, within-person, block-to-block changes in P3b were. Specifically, coupling between RSA and PEP was stronger in blocks when individuals’ P3b was higher than usual (γ = 0.0004). These results are consistent with the neurovisceral integration model, showing within-person dynamic coordination between cognitive and physiological systems.
INDIVIDUAL DIFFERENCES IN COGNITIVE FUNCTIONING MODULATE COGNITIVE-EMOTIONAL INTERACTIONS: EVIDENCE FROM ERPS

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Descriptors: emotion, cognitive control, ERP

Cognitive-emotional interactions are highly important for goal-directed behavior, but the precise temporal mechanisms underlying this interaction remain unclear. Biased competition models suggest that the benefit of cognitive-emotional interactions strongly depends on resource competition. The present study examined the impact of individual differences in cognitive functioning in 19 high and low performing adults and the role of emotions (happy and angry relative to neutral cues) on cognitive control performance in a modified AX-Continuous-Performance-Task (AX-CPT). Event-related potentials (ERPs) assessed cognitive-emotional interactions on task-preparatory and response-related processes in the AX-CPT. The data revealed a strong impact of emotional cues and individual differences on cognitive control. High-performing younger adults benefitted from emotional cues in reduced error rates, whereas low-performing adults exhibited higher error rates on both happy and angry trials. In the ERP data, emotions specifically affected task-preparatory control in terms of larger P3b-amplitudes for happy and angry trials in high-performers and larger amplitudes of the Contingent-Negative-Variation in low-performers. Together, the study shows that emotional cues affect cognitive control at distinct processing stages, and emphasizes the role of individual differences in the modulation of cognitive-affective interactions. In line with biased competition accounts, emotions can either enhance or impair behavioral performance, depending on how they interact with individual resource capacities.

GOAL IMPACT INFLUENCES THE EVALUATIVE COMPONENT OF PERFORMANCE MONITORING: EVIDENCE FROM ERPS

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Descriptors: performance monitoring, goal relevance, FRN

Successful performance monitoring (PM) requires continuous assessment of context and action outcomes. Electrophysiological studies have reliably identified event-related potential (ERP) markers for evaluative feedback processing during PM: the Feedback-Related Negativity (FRN) and P3 components. The functional significance of FRN remains debated in the literature, with recent research suggesting that feedback’s goal relevance can account for FRN (amplitude) modulation, apart from its valence or expectedness alone. Extending this account, this study examined whether graded differentiations in feedback’s relevance or importance to one’s goal (referred to as goal impact) would influence PM at the FRN (and P3). The data revealed a strong impact of emotional cues and individual differences on cognitive control. High-performing younger adults benefitted from emotional cues in reduced error rates, whereas low-performing adults exhibited higher error rates on both happy and angry trials. In the ERP data, emotions specifically affected task-preparatory control in terms of larger P3b-amplitudes for happy and angry trials in high-performers and larger amplitudes of the Contingent-Negative-Variation in low-performers. Together, the study shows that emotional cues affect cognitive control at distinct processing stages, and emphasizes the role of individual differences in the modulation of cognitive-affective interactions. In line with biased competition accounts, emotions can either enhance or impair behavioral performance, depending on how they interact with individual resource capacities.

THE EFFECTS OF BREATHELESSNESS ON ERROR-RELATED BRAIN ACTIVITY

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Descriptors: breathlessness, error-related negativity, error-related positivity

The error-related negativity (ERN) is an electrophysiological component associated with monitoring action and detecting errors, while the error positivity (Pe) is a component linked to subsequent error awareness. Differences in the ERN are well established in different psychopathologies, but little is known about the effects of aversive bodily symptoms (e.g. breathlessness) on the ERN/Pe. We studied the effects of experimentally induced breathlessness on the ERN/Pe. Thirty healthy participants performed an arrow version of the flanker task under loaded and unloaded breathing conditions, while high-density electroencephalography (EEG) was continuously measured. Individually preselected inspiratory resistive loads were used to induce strong breathlessness in the loaded breathing conditions. No differences (p > 0.05) between the loaded and unloaded breathing conditions in the flanker task performance (reaction times, errors) were found. Mean amplitudes for the ERN (latency 0–100ms) and the Pe (latency 150–300ms) were comparable between both conditions. Overall, experimentally induced breathlessness showed no modulating effect on the ERN/Pe. The present findings suggest that breathlessness as an aversive bodily symptom might not affect the error-related brain activity.
The relationship between age and DAN RSFC may be related to cerebrovascular health. RSFC was mediated by concurrently measured arterial elasticity, suggesting that age-related differences were found for relative VN RSFC. These findings are in agreement with previous studies showing that DAN RSFC decreases with age, relative DAN RSFC increases with age. However, no significant differences were found for DMN RSFC.

Within-network (i.e. homotopic) predictors in order to derive an indicator of relational strength. For each network, the normalized beta coefficient was used as an independent variable in a general linear model with three contralateral networks. For each network, the averaged beta coefficient for the between-network predictors was averaged and deducted from the averaged beta coefficient for the within-network predictors. The result is a measure of the between-network vs. within-network contribution to the strength of the network.

For the between-network predictors, we used whole-head functional near-infrared spectroscopy (fNIRS) to study three brain networks: the default mode network (DMN), the dorsal attention network (DAN) and the visual network (VN). Using a seed-based approach, the time course of each seed was calculated as a function of the network of interest. The mean of the time courses for each seed was then averaged across seeds to obtain a measure of the network's activity. The activity was then compared between different age groups.

Descriptors: lifespan differences, network topology dynamics, cross-frequency coupling Neurophysiological evidence suggests that brain oscillations and coupling dynamics play a crucial role in neuronal computation, working memory, learning and other brain functions or processes. However, surprisingly little is known about lifespan changes in basic neuronal mechanisms underlying neuronal synchronization in cortical networks. Here, we examine changes in the network topology dynamics (NTD) of hyper-frequency networks (HFN) based on within- and cross-frequency coupling (WFC and CFC, respectively) across the lifespan: young children (YC), older children (OC), young adults (YA), and older adults (OA). We showed that WFC was significantly lower in YC than in other age groups, while CFC was significantly lower in YA than in other age groups, and also significantly lower in OC than in OA. Analysis of NTD (i.e., temporal changes of different graph-theoretical measures such as strength, clustering coefficient, path length, local and global efficiency determined for HFNs at different time windows) revealed that both means and standard deviations (SDs) of these measures vary as a function of age: means for practically all metrics increase with age and decrease for characteristic path length correspondingly; SDs were generally highest in YA and for clustering coefficient in OA. We conclude that functional connectivity dynamics, or NTD, which was found using the HFN approach during rest and auditory stimulus processing, reflects temporal and topological changes in the functional organization and reorganization of neuronal cell assemblies across the lifespan.

ILLUMINATING AGE-RELATED RESTING STATE NETWORK DIFFERENCES USING WHOLE-HEAD NEAR-INFRARED OPTICAL IMAGING

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Descriptors: functional connectivity, resting state, aging The utility of understanding the resting brain with regards to age has been widely demonstrated using fMRI. However, optical imaging has not been used as commonly for exploring resting state functional connectivity (RSFC). To evaluate its sensitivity in understanding age-related RSFC differences, we used whole-head functional near-infrared spectroscopy (fNIRS) to study three brain networks: the default mode network (DMN), the dorsal attention network (DAN) and the visual network (VN). Using a seed-based approach, the time course of each seed was used as an independent variable in a general linear model with three contralateral predictors from each network. For each network, the normalized beta coefficient for the between-network predictors was averaged and deducted from the averaged within-network (i.e. homotopic) predictors in order to derive an indicator of relative FC strength. Using a sample of forty-five adults (ages 18–75 years; approximately 10 people per decade), the results revealed that while relative DMN RSFC decreased with age, relative DAN RSFC increased with age. However, no age-related differences were found for relative VN RSFC. These findings are in line with observations from fMRI research, indicating the effectiveness of fNIRS in shedding light on age-related RSFC differences. In addition, relative DAN RSFC was mediated by concurrently measured arterial elasticity, suggesting that the relationship between age and DAN RSFC may be related to cerebrovascular health.
DYNAMIC TONES ARE MORE DISTRACTING THAN STATIC TONES REGARDLESS OF TASK DIFFICULTY

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Descriptors: ERP, attention, distraction

The auditory evoked N1 is elicited even in the absence of overt attention, but it is larger to attended stimuli. As such, it is useful for studying attention and distractibility. We previously found that, during a visual 1-back task, peak amplitudes of auditory N1s are smaller to repetitions of the same tones than to changing tones. However, this difference was absent during a 3-back task, where N1s were unexpectedly similar to both types of sound stimuli. In the present study, we sought to clarify this task vs. distractor relationship by adding a third, medium difficulty task. Thus, we manipulated selective attention by engaging participants in a 1-back (easy), 2-back (medium), and 3-back (difficult) memory task. Automatic attention, or salience, of distractor stimuli was manipulated by presenting 5-tone trains that either remained constant (“same”) or varied in frequency (“different”) through the train. Tones within the train were separated by 400-ms onset-to-onset intervals, with 2.5–3.5 s between trains. For each of the six conditions, we examined the auditory N1 component to each tone in the train. N1 peak amplitudes were larger to different tone trains than to same tone trains in all task conditions. N1s were also larger to initial tones in the trains and attenuated as the trains continued. N1 amplitudes were not affected by task difficulty, which suggests that automatic attentional processes continue to filter extraneous stimuli even when we are focused on a difficult task. Thus, higher processes may be responsible for reduced distraction when focusing on a task.

THE CONTENTS OF AUDITORY STIMULUS AFFECT BRAIN REGIONS INVOLVED IN ANTICIPATION: AN FMRI STUDY

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Descriptors: stimulus-preceding negativity, anticipation, fMRI

In our previous study, we revealed that anticipatory brain activations could also be differentiated according to the contents of visual stimulus (word, symbol, face) even when the stimulus modality was identical. In the present study, we manipulated the contents of auditory stimuli (beep, voice, or rhythm) to elucidate if the stimulus contents of auditory stimuli could also differentiate brain activations related to anticipation. Twenty right-handed volunteers participated in an fMRI experiment and performed a time estimation task. In the task, participants had to press a button four seconds after an instruction stimulus. A feedback stimulus about task performance was presented two seconds after the button press, and we manipulated the contents of the feedback stimulus. There were three experimental conditions: (a) beep, (b) rhythm, and (c) voice conditions. The analyses revealed that anticipation of voice sound more activated the left temporal gyrus probably due to language processing that is dominantly processed in the left hemisphere. On the other hand, the right temporal gyrus was activated by anticipation of rhythmic sound. Some studies showed that lesions around the right temporal gyrus cause amusia and dominant processing in the right temporal gyrus for rhythmic sound could be a reason for the pre-activation in the right temporal gyrus before rhythmic sound. The present study further supports the notion that anticipatory attention pre-activates different brain regions according to the content of anticipated stimuli even when the stimulus modality is identical.

ANTERIOR PREFRONTAL REPRESENTATION OF LOW-LEVEL STIMULUS FEATURES IN ATTENTIONAL REALLOCATION

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Descriptors: attentional reallocation, anterior prefrontal cortex, multivariate pattern analysis

Anterior prefrontal areas are involved in cognitive tasks that require flexible exploration of response alternatives. This may be because the frontopolar cortex (FPC) maintains reallocation of attention in under-defined situations without a clear rule of when to shift attention. Interestingly, complex explicit decision-making does not seem to be a precondition for FPC involvement. A couple of both neuroimaging and patient studies show a relationship between FPC activation and implicit attentional reallocation. The latter seem to require a representation of low-level stimulus features in anterior frontal areas. Here, we test the characteristics of this representation using a simple discrimination task involving flexible attentional switches between visual feature dimensions. We find increased reaction times and increased BOLD activation in frontopolar and superior frontal areas (BA9 and BA10) for trials in which the to be attended feature dimension changes from the previous trial. Using multivariate pattern analysis on EEG data we then investigated the time course of the stimulus feature representations these switches are based on. We find an early (starting at 100ms) above-chance classification performance between stimulus features, not only, as expectable, for occipital, but also for frontal EEG components. Classification performance in frontal areas differs between trials with and without a need for attentional switches. Implications for the mechanisms underlying implicit attentional processing in anterior frontal areas are discussed.

EVENT-RELATED DESYNCHRONIZATION/SYNCHRONIZATION DURING PRODUCTIVE AND REPRODUCTIVE IMAGINATION

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Descriptors: event-related desynchronization/synchronization, attention, memory, imagination

Event-related desynchronization/synchronization (ERD/ERS) of EEG in common frequency bands (theta, alpha 1–2, beta 1–2) during productive (PI - actual imagination) and reproductive imagination (RI - recollection) were investigated in 20 volunteers. Word pairs (the phrases specified what should be remembered or imagined) were presented on a computer screen at the beginning of each probe. After each pair an empty screen was presented. In the PI task the subjects were asked to come up and visualize during the empty screen an image-illustration for the phrase presented in the probe. Before RI tasks the subjects had to look through and memorize certain images and corresponding phrases. When performing a RI task, the subjects were presented with the phrases and had to recall and visualize the corresponding images. Widespread alpha-ERS were expressed during presentation of an empty screen in PI and RI tasks both. This alpha-ERS is considered as a reflection of attention internalization during the task performances [Ray, Cole 1985, Klimesch et al., 2007]. The fact, that alpha-ERS was more pronounced in the PI tasks may indicate a more expressed blockade of external sensory inputs during productive imagination. PI is characterized also by more explicit theta-ERS during the phrase presentations. Since a theta synchronization can be associated with processes of coding, storing and retrieving information from memory [Klimesch 1999, Kahana et al., 2002], it can be assumed that productive imagination demands involvement of wider internal representations than reproductive imagination.
RESPONSE- AND STIMULUS-LOCKED N2PC ALLOWS THE DISTINCTION OF PROCESSING STAGES OCCURRING BEFORE AND AFTER ENGAGEMENT OF VISUAL-SPATIAL ATTENTION
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Descriptors: N2pc, ERPs, response-locked averaging
The N2pc is an electrophysiological index of target selection characterised by a posterior negative and contralateral scalp distribution relative to the side of the visual field where attention was deployed. This component likely reflects neural activity involved in target selection, processing, and possibly distractor suppression. Researchers studying the N2pc generally segment data by time-locking to the search array onset using pop-out stimuli. These target stimuli attract attention with very little variance from stimulus onset to when attention is engaged. The goal of the present study was to track the stages of cognitive processing in difficult search, where the target is not necessarily the first to be selected, by examining the N2pc using both stimulus-locked (S-N2pc) and response-locked (R-N2pc) averaging techniques. Subjects located a box with a single gap among boxes of the same colour with two gaps. There were two response options: Subjects reported whether the gap was on top or not (2 options) or indicated which side contained a gap (4 options), varying response selection difficulty. An increase in neural activity associated with the number of distractors (boxes with two gaps) for both S-N2pc and R-N2pc activity was observed. For response difficulty, more time passed between the onset of the R-N2pc and the response when response selection was more difficult. Using both averaging methods in conjunction, we could therefore examine, compare, and contrast different stages of target processing.

STROOP AND STOP SIGNAL INTERFERENCES - ELABORATION OF A PROTOCOL TO EVALUATE EXECUTIVE FUNCTIONS
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Fluminense Federal University

Descriptors: stop signal, Stroop effect, EMG
Stroop task and Stop Signal protocol are widely used to investigate distinct aspects of executive functions: competition in cognitive processing and ability to inhibit prepotent motor responses. In the Stroop Effect, naming the color of an incongruent color-word (RED printed in green) is slower than naming the color of a congruent one (RED in red). We studied the interaction between Stroop conflict and Stop Signal. Volunteers (n=30) had to compare the color of a central Stroop stimulus (congruent or incongruent) with two peripheral words and press the corresponding key – reaction time (RT). In 33% of the trials an “X” appeared on the fixation point, indicating that subjects should withhold the response (stop trials). It could occur in different moments (from 100 to 400 ms) after stimuli presentation – the stop signal interval (SSI). Electromyography (EMG), RTs and response accuracy were evaluated and data revealed that: i) RTs were faster for congruent than for incongruent trials; ii) Error rates increased according to the SSI and were greater for congruent trials, indicating a correlation between the Stroop task and the Stop Signal protocol; iii) Double EMG activation (in both hands) was more frequent when the incorrect response option in that trial corresponded to the irrelevant Stroop attribute; iv) subliminal EMG activity (EMG activity that did not produce an overt motor response) was more frequent at 400 ms SSI. Results were discussed in terms to the current models used to explain both phenomenon and interactions between different executive sub-functions.

TRANSITION OF ATTENTION BY THE INTER STIMULI INTERVAL ASSESSED BY DEVIANT ERP P3 DISTRIBUTION
Fumihito Morimoto
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Descriptors: distractor P3, temporal transition, three-stimulus oddball
Temporal transitions in attention to infrequent, deviant events were investigated by using ERP P3s elicited by visual stimuli. Participants (N = 12) pressed a button during a three-stimulus oddball task to discriminate targets from deviant, or standard stimuli. A standard (80%; blue circle), an infrequent deviant (15%; task-irrelevant doctored picture) and an infrequent target (5%; small blue circle) were presented in a random series. The duration of each stimulus was 120 ms and interval between stimuli (SOA) was any one of nine SOAs; 800, 900, 1000, 1100, 1200, 1300, 1400, 1500 or 1600 ms. Participants performed the task for approximately 32 minutes in four, eight-minute blocks, while their ERPs were recorded. We focused on specific order of stimulus series, standard (s1), standard (s2) and distractor. Distractor stimuli elicited deviant P3s in all the blocks. Over a designated time period, the scalp distribution of the deviant P3 changed from central to parietal and the amplitude of the deviant P3 attenuated, whereas this tendency was not observed for the target P3. However, detailed analysis of these distribution changes indicated that the accumulated number of deviant stimuli in each block had no significant effect on these changes when the SOA between s1 and s2 was longer than the interval between s2 and distractor. These results suggest that the distribution of deviant P5 elicited by infrequent events reflect an attentional set of constant changes depending on the temporal timing of a stimulus presented in a random series.
Attentional bias toward threat may have a causal influence on the emergence and persistence of anxiety because its modification is accompanied by concurrent changes in symptomatology (Mogosanu, David, & Kotler, 2014). Attentional Bias Modification Training (ABMT) might therefore be a promising tool to efficiently enhance existing treatment effects (Bar-Haim, 2010) and even serve as a preventative measure by reducing vulnerability to anxiety (See, MacLeod, & Bridle, 2009). However, it is still unknown what kind of changes ABMT initiates inside the brain. We conducted a randomized control trial with a large sample of socially anxious participants and measured changes in the N2pc component pre, post, and 11 weeks following up the intervention consisting of eight sessions of ABMT or placebo procedure. We found a decrease in attentional deployment toward angry compared to neutral faces as reflected by the N2pc. This modification, however, was not specific for ABMT but also occurred within the placebo procedure (a standard Dot Probe Paradigm). Effects on anxiety symptoms were heterogeneous for different questionnaires and divergent from changes in brain activity. The data suggest that changes of attentional bias as indexed by activation inside the primary visual cortex are not specific to attentional modification training but also occur during mere exposition to threatening stimuli (cp. De Voogd et al., 2017). Reliability issues and hemispheric differences are discussed.

**Poster 3-014**

**INVOLVEMENT OF TEMPORAL ATTENTION IN TASK-DIFFICULTY EFFECT ON P3A**

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**Descriptors:** P3a, task difficulty, temporal attention

In a three-stimulus oddball task, the amplitude of P3a elicited by deviant non-target stimuli increases with an increase in the difficulty of discriminating between standard and target stimuli (i.e., task-difficulty effect on P3a), indicating that attentional capture by deviant stimuli is enhanced with an increase in task difficulty. This enhancement could be explained in terms of the modulation of modality-nonspecific temporal attention; that is, the participant’s attention directed to the predicted timing of stimulus presentation is stronger when the task difficulty increases, resulting in enhanced attentional capture. The present study examined this possibility with a modified three-stimulus oddball task consisting of visual standard, visual target, and four types of deviant stimuli defined by a combination of two modalities (visual and auditory) and two presentation timings (predicted and unpredicted). If the modulation of temporal attention is involved in enhanced attentional capture, then the task-difficulty effect on P3a should be reduced for unpredicted compared to predicted deviant stimuli irrespective of their modality; this is because the influence of temporal attention should be weaker for unpredicted compared to predicted deviant stimuli. The results showed that the task-difficulty effect on P3a was reduced for unpredicted compared to predicted deviant stimuli in both modalities. This result suggests that the modulation of temporal attention induced by the increase in task difficulty is involved in the enhancement of attentional capture by deviant stimuli.

**Poster 3-015**

**ATTENTIONAL BIAS MODIFICATION IN SOCIAL ANXIETY: EFFECTS ON THE N2PC COMPONENT**

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**Descriptors:** attentional bias modification, N2pc, dot probe

Attentional bias toward threat may have a causal influence on the emergence and persistence of anxiety because its modification is accompanied by concurrent changes in symptomatology (Mogosanu, David, & Kotler, 2014). Attentional Bias Modification Training (ABMT) might therefore be a promising tool to efficiently enhance existing treatment effects (Bar-Haim, 2010) and even serve as a preventative measure by reducing vulnerability to anxiety (See, MacLeod, & Bridle, 2009). However, it is still unknown what kind of changes ABMT initiates inside the brain. We conducted a randomized control trial with a large sample of socially anxious participants and measured changes in the N2pc component pre, post, and 11 weeks following up the intervention consisting of eight sessions of ABMT or placebo procedure. We found a decrease in attentional deployment toward angry compared to neutral faces as reflected by the N2pc. This modification, however, was not specific for ABMT but also occurred within the placebo procedure (a standard Dot Probe Paradigm). Effects on anxiety symptoms were heterogeneous for different questionnaires and divergent from changes in brain activity. The data suggest that changes of attentional bias as indexed by activation inside the primary visual cortex are not specific to attentional modification training but also occur during mere exposition to threatening stimuli (cp. De Voogd et al., 2017). Reliability issues and hemispheric differences are discussed.

**Poster 3-016**

**WHAT DOES THE DOT-PROBE TASK MEASURE? A REVERSE CORRELATION ANALYSIS OF ELECTROCORTICAL ACTIVITY**

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**Descriptors:** dot-probe, selective attention, EEG

The dot-probe task is considered a gold standard for assessing the intrinsic attention selection of one of two lateralized visual cues, measured by the response time to a subsequent, lateralized probe stimulus. Here, we used a reverse correlation approach in combination with frequency-tagged steady-state visual potentials (ssVEPs) to examine the assumption that fast probe responses index heightened selection of a preceding lateralized cue. Twenty-one participants completed a version of the dot-probe task in which ssVEPs were evoked by each member of a pair of lateralized faces varying in emotional expression: On each of 160 trials, participants viewed two face cues (angry-angry, neutral-angry, or neutral-neutral) for 200 ms, each flickering at a different frequency (12 or 15 Hz), to elicit ssVEPs. One cue was then replaced by an oriented grating probe (Gabor patch), and participants indicated whether the probe was oriented at 0° or 90°. We then examined the extent to which fast probe responses reflected selective visuo-cortical processing (assessed with ssVEPs) of the cue preceding at the same location. Results showed opposite patterns for left and right visual fields: Faster responses to left visual field probes were associated with heightened visuo-cortical selection of the preceding left visual field cue. By contrast, faster responses to right visual field probes were associated with diminished visuo-cortical selection of the preceding right visual field cue. These findings challenge the use of response time in the dot-probe task as an index of covert attention.
**Poster 3-017**

HEART RATE VARIABILITY AND BODY MASS INDEX ARE ASSOCIATED WITH VERY SLOW CHOICE RESPONSE TIMES DURING CARDIAC DIASTOLE

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Descriptors: heart rate variability, body mass index, attention

Sustained attention is related to adaptive control of the organism’s energetic resources and can be reflected by reaction time (RT) performance (Sonuga-Barke & Castellanos, 2007). Ex-Gaussian modeling of RT distributions generates tau, the proportion of infrequent, very slow RTs, which has been linked to poor attentional control and inefficient use of neural resources (Leth-Steensen et al., 2000). Individual differences in attention have also been related to vagally mediated heart rate variability (HRV, Thayer & Lane, 2009) and other indices associated with energy expenditure, such as body mass index (BMI, Koenig et al., 2014). However, relative contributions of resting HRV and BMI to tau is unclear.

Thirty-one college students performed 160 trials of a two-choice RT task. Auditory RT stimuli were presented at either cardiac systole or diastole. RTs were fit with an Ex-Gaussian model. Relative contributions of resting HRV and BMI to tau is unclear.

Results suggest adaptive aspects of tau that relate to vagally mediated inhibition of cognitive processing. Results will be discussed in reference to links between attention and regulation of organismic energy expenditure, which may be reflected by BMI and HRV.

**Poster 3-018**

ALTERATIONS IN STRESS PHYSIOLOGY FOLLOWING YOGIC BREATHING AND COGNITIVELY BASED PSYCHOSOCIAL WORKSHOPS FOR COLLEGE STUDENTS: A RANDOMIZED CONTROLLED TRIAL

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University of Arizona

Descriptors: stress physiology, stress management, yoga

College and graduate school are often filled with life transitions and stress. Considering individual differences, multi-component psychosocial interventions are most likely to benefit both subjective wellness and stress physiology. Students (N=108) were randomly assigned to undergo one of two active workshops. ‘Your Enlightened Side’ (YESplus) primarily emphasized yogic breathing, acceptance and social connectedness, and ‘Wisdom On Wellness’ (WOW!) targeted cognitive stress management techniques. Both workshops entailed 18 hours training on four consecutive days. Data were collected from October 2015 to March 2017. At pre, post, and 3-month follow-up, participants completed a variety of questionnaires, daily sleep logs, and psychophysiology measures including EKG, salivary cortisol, momentary stress ratings, and peripheral skin temperature in the context of the Maastricht Acute Stress Test, a psychophysiological stress induction with cold-pressor task. Preliminary results demonstrated robust changes in EKG, skin temperature, and stress ratings in response to the alternating sequence of ice-water immersions and arithmetic tasks at baseline, most prominently during the second half of the test. EKG changes were predicted by anticipated math-related stimulation (FES) and classified as left or right imagery using linear discriminant analysis (LDA). While the classification was matched with the instruction, FES (e.g. Extin, g.tec medical engineering GmbH, Austria) were triggered and the visual feedback was also provided on a screen. One patient was trained over 25 sessions and the classification accuracy was above 80% throughout the session. It took 65 seconds to complete the 9 hole peg test before the intervention and 30 seconds after intervention. This shortened time implies that the patients had motor improvement in his upper limb including wrist and hand.

**Poster 3-019**

BRAIN-COMPUTER INTERFACE WITH VISUAL AND PROPRIOCEPTIVE FEEDBACK IN POST-STROKE REHABILITATION

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1g.tec medical engineering GmbH, 2Guger Technologies OG

Descriptors: brain-computer interface, closed-loop feedback, proprioceptive stimulation

Stroke is one of the main causes of disability worldwide, which severely affects the patients’ quality of daily life and contributes heavily to the society burden of health care. Conventional therapy is available, but it still has limitations and require residual movements. Recently, brain-computer interfaces (BCI) have been used in rehabilitation for stroke survivors and showed its efficacy in previous studies. They used mechanical devices such as orthosis or robot to produce passive movement of their parietic hands to evoked visual and proprioceptive feedback for sensorimotor closed loop. In this case study, functional electrical stimulation (FES) has been implemented in rehabilitation therapy. Patients were expected to imagine the wrist extension according to instructions from the software and the brain activity was acquired by electroencephalography (EEG). The data were analyzed with Common Spatial Patterns (CSP) and classified as left or right imagery using linear discriminant analysis (LDA). While the classification was matched with the instruction, FES (e.g. Extin, g.tec medical engineering GmbH, Austria) were triggered and the visual feedback was also provided on a screen. One patient was trained over 25 sessions and the classification accuracy was above 80% throughout the session. It took 65 seconds to complete the 9 hole peg test before the intervention and 30 seconds after intervention. This shortened time implies that the patients had motor improvement in his upper limb including wrist and hand.

**Poster 3-020**

NEURAL CORRELATES OF CONVERGENT AND DIVERGENT CREATIVITY: AN FMRI STUDY

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Descriptors: creativity, convergent and divergent thinking, fMRI

Creativity is commonly defined as the mental ability to generate original ideas or solve problems in novel ways. Such metal ability has been conceptualized as involving two distinct components: convergent and divergent thinking. Convergent thinking requires one single solution to a problem in an analytic way or with insight experience. In contrast, divergent thinking relates to generate unusual ideas or solutions to problems. We conducted an event-related fMRI study to investigate neural correlates of creativity in convergent and divergent thinking. Sixteen participants were instructed to perform three fMRI tasks during scanning: the Chinese-Word remote associates test (CAT) to represent the processes of convergent thinking, the alternative uses task (AUT) to measure the processes of divergent thinking, and the memory retrieval task (MRT) to monitor the processes of retrieving semantic knowledge from long-term memory. A whole brain analysis revealed that CAT involved primarily left-lateralized dorsolateral and ventrolateral prefrontal activation and AUT associated with bilateral frontoparietal activation. Moreover, the direct comparisons among tasks showed that the CAT activated more left superior frontal gyrus than MRT and AUT, possibly indicating the neural locus of processing insight. These findings provide evidence for the role of inferior frontal gyrus in divergent and convergent thinking and a critical role of superior frontal regions during insightful problems solving.
ACUTE STRESS AND DECISION-MAKING: AN FRN STUDY

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Descriptors: stress, decision making, FRN

A recent hypothesis states that acute stress induces faster and more risky decisions. This hypothesis was tested by exposing 22 young, healthy subjects to the Social Evaluated Cold Pressure Test (SCEPT) and 10 control subjects to a hand-warm water condition before all subjects were performing the Balloon Analogue Risk Task (BART). This test evaluates subjects' risk decisions and behaviors. In the BART, subjects were requested to stepwisely inflate a balloon in order to earn money. However, with growing balloon size (max. 6 steps), the risk increased that the balloon busted. Based on subjects' cortisol level before and during the SCEPT, they were divided into high and low cortisol responders. While exposed to the BART, EEG was recorded from 61 electrodes for later offline-analysis of subjects' FRN (feedback-related negativity) amplitudes a sensitive biological marker for feedback processing in response to non-bursting inflations and busts. Behavioral data revealed no negative effect of acute stress on decision making. In contrast, subjects with high cortisol levels in the SPECT showed reduced risk and highest risky behaviors as compared to low cortisol responders. FRN-amplitudes were more negative for negative than for positive feedback but this effect was not moderated by stress. Thus, acute stress does not always affect decision making negatively but depends on the type of stress, subjects' stress task, personality, stress experience, and coping behaviors.

OUTCOME PROCESSING IN THE CONTEXT OF GAINS VERSUS LOSSES: THE INFLUENCE OF FEEDBACK VALENCE IN FEEDBACK-P3

Carina Fernandes1,2, Ana Gonçalves1, Rita Pasión1,3, Fernando Ferreira-Santos1, Fernando Barbos1, Isabel Martins1 & João Manques-Texeira1
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Descriptors: decision-making under risk, prospect theory, risk-aversion

The valence of outcomes has great influence on risk preference in economic decision-making. In the present study, we examined the effects of the valence of outcomes on the feedback-P3 (fb-P3), an ERP component considered an indicator of motivational significance of rewards. To this end, we used a gambling task in which participants opted between two gambles in the context of possible gains (where a zero-value outcome is the worst possible outcome) or losses (where a zero-value is the best possible outcome). EEG was recorded for 27 participants (16 females) while they completed this task. The fb-P3 was quantified as the mean amplitude in the time window of 350–450 ms post feedback onset. Behavioral results are in accordance with Prospect Theory, showing that participants were risk-averse for gains and risk-seeking for losses. Regarding electrophysiological results, we found a significant interaction between context and valence. However, significant differences occurred only in the context of gains, where outcomes with positive valence elicited higher amplitudes than those with negative valence. As the fb-P3 is associated with motivational significance of the outcomes, our results suggest that higher relevance is given to possible outcomes obtained in the context of gains in contrast with the context of losses, where similar relevance appear to be given to loss or not. This effect may underlie differences in reward learning in both contexts, which may explain the opposite economic preferences revealed by behavioral results.

NEURAL CORRELATES OF SYSTEM I AND SYSTEM II JUDGMENTS WHEN DIAGNOSING DISEASES

Chad Williams, Marie Schulze, Bruce Wright & Olav Krigolson
University of Victoria

Descriptors: System I and System II decisions, diagnosis, diseases, theta

Understanding how clinicians make diagnostic decisions is imperative to the health of their patients. Within the medical literature, judgments that are quick and reflexive have been termed System I decisions, while judgments that are slow and contemplative are System II decisions. In the current study, we had participants diagnose liver and biliary tree diseases from patient medical cards while electroencephalography data was recorded. To analyze the neural correlates of system I and system II decisions, the diseases were characterized by their degree of conflict within the disease set in that diseases that were easy to distinguish would recruit system I judgments, while diseases that were difficult to distinguish would require system II judgments. We found that less distinct diseases (i.e., high conflict) corresponded to enhanced theta activity within the medial-frontal cortex in relation to more distinct diseases (i.e., low conflict). This is in line with recent evidence that theta activity may reflect the need for cognitive control (Cavanagh & Frank, 2014). Thus, this indicates that theta activity may be used as a measure of System I and System II judgments within a medical context.
VIRTUAL REALITY EXPOSURE AS AN INTERVENTION FOR PUBLIC SPEAKING ANXIETY: SELF-REPORTS AND PSYCHOPHYSIOLOGICAL MEASURES
Stephani Naziri, Christiana Theodorou, Dora Georgiou & Georgia Panayiotou
University of Cyprus

Descriptors: public speaking anxiety, virtual reality exposure, psychophysiological measures
This study aimed at investigating the effectiveness of Virtual Reality Exposure (VRE) Therapy as an intervention for reducing Public Speaking Anxiety (PSA) of university students. Participants’ level of PSA was assessed using the Personal Report of Confidence as a Speaker (PRCS). Both VRE and control groups were asked to present a 2-min speech while psychophysiology measures were recorded as objective measures of distress. Then participants completed the Subjective Units of Distress (SUDS) ratings (0–100). VRE participants were exposed at different immersive audiences from least phobic to most phobic (based on participants’ ratings) through a head-mounted display (HMD). They were exposed to each type of audience 3–5 times for 1-min each time. Before and after each exposure participants completed the SUDS. Results showed statistically significant reductions in SUDS in the VRE group compared to the CG. There was also a reduction of anxiety irrespective of audience from the first to the fifth exposure.

ATTENTION TRAINING MODULATES P200 AMPLITUDE EVIDENCE OF ATTENTIONAL BIAS IN CHRONIC WORRIERS
Sarah Sass1,2, Xue Xiong1, Travis Evans3 & Bridget Kennedy1
1University of Texas at Tyler, 2University of Miami

Descriptors: anxiety, attention training, emotion
Attention bias modification (ABM) procedures have been developed to modify attention bias to threat in chronic worriers but the neural mechanisms of bias reduction are not well understood. The present ABM study addressed this issue. Nonpatients reporting chronic worry were randomly assigned to an attention-training or placebo condition using a dot-probe task. In the attention-training condition, probes replaced only neutral words within emotion-neutral word pairs. In the placebo condition, probes replaced neutral and emotionally arousing words equally within emotion-neutral word pairs. In the absence of baseline differences in P200 amplitude, attention training and not placebo was associated with increased frontocentral P200 amplitude from pre-to-post intervention prompted by neutral and threat but not pleasant stimuli. Reaction time (RT) evidence of bias was not apparent, consistent with previous attention-training studies using the dot-probe task. Results highlight the importance of including neural alongside behavioral measures in investigating attentional bias change in chronic worriers.

POSTAURICULAR REFLEX POTENTIATION DURING TONIC SOCIAL SUPPORT AND PHASIC RELIEF FROM SHOCK
Stephen Benning, Meghan Pierce & Stephany Molina
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Descriptors: postauricular reflex, aversive conditioning, social support
The postauricular reflex is a psychophysiological measure of positive emotional processing. However, its modulation has primarily been assessed during emotional pictures and sounds, leaving open the question whether it is modulated by other kinds of phasic stimuli and by tonic situations. In a sample of undergraduates, we used an instructed threat of shock paradigm in which participants knew they would be shocked 20% of the time to any letter appearing in one of two counterbalanced colors (red or yellow) and 0% of the time during any letter of the other color (yellow or red). This procedure created a phasic manipulation of emotional state. A counterbalanced manipulation of tonic social support involved participants having a friend (who accompanied the participant to the lab) place his or her right hand on the participant’s left shoulder during one block of trials and being alone during another block of trials. Postauricular reflex magnitude was greater during letters in participants had no risk of being shocked, which replicated previous findings on this reflex’s modulation during differential aversive conditioning. Postauricular reflex magnitude was much greater while the participant’s friend was in the room than when the participant was alone, suggesting that tonic manipulations of social support modulate postauricular reflexes more strongly than phasic emotional manipulations in the same paradigm.
Poster 3-031
CORRELATIONS BETWEEN INDICES OF RESILIENCE AND INDICES OF CARDIAC REGULATION IN YOUNG WOMEN
Julia Otero González, Azahara Miranda Gálvez, Miguel Ángel Muñoz García, Jaime Vila Castellar & María Sánchez Barrera
Granada University

Descriptors: heart rate variability, resilience, CD-RISC

The variability in the heart rate is one of the most recently investigated phenomena in terms of autonomic mechanisms and emotional regulation. Heart rate variability has been associated with the ability to recover from adverse situations. Therefore, individuals with high scores in resilience questionnaires could have greater indices of heart rate variability. The present study examined the correlations between resilience scores and indices of heart rate variability in a group of 21 women with high scores and 19 women with low scores in resilience taking into account two questionnaires: The CD-RISC 25 Resilience Scale and the Wagner & Young Resilience Scale. The following indices of heart rate variability were obtained during a resting state of 5 minutes: Root Mean Squared of Successive Differences (RMSSD), High Frequency (HF), Low Frequency (LF), and Very Low Frequency (VLF), in addition to the Inter-Beat-Interval (IBI). Results showed significant positive correlations between indices of resilience and indices of heart rate variability in the high frequency band (RMSSD and HF), as well as between indices of resilience and IBI in the low resilience group. However, in the high resilience group significant negative correlations were found between indices of resilience and heart rate variability in the low and very low frequency band (LF and VLF). This finding suggests a predominant vagal activation control in the more resilient people within the high resilient group.

Poster 3-032
EMPATHIC CONCERN AND EMOTIONAL SENTENCE PROCESSING: AN N400 ERP STUDY
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Descriptors: empathy, emotional sentences, N400

People who are low in empathy, such as those with high trait psychopathy, often show blunted emotional processing. We investigated how individual differences in empathy affected emotional information processing in a sentential priming paradigm. We used three types of sentence endings: expected, unexpected and emotionally negative. Both unexpected and emotional sentence endings had a lower probability of zero. Participants had their EEG recorded while they silently read the words which were presented one word at a time on a computer screen. We hypothesized that participants who were high in empathic concern on the Interpersonal Reactivity Index would find the emotional sentence endings somewhat disturbing and unexpected. In contrast, we expected participants who were low in empathic concern to be less affected by the emotional sentences. For participants who were high in empathic concern, emotional sentence endings elicited large N400s, which were not significantly different in amplitude from those elicited by unexpected but unemotional sentence endings. Participants who were low in empathic concern however, showed smaller N400s to emotional sentence endings in comparison to the unexpected unemotional sentence endings. Given that the N400 is thought to index the difficulty with which a word is retrieved from semantic memory, these results support our hypotheses. These data add to a growing body of empirical evidence documenting that low empathy is associated with blunted affective processing across a range of modalities.

Poster 3-033
COGNITIVE CONTROL OF EMOTIONAL DISTRACTION
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Descriptors: Attention, Cognitive Control, ERP

Although emotional stimuli are often important, sometimes they are best ignored. Here we examined the mechanisms that support control of emotional distraction. In Experiment 1, participants identified a target letter that appeared above or below fixation. On 25% of trials, a distracting image (positive, negative, or neutral) appeared at fixation for 200ms. The low distractor frequency encourages use of a reactive control strategy, whereby control should be engaged after distractors appear. Even though images were task-irrelevant, emotional images (both positive and negative) produced greater distraction than neutral ones. These behavioral effects were mirrored in 3 ERP components: the EPN, reflecting early attention to emotional images, the LPP, reflecting sustained emotional processing, and the N2, reflecting proactive control processes. In Experiment 2, distractors were presented on either 25% of trials, or on 75% to encourage a shift to proactive control processes which can prevent distraction before it occurs. Findings in the 25% condition replicated Experiment 1. In the 75% condition, distraction was markedly reduced, and was equivalently low for all image types. This effect was evident in attenuation of the N2, as expected with a shift to proactive control. However, the EPN was unaffected by increased distractor frequency, and the LPP was only modestly attenuated. Our findings suggest that proactive control mechanisms do not downregulate emotional processing of potential distractors; rather, they effectively suppress distractors despite their emotional value.

Poster 3-034
RELATING EEG BASED PREDICTION OF EMOTIONAL AROUSAL IN GSR BY SUBJECTIVE RATINGS
Hedwig Eisenbarth
University of Southampton

Descriptors: emotional arousal, EEG pattern, cross-validation

We use several psychophysiological measures of arousal to measure physiological reactions at baseline and in response to various types of arousing stimuli in order to obtain what we think might be objective emotional states of participants. In fact, psychophysiological arousal (e.g. measured via galvanic skin response, GSR) and it’s neurophysiological correlates (e.g. measured via EEG) have been found to be highly correlated, however can a GSR trace in response to emotional content be predicted by EEG based pattern within subjects and can we predict individuals subjective response by prediction quality? This study investigates the prediction of GSR traces within subjects and for groups based on EEG data and its correlation with subjective experiences. Using the DEAP dataset, based on n=32 participants, an EEG based pattern for emotional arousal was computed and cross-validated. Predicted and true variables were highly correlated within subjects, however, a group mean pattern showed a much lower relationship with an individuals GSR response. In addition, correlations between subjective ratings of the emotional response to the emotional stimuli and the RMSE of the within-subject prediction were computed: a significant but low correlation shows that the subjective rating of stimuli is related to the uniformity of the relationship between EEG and GSR responses. These findings have implications for the understanding of the relationship between EEG derived emotional arousal reactions and GSR derived measures, as well as for the generalizability from individuals to groups using these measures.
SYMPATHETIC NERVOUS SYSTEM MEDIATION IN EVOCATION, HABITUATION AND DISHABITUATION OF CARDIAC DEFENSE RESPONSE

Alba Garrido1, Javier Rodríguez-Arbo1, José Luis Mata1, Renaldo Simões2, Eliane Volchan3 & Jaime Vila4
1Mind, Brain, & Behavior Research Center, University of Granada, 2Federal University of Rio Grande do Sul, 3Federal University of Rio de Janeiro

Descriptors: cardiac defense response, sympathetic nervous system, pre-ejection period

The classic model of CDR suggests that the response is a heart rate acceleration, it shows slow habituation with stimulus repetition and its physiological mediation is exclusively sympathetic. However, recent studies support a description of CDR as a complex pattern characterized by two accelerative and two decelerative components in alternating order (acceleration-deceleration-acceleration-deceleration), that shows fast habituation with repeated stimulation and includes both sympathetic and parasympathetic influences. The aim of this study was to examine sympathetic nervous system (SNS) activity in evocation, habituation and dishabituation of cardiac defense response (CDR) using impedance cardiography. This measurement provides a direct index of sympathetic mediation: pre-ejection period (PEP). Participants were 56 university students (28 men and 28 women) randomly split into two inter-trial-interval (ITI) conditions. All participants received three presentations of an acoustic stimulus capable of eliciting the CDR: white noise of 105 dB, 500 ms duration and instantaneous rise time. The ITI was received three presentations of an acoustic stimulus capable of eliciting the CDR: random.

PHYSIOLOGICAL FACTORS THAT PREDICT THE DETECTION OF ANXIETY IN OTHERS

Stephanie Dimitroff, Karen Smith, Kelly Faig, Elizabeth Necka, Frederica Rockwood & Greg Norman
University of Chicago

Descriptors: anxiety, interpersonal sensitivity, interoception

Interpersonal sensitivity, the ability to make sensitive judgements about another person’s state, is critical for the successful navigation of relationships. Individuals who are more accurate when making emotional judgments may be more successful in forging and maintaining relationships, making it important to understand what factors contribute to these individual differences. The current study sought to elucidate how physiological variables are associated with how individuals assess the anxiety levels of others. Sixty-three participants watched 21 videos in each of which a speaker gave a 1 minute speech. The video set included 21 speakers who were under varying levels of stress. All participants rated the anxiety of each speaker. All speakers and participants were monitored via electrocardiogram. A series of forward stepwise linear models predicting participants’ assessments of speakers’ anxiety were run incorporating physiological and psychological measures of both the speakers and participants. Analyses revealed that participants’ average heart rate (HR) while watching each video was most predictive of the mean anxiety rating attributed to each speaker. Furthermore, each participant’s overall sensitivity score (defined as the strength of the correlation between anxiety ratings and HR of the speaker) was related to how strongly one’s anxiety ratings were correlated with one’s own HR. These results suggest that a potential mechanism driving judgements of other’s anxiety may be reliance on interoceptive cues, which may in turn be related to one’s interpersonal sensitivity.

FRONTAL ALPHA POWER ASYMMETRY SHOWS DIFFERENT TEMPORAL PATTERN BETWEEN NEGATIVE AND POSITIVE EMOTIONS

Motoyuki Sanada, Masanori Kobayashi, Keiko Otake & Jun‘ichi Katayama
Kwansei Gakuin University

Descriptors: frontal alpha power asymmetry, EEG, emotion

In daily life, we often experience fluctuations of emotional states. In order to investigate the temporal aspect of our emotion, current study evaluated a frontal alpha power asymmetry of EEG, which has been considered to reflect our emotional state, i.e., negative and positive emotion evokes left and right dominant power, respectively (Davidson et al., 1990). Twenty four students were recorded their EEGs while watching six video clips, the durations of which were from 0.5 to 2.5 min (negative, positive, and neutral contents, two video clips for each). We divided the EEG data into ten-second segments, and calculated alpha power of each EEG segments by Fast Fourier Transformation. This analysis revealed that the temporal pattern of the frontal alpha power asymmetry was distinct between the valences. When the participants watched negative video clips, left alpha power became higher than right approximately 20 seconds after the start of the video clips. In contrast, when watching positive video clips, their left alpha power was lower than right from the beginning of the video clips. Our data showed 1) that the asymmetry patterns corresponding to the valences were consistent with previous studies, and 2) that the latencies which the cortical processing reflected emotion were different between the valences. These results could be a clue to unveil the temporal aspect of our emotion, which suggests the importance of tracking temporal dynamics of emotional states.

ACUTE STRESS AND EMOTION REGULATION: THE ROLE OF FRONTAL EEG ALPHA ASYMMETRY

Xinwei Zhang, Petra Bachmann, Hartmut Schichinger & Mauro Larra
University of Trier

Descriptors: EEG alpha asymmetry, cold pressor test

Frontal EEG asymmetry has been proposed as an index of emotional regulation, reflecting both state and trait components, and there is evidence that these factors influence the cortisol response to stress. Here, we asked whether cold pressor stress modulates frontal asymmetry and whether this is predictive of the cortisol response induced. 24 male participants underwent an automated bilateral feet cold pressor test (CPT) and a warm water control procedure on two separate days, one week apart. Resting EEG, salivary cortisol and subjective ratings of stress and arousal were assessed at baseline, during and after the CPT, respectively. The CPT led to a significant increase in cortisol and in subjective ratings of stress and arousal that was absent in the control condition. Furthermore, analysis of frontal alpha band asymmetry revealed a stronger right frontal activation during the CPT compared to the control condition at electrode pairs F7/8 but not F3/4. Whereas subjective ratings and cortisol responses were positively correlated, frontal asymmetry during the CPT were not predictive for neither cortisol responses nor subjective ratings. However, an association between cortisol responses and frontal asymmetry assessed during rest at baseline could be observed. Our results show that cold pressor stress leads to an alteration of emotional processes as reflected in frontal EEG asymmetry. Moreover, cortisol responses to the CPT seem to be differentially moderated by trait and state components present in frontal asymmetry.
COGNITIVE REAPPRAISAL DURING UNPLEASANT PICTURE PROCESSING: SKIN CONDUCTANCE AND STARTLE REACTION

Nieves Fuentes Sánchez1, Irene Jacin1, Beatriz García Carrion1, Ignacio Lucas2, Raúl López Penadés1, Miguel Escrig1 & M. Carmen Pastor1
1Universitat Jaume I, 2Universitat de Lleida, 3Université de les Illes Balears

Descriptors: emotion regulation, startle reflex, electrodermal activity

Cognitive reappraisal has been widely investigated using brain (fMRI, ERP) but not psychophysiological peripheral measures. This study explored peripheral reactivity when processing and regulating emotions to unpleasant (attacks, victims) and neutral (objects) pictures presented during a classical emotion regulation paradigm (N=50). A cue (2 s) indicated the type of regulation (Increase, Decrease, Look) during 8 s of picture presentation. Acoustic probes (white noise, 105 dB, 50 ms) were delivered either after 4 s or 7 s after picture onset (4/5 of each condition) to provoke defensive startle reflexes. Affective ratings of hedonic valence and arousal were collected after picture offset, using the Self-Assessment Manikin (9-point scale). Our findings showed that subjective evaluations replicated previous results in this paradigm, in terms of picture content and task instructions. Similarly, for both unpleasant contents, blink response was potentiated when participants were instructed to increase– and inhibited when they had to decrease– their emotions, compared to the Look condition. Moreover, electrodermal activity also varied depending on task instructions for both unpleasant contents, with enhanced activity for increased affect, besides reduced activity for decreased emotions, in comparison to looking at pictures. These results suggest that certain cognitive strategies such as reappraisal can certainly modulate physiological states associated to negative emotions. Further clinical implications on psychopathologies characterized by emotion dysregulation are also discussed.

Poster 3-040
DON’T YOU WANT ME, BABY? CARDIAC AND ELECTROCORTICAL CONCOMITANTS OF ROMANTIC INTEREST AND REJECTION

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1Erasmus University Rotterdam, the Netherlands, 2University of Missouri - St. Louis

Descriptors: P300, romantic rejection, HR

With the rise of internet, online dating has become a popular way to find a romantic partner. Receiving online evaluations in terms of ‘dateability’ can be stressful and a negative evaluation might be a possible trigger for lowered self-esteem and associated psychopathologies. Therefore it is interesting to examine the cardiac and autonomic nervous system responses to both romantic rejection and acceptance in such a setting. For this purpose a database of profiles was created where heterosexual, same-sex and same-gender participants passively viewed the pictures of the potential partners together with their personal information and photos were placed. Heterosexual, same-sex and different-gender stimuli compared to emotional ones (F(5,505)<0.01). Gender differences were found in the corrugator response: women showed a greater activation of the dorsal part of the anterior cingulate cortex (ACC) and the enhanced P3 in terms of activation of the ventral part of the ACC.
YOU SMILE - I SMILE, BROTHER! FACIAL RESEMBLANCE INCREASES MIMICRY OF JOY EXPRESSION AND TRUST JUDGMENTS
Michal Olszanowski
University of Social Sciences & Humanities

Descriptors: facial mimicry, social judgments, emotional expression
Theories on facial mimicry states that one of its goal is to promote affiliation. Thus, people are more likely to imitate positive emotional signals of liked others or group/family members. Interestingly similarity to familiar faces or resemblance to the judge’s own face is one of the characteristic that may affect a face's social evaluations. Own-reshsembling faces are judged as more trustworthy and not necessarily as more attractive, suggesting specialized adaptations to recognize kin in the domains of mate choice and prosocial behavior. Taking this together we can expect that faces physically similar to judge’s face along with higher trustworthiness would also elicit stronger facial mimicry. To test this assumption, we used 50% morphs that combined a participant face (or averaged prototype in control condition) of neutral expression with an unknown face of neutral, joy or anger expression. Further on, from combined faces we created morphed, short animation showing consecutive change from neutral to emotional. During experimental procedure participants watched series of short movies of smiling or frowning faces, while their facial muscle activity was measured by fEMG. They were also judging faces on trustworthiness and attractiveness. Results showed greater mimicry of smiles of own-reshsembling faces, while there was no difference for frowning. Also, we found that smile increase trust and attractiveness evaluations in general, while similarity matters only for trust but does not change attraction.

PUPIL DILATION DURING REWARD ANTICIPATION IS ASSOCIATED WITH ACTIVATION OF THE SALIENCE NETWORK
Maximilian Schneider, Laura Leuchs, Michael Czisch, Philipp Sämann & Victor Spoormaker
Max Planck Institute of Psychiatry

Descriptors: pupillometry, fMRI, reward
Recent work in macaque monkeys has shown that autonomic arousal increases in response to cues that predict rewards, reflected by an increase in pupil size. Neuroimaging studies in humans have highlighted the role of the dorsal anterior cingulate cortex (dACC) in regulating autonomic arousal, and our own work has shown that spontaneous pupil dilations are closely correlated to dACC and bilateral insula (salience network) activity in the resting state. Here we aimed to identify the neural correlates of pupil dilations during reward anticipation, using functional magnetic resonance imaging (fMRI) and eye-tracking. Thirty-one healthy subjects completed a commonly used reward anticipation task including functional magnetic resonance imaging (fMRI) and eyetracking. Three isoluminant stimuli, one of which signaled the possibility to gain money, to healthy subjects completed a commonly used reward anticipation task including functional magnetic resonance imaging (fMRI) and eyetracking. Thirty-one healthy subjects completed a commonly used reward anticipation task including functional magnetic resonance imaging (fMRI) and eyetracking. Thirty-one healthy subjects completed a commonly used reward anticipation task including functional magnetic resonance imaging (fMRI) and eyetracking. Thirty-one healthy subjects completed a commonly used reward anticipation task including functional magnetic resonance imaging (fMRI) and eyetracking. Thirty-one healthy subjects completed a commonly used reward anticipation task including functional magnetic resonance imaging (fMRI) and eyetracking. Thirty-one healthy subjects completed a commonly used reward anticipation task including functional magnetic resonance imaging (fMRI) and eyetracking. Thirty-one healthy subjects completed a commonly used reward anticipation task including functional magnetic resonance imaging (fMRI) and eyetracking. 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Thirty-one healthy subjects completed a commonly used reward anticipation task including functional magnetic resonance imaging (fMRI) and eyetracking. Thirty-one healthy subjects completed a commonly used reward anticipation task including functional magnetic resonance imaging (fMRI) and eyetracking. Thirty-one healthy subjects completed a commonly used reward anticipation task including functional magnetic resonance imaging (fMRI) and eyetracking.
Interoceptive accuracy (IA) may facilitate the regulation of emotions (ER). For instance, previous studies showed that successful reappraisal and reduction of emotional arousal during ER. Forty-five healthy participants underwent a heartbeat monitoring paradigm, viewing high-caloric food stimuli and non-food control stimuli, in a pseudorandomized order. Participants (n = 51) were reinforced by mild electric shocks, serving as unconditioned stimulus (US), in 80% of all CS trials. The amplitudes of different physiological responses to the CS+ were tested against responses to a safety stimulus (CS−), and the dynamics of physiological responses over time were explored. All three measures differentiated between CS+ and CS− during fear conditioning as well as extinction. Pupil dilations showed the strongest differentiation between CS− and CS+ shortly before shock onset. Startle EMG and SCR displayed robust habituation during conditioning trials. Startle sounds were rated equally aversive as the US. Pupillometry, SCR and startle EMG are comparable readouts of conditioned fear with different advantages. Also these readouts may capture different components of the conditioned response. While onset SCR and startle EMG habituate over time, and may rely on reflexive circuity, pupil dilations do not seem to habituate and may relate more strongly to cognitive threat appraisal.

**Poster 3-050**

**REWARD SENSITIVITY TOWARDS FOOD IN OVERWEIGHT INDIVIDUALS WITH BINGE EATING DISORDER – A COMBINED EYE-TRACKING AND ELECTROENCEPHALOGRAPHY STUDY**

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Descriptors: eating, reward, mood

Introduction: Reward sensitivity towards food stimuli might be one relevant factor for the development and maintenance of the binge eating disorder (BED). However, evidence concerning the role of current mood status and the interplay between mood and reward sensitivity is lacking. Method: We investigated reward sensitivity in overweight individuals with (BED+) and without BED (BED−) and normal-weight controls. Participants (n = 71) performed a free exploration paradigm, viewing high-caloric food stimuli and non-food control stimuli, in a neutral and negative mood condition. We measured approach behavior towards stimuli with eye-tracking (ET), using the position of the first fixation and the total dwell time as a proxy of reward sensitivity. Further, electroencephalography (EEG) was applied to assess anticipatory brain processes. Results: The different mood states did not affect gaze data. Participants fixated significantly more often the food stimuli first. BED+ individuals showed an increased dwell time for food stimuli compared to both control groups. Event-related potentials revealed specific associations with ET data. Discussion: The combination of ET and EEG data proves to be a useful method combination to investigate basic mechanisms of reward sensitivity. Our results strengthen the evidence of increased reward sensitivity towards food in overweight individuals with BED regardless of mood condition. The potential prediction of gaze behavior through EEG data will give insights into early processes and might give indications for psychotherapeutic interventions.
ASSOCIATIONS BETWEEN THE ABILITY TO REGULATE HEART RATE AFTER AN EMOTIONAL EXPERIENCE AND EXPERIENTIAL AVOIDANCE

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Descriptors: emotional regulation, heart rate, experiential avoidance

Physiological reactivity during the experience of an emotion and the ability to appropriately reduce reactivity when the emotional stimulus is no longer present (recover) is an indication of good emotional regulation. This study aims to investigate the relationship between emotion regulation, as defined by degree of recovery after the presentation of emotional stimuli and levels of avoidance coping. It was predicted that individuals high in the tendency to use avoidant coping would show less appropriate recovery. Heart rate was assessed during a tone-elicited emotional imagery during which 85 participants (47 females; 18-67 years old) had to imagine for 8-second periods normative scenarios describing joy, fear, sadness and relaxation. Experiential Avoidance and Avoidant coping were measured using the Acceptance and Action Questionnaire – II and Brief - COPE respectively. In general, avoidance predicted appropriate recovery (defined as the difference between the centered mean scores of HR during imagery and during ITIs) only for positive emotions. The difference score between imagery and baseline period was not statistically significant with regards to negative emotions. These results show that individuals with high EA may seem to present normal emotional regulation only for positive emotions. Findings provide preliminary evidence about the relationship between the tendency to avoid emotional experiences and ability to adjust to changing emotional demands in the environment.

ATTACHMENT MODULATES THE PROCESSING OF FACIAL EXPRESSIONS OF EMOTION: N170 AND LPP EVIDENCE

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Descriptors: facial expressions of emotion, ERP, attachment

Attachment relationships influence the representations of the self and the others. This is thought to guide beliefs and perceptions, namely of emotional significant information as facial expressions of emotion(FEE). The goal of this work was to understand how attachment dimensions are associated with neural responses to FEE. Twenty-seven healthy adults saw anger and happiness FEE, matched for arousal, and filled the Adult Attachment Scale, that measures the subscales of Anxiety, Close/comfort with intimacy) and Depend/sense of availability of others to one’s needs). A significant interaction between emotion and attachment showed that the 3 subscales were associated with N170 amplitude to happy, but not angry faces. Specifically, anxiety scores predicted a reduction in N170 amplitude while Close and Depand scores predicted increased amplitudes to happy faces. An association was also found between the subscales and the LPP amplitude to both anger and happy faces in Anxiety (increased LPP) and in Depand (reduced LPP). Close scores were only negatively correlated with LPP amplitude for happy FEE. In sum, Anxiety affects the initial processing of happiness and leads to a larger later response to both FEE, possibly due to a hypervigilance to the meaning of these expressions towards the self. Contrarily, both Comfort with intimacy and Sense of Dependence increase early reactivity to happiness with reduced later processing (Depend for both FEE), illustrative of a secure pattern of emotional processing.

ELECTROCORITICAL RESPONSES TO APPETITIVE AND AVERSIVE PICTURES: MOITIVATIONAL GRADIENTS AND TEMPORAL STABILITY

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Descriptors: emotion, EEG, stability

Does the appetitive motivational system respond more intensely than the appetitive system to comparable amount of activation? Previous studies focused only on subjective ratings, or on cortical responses to a small sample of high arousing emotional pictures, restricting the possibility to compare the appetitive and aversive gradients. The aim of the present study was to compare electrocortical responses to appetitive and aversive stimuli varying in emotional arousal defined by both subjective ratings and sympathetic changes. More specifically we examined electrocortical (Late Positive Potential and Alpha-desynchronization) sympathetic (skin conductance), and subjective responses to a large sample of stimuli (1200 pictures), portraying pleasant and unpleasant scenes from a large variety of contents, and varying in emotional arousal. Participants took part in two different sessions a week apart, that allowed us also assess the temporal stability of appetitive and aversive gradients. In terms of both cortical and sympathetic measures, the appetitive and aversive gradients did not significantly differ from each other. Also, temporal stability was similar for appetitive and aversive stimuli. The only difference between gradients was found in the subjective ratings, with a steeper aversive gradient. Altogether, the present findings are consistent with the idea that cortical and sympathetic changes reflect an early engagement of motivational systems, associated with emotional significance, while subjective ratings rely on later stages of emotional processing.

ATTENTIONAL CAPTURE BY STIMULUS DEVIANCE: TASK DIFFICULTY AND EMOTIONAL AROUSAL

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Descriptors: deviant distraction, emotion, event-related potentials

Attentional capture for deviant distractor is modulated by top-down attentional control, as indicated by a larger P3a component to distractor stimuli when the degree of attentional focus is increased by task difficulty. In this study, we investigated whether this mechanism of deviation detection is sensitive to the emotional content of distractor stimuli, which is typically effective in naturally capturing attention. Event-related brain potentials were recorded from participants while they performed a visual three-stimulus oddball paradigm (frequent standard, rare target, and rare distractor) and the discrimination difficulty (easy vs. difficult) between standard and target was manipulated across blocks. Natural scenes depicting emotional or neutral contents were presented as distractor stimuli. Results showed that the P3a to distractor stimuli was enhanced during a difficult discrimination task, and this task effect was more evident in high performance participants and decreased over trials. The overall P3a was also larger for emotional compared to neutral distractors, but this ERP emotional modulation was unaffected by task difficulty. Taken together these results are consistent with the idea of distinct attentional mechanisms underlying deviant attention and attention capture by emotionally relevant stimuli.

ACUTE SOCIAL STRESS ENHANCES PUPILARY RESPONSES TO EROTIC NUDES: EVIDENCE FOR DIFFERENTIAL EFFECTS OF SUBJECTIVELY PERCEIVED STRESS AND CORTISOL

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Descriptors: social stress, erotic pictures, pupil responses

Chronic stress attenuates reproductive behavior in many species, but experimental research on the impact of acute, transient stress on sexual arousability in humans is scarce. Animal studies reported mixed results ranging from inhibitory to stimulatory effects. Given that social stress has been linked to affiliation-oriented coping (‘tend & befriend’), we hypothesized that social context might moderate stress-related effects on responses to erotica. For physical stress induction, an isometric handgrip test performed for 3 min at either 45% or 10% (control) of maximum voluntary contraction was used. To add a social-evaluative component, half of the participants (N=39) were monitored by an unknown person of the opposite sex. Subsequently luminance-adjusted greyscale pictures of erotic nudes were presented for a duration of 2500 ms within the central visual field. As an index of sexual processing, left pupil diameter was recorded at 500 Hz using video-based eye-tracking. Overall, stressed participants showed enhanced pupil responses to explicit erotica. This moderation effect of stimulus explicitness was mediated by subjectively perceived stress. Moreover, combined physical and social stress led to a general increase in responsivity. However, elevated cortisol levels were associated with a relatively reduced preference for opposite-sex pictures. Our results suggest that stress exposure, particularly with social-evaluative threat, facilitates the processing of erotic stimuli, which might reflect either a specific adaptive mechanism or a more global change in emotion regulation.
ANALYZING EEG SIGNAL OF ALPHA BAND POWER WITH A NOVEL WICK-POLYMER ELECTRODE

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Descriptors: quasi-dry electrodes, EEG methods

Remarkable developments have been observed on EEG equipment, but the skin-to-electrode signal transfer remains a challenge for EEG recording. This study aims to compare the performance of a new quasi-dry electrode (WICK) with the conventional silver/silver chloride (Ag/AgCl) electrodes. The new sensor was developed as a polymer-wick electrode, based on the felt principle in which a moistener creates a conductive bridge between the chloride silver sensor and the skin. We expected non-significant differences between WICK and Ag/AgCl systems. The in-vivo assessment was carried out with 10 healthy volunteers (4 females, mean age = 33) that performed an alpha-blocking task (conditions: eyes-open, closed). EEG was recorded simultaneously with the two systems (WICK, Ag/AgCl) at fixed close positions. All impedances were kept below 30 kohm for both electrodes. The power of alpha band (8Hz-14Hz) was analyzed at Fz. Alpha power was higher in eyes-closed compared to eyes-open condition, F(1, 9) = 14.4, p = .033. Importantly, there was no main effect of system, nor condition/system interaction (both F < 1), suggesting that the alpha-frequency signals recorded by WICK and Ag/AgCl electrodes were similar. The main finding provides the first insights to the reliability of WICK electrodes to clinical EEG research, and supports results of previous studies on P3 event-related potential with these new electrodes. The WICK system is a promising half-way alternative to wet and dry solutions, making the EEG more comfortable and less time consuming to the participant and the investigator.

HERITABILITY OF THE NEURAL CORRELATES OF PERFORMANCE MONITORING

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Descriptors: ERN, heritability, performance monitoring

The detection of a discrepancy between an intended and an executed action (performance monitoring, PM) is a key component of adaptive self-regulation of goal-directed behavior. Neurophysiological indicators of PM, error-related negativity (ERN) and the subsequent error positivity (Pe), have been associated with individual differences in cognition, emotion, personality, and risk for psychopathology. Formerly, we have demonstrated heritability of ERN and Pe in children (Anokhin et al., 2008). Here we extend this evidence to adult age. Monozygotic (MZ) and dizygotic (DZ) twins (132 and 134 pairs, respectively; age 18–36, 54% females) performed a flanker task, and error-related brain activity was assessed using ERN and Pe peak amplitudes, the power of the theta band event-related oscillations (ERO), theta-band inter-trial phase coherence (ITC), and activation in the dorsal anterior cingulate cortex estimated using Low-Resolution Electromagnetic Tomography (LORETA). A genetic analysis using structural equation modeling showed high heritability of ERN, Pe, and ERO (46–61%) and moderate but significant heritability of ITC and LORETA measures (28–35%). In conjunction with test-retest reliability data (reported elsewhere), the present results suggest that >80% of stable individual differences in error-related brain activity are determined by genetic factors. We conclude that neural correlates of PM are potentially useful intermediate phenotypes for the interrogation of neurobiological mechanisms mediating genetic influences on personality and psychopathology.

DISINHIBITORY LIABILITY INTERACTS WITH STRESSFUL LIFE EVENTS IN PREDICTING SUBSTANCE USE PROBLEMS

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Descriptors: biobehavioral, substance use, disinhibition

Substantial evidence indicates that a highly heritable trait disposition involving weak inhibitory control confers broad risk for externalizing problems including substance use disorders (SUDs). This disinhibitory (DIS) liability, when assessed as a biobehavioral composite of scale and brain-response measures, covaries with SUDs mainly due to common genetic influences (Venables et al., IoP, 2017). The current study examined how stressful life events combine with DIS liability to increase proneness to SUDs. Specifically, we tested for additive and interactive effects of these two variables on SUD symptoms in an adult twin sample (N = 409). As in priour work, DIS liability was assessed as a composite of two scale measurements of disinhibition (DIS) and two P3 brain potential response variants, known neural markers of externalizing risk. Lifetime experience of stressful and adverse life events (e.g., accidents, victim of assault, etc.) was assessed through self-report. SUD severity (i.e., lifetime alcohol, cannabis, and other-drug use disorder symptoms) was assessed via clinical interview. Consistent with our predictions, DIS liability and the number of stressful life events independently and positively predicted extent of SUD symptoms. In addition, these two variables interacted to predict SUD severity, such that individuals high in DIS liability exposed to a larger number of salient adverse life events exhibited the greatest SUD symptomatology. These findings indicate that adverse experiences synergize with latent DIS liability to promote harmful use of alcohol and drugs.

BIOLGICAL RELEVANCE MODERATES SEX DIFFERENCES (AND SIMILARITIES) IN N2 AND LPP ACTIVITY EVOKED BY AVERSIVE IMAGES

Rosemarea Miller & Frances Martin
University of Newcastle

Descriptors: sex differences, N2, late positive potential

Differences between men and women in responses towards unpleasant images may be related to stimulus qualities unique to highly aversive examples of these stimuli. In the present study, the effect of biological relevance and action disposition on sex differences in N2 and late positive potential (LPP) activity was investigated. Seventy-four participants (21 male) rated the emotional characteristics of aversive and neutral images as EEG data were recorded. Twenty-two women were currently prescribed some form of hormonal contraceptive medication, while 31 women were not (15 follicular phase, 16 luteal phase). Linear mixed effects analysis techniques were applied to N2 and LPP mean amplitudes to allow for individual variation in ERP activity derived from EEG data. N2 modulation for images of snakes or handguns varied significantly between the male and three female groupings when these stimuli were shown with an attack or an inactive disposition. For the LPP, aimed handgungs and attacking snakes both elicited larger amounts of activity than equivalent inactive or neutral stimuli. In contrast to reptile and firearm stimuli, N2 and LPP modulation evoked by images of injured and non-injured humans was consistent between male and female participants. Together, these findings indicate the semantic characteristics of unpleasant images must be considered during stimulus selection in picture processing research. Moreover, the relative salience of negative stimuli to men and women may not be solely driven by the valence of the object or event depicted in an unpleasant image.

WHY I KEEP OVEREATING”: FOOD CUE REACTIVITY IN HIGHER EXTERNAL EATERS AND LESSER EXTERNAL EATERS

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Descriptors: food cue, skin conductivity levels, external eating

Food cues have a crucial influence on eating, particularly in individuals who are more sensitive to them. Empirical research suggests that individuals high in external eating tendency exhibit heightened cognitive and behavioral responsiveness to sensory food-reward cues, including attentional bias toward food cues, as well as overeating and obesity. This study examined the influences of different characteristics of visual food cues on motivational intensity and valenced preference. 55 students who had greater and lesser external eating tendency viewed and rated 55 food images that varied in their visual depiction of the food and the brightness of the image. During exposure to the images, participant’s skin conductivity levels (SCL). Results indicated that compared to lesser external eaters, higher external eaters exhibited greater skin conductivity during exposure to the food cues that presented food visually as ready-to-eat, F(3, 105) = 3.599, p = .032, ηp²=.093. Further, higher external eaters exhibited less skin conductivity during exposure to darker depictions of food that were not ready-to-eat. These findings indicate that small changes in contextual cues may help people overcome their vulnerability to food cues.
TEMPORAL STABILITY OF POSTERIOR EEG ALPHA OVER TEN YEARS IN A STUDY OF FAMILIAL RISK FOR MAJOR DEPRESSIVE DISORDER

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Descriptors: EEG alpha, test-retest reliability, current source density (CSD)

The stability of resting EEG alpha has been studied on a time scale of weeks or months, often to match treatment protocols in clinical trials. However, very few studies have examined EEG test-retest reliability on a time scale of years. The present study characterized the long term temporal stability of EEG alpha over a considerably greater time scale. Resting EEG was recorded from 73 participants in a study of familial risk for depression during testing sessions separated by a span of ten years. Low- and high-frequency EEG alpha factors were unequivocally identified, separated and quantified using reference-free methods that combine current source density (CSD) with principal components analysis (PCA). Measures of overall and net (eyes closed-minus-open) posterior alpha were compared across source density (CSD) with principal components analysis (PCA). Measures of resting EEG alpha at rest across prolonged time intervals, and are indicative of an individual trait.

ADVERSE CHILDHOOD EXPERIENCES ARE ASSOCIATED WITH THE MAGNITUDE OF THE ERN DIFFERENCE

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Descriptors: error-related negativity, EEG, adolescence

Previous studies have documented an association between levels of anxiety and error-monitoring processes. The error-related negativity (ERN) is an ERP component that is larger (i.e., more negative) when a participant makes an erroneous response than when they make a correct response. Increased levels of error-related brain activation are observed in anxious and obsessive-compulsive populations. Here we investigated the association of adverse childhood experiences (e.g., experiencing a serious illness or injury or the death of a parent) to such error-monitoring processes in adolescents. Forty-three typically developing 12- to 15 year olds performed a fish flanker task while EEG data were recorded and ERNs were compared for trials where correct versus incorrect responses were made. Participants were grouped according to the number of adverse childhood experiences they reported. Here we demonstrate an interaction between trial type (correct vs incorrect) and group (trauma vs no trauma) on the ERN. Both groups showed an ERN effect in the expected direction (more negative ERNs elicited to incorrect than correct responses), but the trauma group showed a larger Error-Correct difference than the no trauma group. Results are discussed in terms of a sensitization process, whereby early childhood experiences may have sensitized neural mechanisms related to disinhibitory liability and its differing clinical manifestations.

VIBROTACTILE STIMULATION: A NOVEL TREATMENT FOR NEONATAL ABstinence SYNDROME

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Descriptors: opioids, stochastic resonance, neonates

Neonatal Abstinence Syndrome (NAS) in newborns due to prenatal opioid exposure is characterized by dysregulated behaviors of the central and autonomic nervous system. Most infants with NAS require pharmacological treatment with an opioid derivative, which may independently contribute to neurodevelopmental problems. Tactile stimulation during critical periods of early brain development augments maturation of brain structures and improves behaviors and stability of functioning. We tested whether prolonged intervals of stochastic (random) vibrotactile stimulation (SVS; 30–60Hz μm RMS) with a uniquely constructed crib matress reduced hyperirritability (indexed by movement activity) and pathophysiological cardiac and respiratory instabilities. Seven opioid-exposed full-term newborns (mean GA 39.4 wks, SD 1.5; 4 female) hospitalized since birth and requiring pharmacological treatment for severity of symptoms participated in a within-subjects single-session study where they received interfered intervals of SVS (ON) and no stimulation (OFF). There was a significant reduction in movement activity during mattress OFF [F(2,16)=5.23, p=0.018] and a trend toward a significant reduction in tachycardic heart beats (150-200bpm) with stimulation [F(2, 17)=3.15, p=0.068]. Preliminary findings suggest prolonged periods of SVS may provide a complementary therapeutic intervention for facilitating drug withdrawal by reducing movement activity (index of sleep disruption) and pathophysiological cardiac instabilities in opioid-exposed newborns.
PHYSIOLOGICAL INDICES OF ADHD AND ODD/CD SYMPTOMS IN RESPONSE TO VALENCE AND AROUSAL DIMENSIONS OF AFFECTIVE STIMULI

Andry Souroulla, Thokla Constantinou, Androula Kepola, Maria Panteli & Georgia Panayiotou University of Cyprus

Descriptors: valence, affective stimuli, physiological indices

Research on the emotional profile of children with Attention Deficit Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD) and Conduct Disorder (CD) symptoms using physiological indices is limited. The purpose of this study was to examine the emotional reactivity of children with ADHD and ODD/CD symptoms in response to positive and aversive valence stimuli and to assess which physiological indices of valence and arousal system reactivity best predict their symptoms. The participants were 81 children (39 female). Children were instructed to look at a series of 12 pictures (neutral=4, sad=4, joy=4, fear=4). Mean heart rate (HR), skin conductance level (SCL), zygomaticus major and corrugator reactivity while viewing the affective pictures were recorded. Mean physiological at each type of picture was entered in multiple regression analysis as predictor, with ADHD and ODD/CD symptoms being the outcome variables. Results revealed increased HR in response to pleasant stimuli, indicative of an overactive appetitive system, and decreased HR in response to fear stimuli, indicative of fearlessness for both categories of symptoms. Results also supported differences between children with ADHD and ODD/CD symptoms in regards to their emotional processing: lower SCL scores across emotional conditions were observed for ODD/CD symptoms indicating difficulties in the negative valence system of these children. Limitations of the study are discussed.

PUBLIC AND SHORT-TERM PHONICS TRAINING IMPROVES PRINT-SPECIFIC ERP IN ENGLISH: A CASE STUDY OF A JAPANESE MIDDLE SCHOOL GIRL

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Descriptors: reading difficulty, phonics, event-related potential

Although phonics has been the most frequently used intervention approach for children with reading difficulties, its effects have not been fully clarified at a neurophysiological level. The present study administered pure and short-term (10 minutes per day for five weeks) phonics-training to a 13-year-old Japanese girl with severe difficulty in learning English, and examined changes in reading performance and event-related potentials (ERPs) for English words. In the intervention, the girl was first presented with correspondences between letters and phonemes and then taught to read regularly-spelled English words based on that knowledge. ERPs for the same words were recorded before and after the intervention while she was engaged in one-back repetition detection task. As a result, the girl who was initially unable to read any of the words showed a drastic improvement in reading accuracy. This behavioral remediation was associated with the increase in amplitude as well as print-specialization (i.e., amplitude difference between learned letter strings and non-linguistic visual control stimuli) of N170 component in ERPs elicited by the trained words. The patterns of changes in N170 closely resembled those that have been reported in novice readers of native English speakers, which suggested that present intervention laid the foundation of an English reading network in the participant girl. In conclusion, the present finding indicates that phonics training can, by itself, remediate English reading and improve its neurophysiological bases.

EFFECT OF PREMATURITY ON EARLY NEUROCOGNITIVE DEVELOPMENT OF MALE INFANTS

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Descriptors: early neurocognitive development, infants, Bayley Scales

It is known that prematurity is a risk for neurodevelopmental disorders, particularly for ADHD and autism [Anderson & Doyle, 2008]. However, most of the studies were dedicated to those children who have reached the pre-school and primary school age [Stephens & Vohr, 2009; Marlow et al., 2005]. The impact of prematurity on neurocognitive functions in the early stages of development is not investigated thoroughly. The aim of research was to reveal the differences in neurocognitive development in premature and mature full-term male infants at 5 months of age. The participants were 21 premature male infants at 5 months of corrected age and 21 age-matched healthy full-term male infants. The gestational age of preterm infants was between 29 and 35 weeks. The Bayley Scales of Infant and Toddler Development (3rd Edition) were used to evaluate the neurocognitive abilities in infants. The results were evaluated by one-way ANOVA, with level of performance in five Bayley scales as dependent variable, with group as between-subjects factors. Premature infants performed significantly (p<0.05) more poorly than the full-term infants on cognitive scale, receptive language and gross motor. No significant (p>0.05) differences were found between preterm and full-term infants on expressive language and fine motor. In view of the obtained results it can be assumed that the prematurity has specific (not global) negative effect on neurocognitive development in premature male infants at 5 months age.

AGE-RELATED DIFFERENCES IN PROCESSING SPEED IN CHILDREN

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Descriptors: processing speed, heterochrony of human brain development

Age-related differences in the processing speed has been observed in a great variety of tasks. In spite of the great amount of researches in this area, we know relatively little about the nature of this developmental tendency. The aim of this study was to assess whether age-related differences in reaction time (RT) can be explained satisfactorily in terms of a global age-related differences in processing speed alone. The sample consisted of 48 7-year-olds, 50 8-year-olds, 46 9-year-olds, and 35 adults. The test battery consisted of three types of RT tasks: simple, discrimination, and choice. We have revealed clear age-related differences in processing speed not only between children and adults but also between three age groups of children. However, using transformation method proposed by Madden et al. (2001) and Raddenikhof & van der Molen (1997) we revealed that there are not only global age-related differences but also process-specific age-related differences in processing speed. Among children, age-related differences larger than predicted by the global difference hypothesis were evident when tasks required spatial orientation discrimination and stimulus-response rule complexity, but not for response suppression or reversal of stimulus-response contingencies. The observed process-specific, age-related differences in processing speed generally are consistent with the principle of heterochrony of human brain development (Casey et al., 2005).

EFFECT OF MEDITATION ON CORTISOL LEVELS

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Descriptors: meditation, cortisol, meta-analysis

Meditation is a widespread and popular technique used to reduce stress, anxiety but whether meditation is really effective remains unclear. In the present meta-analysis we synthesize all evidence from randomised controlled trials assessing the efficacy of meditation to reduce diurnal cortisol levels. We chose cortisol level as the outcome measure because the concentration of this hormone elevates as a result of chronic and acute stress, thus it is an objective biomarker of stress level. As a result of a systematic literature search, we found 51 studies to be included in the meta-analyses. These include samples of both clinical and non-clinical populations and different age groups. The meditation interventions in these studies mainly include mindfulness-based meditation, but some utilized transcendental and zen meditation. Our preliminary results show that meditation has a significant, moderate effect to reduce diurnal cortisol levels on post-test assessment. This result remains when meditation is compared to active control conditions. Results regarding follow-up assessment investigating whether these benefits remain over time will also be discussed.
Poster 3-071
IN THE TRENCHES: MENTAL HEALTH AND PSYCHO BIOLOGICAL STRESS IN SOUTH SUDANESE PARAPROFESSIONALS
Kellie Ann Lee1, Ilya Yacevich2, Brandon Joachim1, Sarah Beranbaum1, Tae Hwon Son2, Wesley Ellen Gregory3, Prescilla John1, Vivian Kheradi1, Anita Shankar2 & Charles Wafula2
1The New School for Social Research, 2Global Trauma Project
Descriptors: trauma, HRV, stress
South Sudan has been embroiled in ongoing violence since 1955, and daily trauma, violence, and displacement have become the norm. Emerging reports document that half the population has posttraumatic stress symptoms (PTSS), and a vulnerable group may be paraprofessionals (e.g., tribal chiefs, police) who encounter trauma in their work—at risk to personal wellbeing as well as impacting those they serve. The goal of this presentation is to provide data on the well-being of South Sudanese paraprofessionals, moving beyond PTSD to incorporate psychobiological regulatory flexibility (measured by heart rate variability [HRV]) which also indexes cardiovascular risk in sympathetic and parasympathetic nervous system domains, broad affect dysregulation, and empowerment. Baseline assessments revealed that participants had significant PTSS, with over half the sample meeting screening criteria for PTSD; all participants had HRV within a catastrophic risk range, on average two standard deviations below age-related norms. High affect dysregulation was inversely related to parasympathetic components of HRV, and high empowerment was related positively to parasympathetic components of HRV. Possibly due to restricted range, HRV and PTSS were not related, though PTSS was related to affect dysregulation. These pilot results demonstrate multidimensional need in South Sudan, extending to physical stress and beyond PTSD. Future work will examine the effects of paraprofessional training on the broader community.

Poster 3-072
ERPS TO MONETARY REINFORCEMENT IN INDIVIDUALS WITH HIGH AND LOW HEDONIC CAPACITY
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University of Oklahoma Health Sciences Center
Descriptors: emotion, ERP, reinforcement
Low hedonic capacity (i.e., the tendency to not enjoy pleasurable stimuli) characterizes multiple mood disorders, but its neurobiological underpinnings are not yet clear. Here, we measured ERPs in 29 participants engaged in a behavioral task designed to objectively characterize theanhedonic phenotype. During the task, participants classify two ambiguous stimuli and receive sporadic monetary rewards for correct responses. Unbeknownst to participants, one response is rewarded three times more often than the other is. Previous studies have shown that individuals with normal hedonic capacity develop a bias toward the more frequently rewarded response whereas anhedonic individuals do not. We replicated this result by showing that individuals endorsing low levels of hedonic capacity on the South Hamilton Pleasure Scale (a validated self-report measure) failed to develop the bias toward the response reinforced more frequently. When we analyzed the ERPs to the reward feedbacks delivered during the task, we demonstrated that individuals that did not develop the response bias had significantly less positive ERPs at Fz from 368 ms to 430 ms post feedback onset. Further analyses showed that this between group difference progressively increased during the task. By employing a multimodal approach that included self-reports, behavioral, and electrophysiological measures, this work provides insight into the neurobiology of hedonic capacity.

Poster 3-073
EFFECT OF ACUTE STRESS ON APPETITIVE CONDITIONING AND HIPPOCAMPAL CONNECTIVITY
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Descriptors: reward, acute stress, fMRI
Stress is a key risk factor for the development of psychiatric disorders. Amongst other things, this is attributed to hypothesized effects of stress on reward learning. Here, we investigated neural mechanisms of this relationship by using an appetitive conditioning paradigm while recording fMRI. In this paradigm one neutral cue (CS+) is associated with a chance to win money, if the reaction to a subsequent target is fast enough. A second cue (CS-) indicates that there is no chance to win money regardless of the reaction to the target. Prior to the experiment one group of participants (N = 27 males) was subjected to an acute stressor (Trier Social Stress Test), while another (N = 29 males) was subjected to a placebo version. All participants acquired the association of the CS+ with the reward and showed increased skin conductance responses and BOLD responses in the reward circuit as compared to the CS-. The NoStress-group, however, reduced their effort to targets following a CS-, while the Stress-Group maintained fast reactions to targets following both stimuli. Correspondingly, the Placebo-group showed stronger BOLD-responses in amygdala, vACC, and OFC to the CS+ as compared to the CS-. Connectivity analyses revealed increased connectivity in the Stress-group between hippocampus and amygdala, vACC, OFC, and NAcc dependent of cortisol reactivity. The results indicate a hippocampally mediated impairment in differential reward learning under acute stress.

Poster 3-074
NEURAL CORRELATES OF SUBJECTIVE CS−REWARD ASSOCIATION IN APPETITIVE CONDITIONING
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Descriptors: appetitive conditioning, CS−reward association, fMRI
Dysfunctional appetitive conditioning processes constitute an important model for the development and maintenance of psychiatric disorders like addictions and depression. Explicit knowledge about the contingencies of CS and UCS impacts for example craving. However, so far only few studies have investigated the relationship between the explicit knowledge about CS−reward associations and the neural correlates during appetitive conditioning. In this study, 85 participants completed a differential appetitive acquisition training (40 trials, reinforcement rate 50%, monetary reward as UCS). Immediately afterwards, subjective CS−reward associations were assessed via subjective ratings. This dimensional measure describes how much more likely participants thought the CS+ than the CS− to be followed by the monetary reward. Results indicate higher subjective CS−reward associations to be associated with stronger differential BOLD-responses (CS+ > CS−) in the primary visual cortex (V1) in the early phase of acquisition, as well as stronger differential BOLD-responses in the ventral striatum in the late phase. Furthermore, PPI-analyses showed an inverse relationship of subjective CS−reward associations with V1/vmPFC-connectivity and striatal/vmPFC-connectivity. Overall, these results provide evidence for the involvement of early attentional processes in the formation of subjective CS−reward associations.

Poster 3-075
CONDITIONAL NEGATIVE STIMULUS EVALUATIONS CAN BE REDUCED WITH COGNITIVE INTERVENTIONS TARGETING VALENCE (BUT THIS REDUCTION DOES NOT REDUCE ELECTRODERMAL REINSTATEMENT)
Camilla Luck & Ottmar Lipp
Curtin University
Descriptors: fear conditioning, cognitive interventions, reinstatement
Conditional negative valence may play an important role in the return of fear, but can be challenging to remove as it extinguishes slowly and, unlike electrodermal responding, does not respond to instructed extinction. We examined whether conditional valence and electrodermal responding, acquired during conditional stimulus (CS)-unconditional stimulus (US) pairings, would respond to cognitive interventions that revalue the conditional stimulus. During acquisition, an image of one person (CS+) was paired with an aversive electrocutaneous stimulus, while another (CS−) was presented alone. After acquisition, participants were given positive character information about the CS+ poser and negative character information about the CS− poser, but no information about the CS−US contingency. Instructed revaluation reversed differential CS valence (CS+ became more pleasant) and eliminated differential electrodermal responding. In Experiment 2, we compared positive and negative revaluation by providing positive/negative information about CS+ and neutral information about CS−. When CS+ was positively revaluated differential valence evaluations were removed and differential electrodermal responding remained intact, however when CS+ was negatively revaluated differential valence evaluations were strengthened and differential electrodermal responding was eliminated. The results confirm that CS valence can be modified with revaluation instructions. Contrary to expectations, reinstatement of conditional electrodermal responding was not affected by CS revaluation.
Poster 3-076

REINFORCEMENT LEARNING MODEL OF ANOTHER’S PREDICTION BASED ON EMPATHY

Natsuki Saito, Kentaro Katahira & Hideki Ohira
Nagoya University

Descriptors: empathy, reinforcement learning, heart rate

Empathy can be divided into affective empathy (AE) and cognitive empathy (CE). However, we currently lack a method to determine how AE and CE influence prediction of others’ behaviors. We adopted two learning tasks in which participants predicted decisions made by a stranger (Other task) or a computer (COM task), through observation of their choices in stochastic avoidance learning. To predict others’ choices, participants needed to learn based on their own emotional responses and/or past others’ choices. Peripheral physiological responses and dispositional empathic scores were measured to confirm whether participants empathized with an agent in the Other task but not in the COM task. We also aimed to establish a computational account of empathy using the Reinforcement Learning (RL) model. Our RL model includes two terms: predictions of the other’s choices based on past another’s choices, or aversive outcomes that another received. The former was assumed as CE, and the latter was assumed as AE. Results showed that learning rate for outcomes that another received correlated with heart rate deceleration, whereas learning rate for outcomes that the computer received was not correlated with such physiological responses. Furthermore, learning rate for the other’s choices correlated with scores of the CE trait but that for the computer’s choices did not correlate with any empathic traits. These results suggested that participants used their own empathic responses only when they learn to predict other persons’ behaviors, but not when they predict actions of non-human agents.

Poster 3-077

EXTINCTION DURING RECONSIDERATION ELIMINATES RECOVERY OF FEAR CONDITIONED TO FEAR-IRRELEVANT AND FEAR-RELEVANT STIMULI

Alina Thompson & Ottmar Lipp
Curtin University

Descriptors: fear conditioning, fear relevance, reconsolidation

Extant literature suggests that extinction training delivered during the memory reconsolidation period is superior to traditional extinction training in the reduction of fear recovery, as it targets the original fear memory trace. At present it is debated whether different types of fear memories are differentially sensitive to reconsolidation recovery, as it targets the original fear memory trace. At present it is debated whether different types of fear memories are differentially sensitive to reconsolidation recovery, as it targets the original fear memory trace. However, evidence for correlates of prediction errors generated by the two learning systems. FRN and P3 amplitudes varied between the predictable and random sets. This suggests that neural markers of model-free and model-based learning, should yield clear prediction errors and judgments on future choices regarding subjective expectations on outcome valence. High uncertainty, allowing only model-free learning, should yield contrasting effects. We hypothesized this pattern to be reflected in the Feedback-related Negativity (FRN) and the P3. Participants had to work through a modified two-stage Markov-Decision Paradigm consisting of two independent sets with uncertain transition contingencies. Contingencies were predictable in one set (75%), but random in the other (50%). We found clear evidence for both model-free and model-based behavior in predictable sets but only model-free learning in random sets. Both FRN and P3 amplitudes varied between the predictable and random sets. This suggests that neural markers of feedback processing are specifically modified by our experimental manipulation of transition contingencies. Additionally we found evidence for correlates of prediction errors generated by the two learning systems.

Poster 3-078

LEARNING UNDER UNCERTAINTY: NEURAL MARKERS OF MODEL-FREE AND MODEL-BASED LEARNING IN PROBABILISTIC ENVIRONMENTS

Franz Warm, Benjamin Ernst & Marco Steinhauer
Catholic University of Eichstätt-Ingolstadt

Descriptors: reinforcement learning, EEG

In the present study we used event-related potentials to investigate feedback-related neural markers of model-free and model-based learning. In contrast to a model-free system, in which actions are habitual and stimulus-driven, a model-based learning system expresses flexible, goal-directed actions by mapping environmental contingencies via an internal world model. Only this model-based system should be able to generate distinct predictions that vary with the environmental uncertainty. Low uncertainty, allowing both model-free and model-based learning, should yield clear prediction errors and judgments on future choices regarding subjective expectations on outcome valence. High uncertainty, allowing only model-free learning, should yield contrasting effects. We hypothesized this pattern to be reflected in the Feedback-related Negativity (FRN) and the P3. Participants had to work through a modified two-stage Markov-Decision Paradigm consisting of two independent sets with uncertain transition contingencies. Contingencies were predictable in one set (75%), but random in the other (50%). We found clear evidence for both model-free and model-based behavior in predictable sets but only model-free learning in random sets. Both FRN and P3 amplitudes varied between the predictable and random sets. This suggests that neural markers of feedback processing are specifically modified by our experimental manipulation of transition contingencies. Additionally we found evidence for correlates of prediction errors generated by the two learning systems.

Poster 3-079

ELECTROPHYSIOLOGICAL CORRELATES OF IMMEDIATE AND DELAYED FEEDBACK PROCESSING IN ACTIVE AND OBSERVATIONAL LEARNING

Benjamin Weismüller, Janna Kullmann, Matthias Hoenen & Christian Bellebaum
Heinrich-Heine University

Descriptors: feedback-learning, feedback delay, observational feedback

In an ever-changing environment learning from feedback is important to develop adaptive behavioural strategies. However, the timing of feedback may vary and it may sometimes be safer to learn by the feedback observed persons receive for their actions. Previous studies suggest that the feedback-related negativity (FRN), an event-related potentials component generated in the anterior cingulate cortex, is reduced for delayed feedback and for feedback given to an observed person. These results indicate reduced dopamine (DA) system involvement in these situations, because the FRN reflects feedback-locked DA neuron firing. This study investigated the combined influence of feedback delay and agency (one’s own vs others’ actions) on feedback processing in a probabilistic learning task. The FRN, scored as the difference between negative and positive feedback, was reduced for delayed feedback only during active, but not observational learning. Interestingly, findings for theta band power are in line with the FRN pattern, with induced theta power being stronger for negative compared to positive feedback only during active, but not observational learning. The results show that, once DA involvement is diminished as e.g. in observational feedback processing, feedback delay does not result in a further reduction. The theta results suggest that higher cognitive control processes are initiated by negative feedback only if it refers to oneself and immediately follows the response.
**Poster 3-080**

FUNCTIONAL HETEROGENEITY OF THE HUMAN EXTENDED AMYGDALA IN FEAR AND ANXIETY PROCESSES

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Descriptors: fear conditioning, amygdala, BNST

The central extended amygdala comprises two major subdivisions, the amygdala and the bed nucleus of the stria terminalis (BNST), with proposed dissociable roles for phasic fear and sustained threat responding – as implemented in the NIMH RDoc matrix. However, a simple double-dissociation between amygdala-mediated ‘fear’ and BNST-mediated ‘anxiety’ has increasingly been challenged. Recently, increased attention has been drawn on the tight functional interconnection of both structures integrating information of transient and certain as well as temporally remote and uncertain threat. Here, we present data (N=49) of a combined cue and context conditioning paradigm exploring differential psychophysiological and neural responding during the acquisition of explicit cue-related phasic fear as compared to context-related sustained anxiety. Our results show a clear psychophysiological dissociation between conditions of phasic cue-related fear and context-related sustained anxiety. On a neural level, however, strong activation of the BNST is observed in cued fear but not sustained anxiety. This is extended by evidence for a time-dependent involvement of the amygdala/hippocampus junction during contextual conditioning. In sum, we provide further evidence for the functional heterogeneity of the human extended amygdala and, thus, challenging the notion of clearly distinct roles of amygdala and BNST in fear and anxiety processes, respectively. Future studies need to explore the boundary conditions for a dissociable involvement of amygdala and BNST in more detail.

**Poster 3-081**

BRAIN ORGANISATION OF RECOGNITION MEMORY: FMRI STUDY

Anastasia Neklyudova1, Stanislav Kozlovsky1, Alexander Vartanov1, Julia Marakshina1, Andrey Kiselkov1, Sergey Kartashov1 & Vadim Ushakov1
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Descriptors: recognition memory, information retrieval, fMRI

In our latest study (Kozlovskyi, Neklyudova et al., 2016) a model of recognition memory supported by two systems was proposed based on localization of EEG sources. The first one is connected with recognition of old stimuli and is provided by functioning of the cingulate cortex (300-400 ms from a stimulus). The second one is responsible for recognizing stimuli as new ones and includes the right putamen (100 and 500 ms from a stimulus) and the hippocampus (200 ms from a stimulus). In the present research more precise localization of these systems was examined using fMRI. Seven healthy right-handed subjects (mean age=22.5) were recruited for this study. The experiment consisted of two sessions. In the first one subjects should categorize visual stimuli as animated and non-animated. In the second session undertaken averagely in 48 hours, subjects were asked to say, if they saw a presented stimulus in the first session. During this task fMRI data was acquired using 3T Siemens Verio and T2*-weighted echo planar imaging (TR=2200 ms, TE=25 ms, flip angle=90°, FOV=192x192 mm). High-resolution structural T1-weighted image was recorded (TR=1470 ms, TE=1.8 ms, flip angle=9°, FOV=250x218 mm) and later combined with functional data for each subject. FMRI analysis was conducted in FSL 5.0 (Z=2.3, a corrected cluster threshold of p=0.05). It was shown that during information retrieval the parahippocampal gyrus, the anterior cingulate cortex and the putamen were active. Thus, these results prove the hypothesis about functioning of two brain systems supporting recognition memory.

**Poster 3-082**

IMPLICIT MEMORY FOR CONTENT AND SPEAKER OF MESSAGES HEARD DURING SLOW-WAVE SLEEP

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Descriptors: sleep, unconscious, EEG

Although sleep is a state of unconsciousness the sleeping brain can distinguish between meaningful and nonsense messages and can even learn contingencies between non-verbal events. Here we asked whether sleeping humans can encode new verbal messages and voices of unfamiliar speakers, and form associations between messages and speakers. To this end, we presented 28 sentences uttered by 28 unfamiliar speakers to participants who were in EEG-defined slow-wave sleep. After waking, we assessed recognition performance for sleep-played speakers, messages, and speaker-message associations in separate tests. While recognition performance was at chance in all three tests, responses were significantly faster for correct vs. incorrect responses in the message recognition test, indicating implicit memory for sleep-played messages (but not for speakers or speaker-message associations). Importantly, ERPs at centro-parietal sites suggested implicit memory during all tests: sleep-played compared to novel stimuli elicited more negative ERPs during the recognition of speakers (800-1200 ms) and speaker-message associations (from 400 ms), and more positive responses during sentence recognition (from 800 ms). Overall, these data suggest that while asleep, humans can implicitly learn about the semantic content and the speaker’s voice from sleep-played messages, and can form associations between these types of information.

**Poster 3-083**

DIFFERENCES BETWEEN REAL-LIFE AND LABORATORY MEMORY: EVIDENCE FROM EEG AND VIRTUAL REALITY

Benjamin Schöne, Marlene Wessels & Thomas Gruber
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Descriptors: autobiographical memory, episodic memory, virtual reality

“Real-life” autobiographical memory is characterized by self-involvement and rich associative mnemonic networks. Concerns have been raised that conventional “laboratory memory” differs from these vivid experiences. We addressed these concerns by comparing retrieval-related EEG-indices of both forms of memory. Furthermore, we aimed at bridging the gap between both types of remembrance by adding a virtual reality (VR) encoding condition. Participants took either part in a (a) real car drive, were confronted with a (b) 360° VR, or (c) a 2D video of the same ride. An unannounced recognition memory task followed 48 hours after encoding. ERPs revealed that the retrieval of real-life and VR experiences is processed similarly, whereas both differ from the retrieval of conventional laboratory-events. Within the 2D condition, we replicated a central N400 memory-related effect (hit vs. miss). Remarkably, no such effect was observed within the real or the VR condition. However, these conditions elicited comparable differences at frontal electrodes in the same latency when comparing the ERPs to old and new items. Our study provides evidence that the central N400 effect only occurs under laboratory conditions. It might be a result of shallow, familiarity-related processes and reflect real-life cognition only to a limited extent. Conversely, the higher degree of self-involvement in the real and the VR condition allowed for an autobiographical decision. The similarity between these two conditions makes VR a promising tool for future studies with enhanced ecological validity.
THE ROLE OF INTERMODULATION FREQUENCIES IN MULTIMODAL NETWORK COMMUNICATION: INFERENCEs FROM AFFECTIVE CONDITIONING

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¹Osnabrück University, ²Experimental Psychology

Descriptors: intermodulation frequencies, associative learning, electroencephalography

Interaction between cortical networks is based on non-linear mechanisms. For example, spatial integration of simultaneously presented visual information, which is processed in distributed networks, relies on intermodulation frequencies. These frequencies are non-linear combinations of oscillatory neuronal activity (f1-fn). Two neuronal networks firing at different frequencies produce intermodulations at e.g. f1+f2, 2*f1+f2. We hypothesized that intermodulations might also play a crucial role in associating multimodal information, for instance linking visual input with affect. In an affective conditioning paradigm, we presented a geometrical figure followed by an affective or non-affective picture. Both stimuli flickered at two different frequencies (f1, f2), eliciting the steady state visual evoked potential. We compared neuronal oscillations at the flicker and the intermodulation frequencies in response to the geometrical figure before and after conditioning. After affective conditioning, the sole presentation of a geometrical figure at f1 led to anticipatory changes in the neuronal response of f2. Hence, the conditioned affective concept is encoded at the frequency it was previously presented in. Topographies of intermodulation frequencies varied between conditions: Whereas in the affective condition changes occurred at posterior sensors, they appeared at frontal sensors within the neutral condition. Intermodulation activity thus might reflect the attempt of establishing communication between distinct neuronal networks instead of maintaining a link between networks.

ENHANCED VOLUNTARY AND SPONTANEOUS MEMORY RETRIEVAL OF EMOTIONAL ASSOCIATES: AN ERP STUDY

Carlos Ventura Bort, Alfons Hamm & Mathias Weymar
University of Potsdam

Descriptors: memory, ERPs, old/new effect

Recent event-related potential (ERP) studies using voluntary memory tasks showed that the ERP old/new difference as a measure of retrieval from episodic memory is enhanced for neutral information previously encoded with emotionally laden stimuli. In the present study we investigated whether the ERP Old/New difference for emotional associates is also observed when memory retrieval is not instructed (spontaneous recognition). Fifty-one participants incidentally encoded 180 neutral objects superimposed on 180 different backgrounds scenes (IAPS) varying in emotional content (60 unpleasant, 60 pleasant and 60 neutral). One week later, the same 180 old objects and 180 novel objects were presented while brain potentials where measured. In the explicit memory group, 28 participants performed a Remember/Know/New task. In the implicit memory group, 23 participants were instructed to simply view the objects. The ERP old/new difference did not differ as a function of retrieval condition. Parietal Old/New differences (600–800 ms) were specifically observed for objects from emotional but not neutral contexts. Our results suggest that facilitated memory retrieval effects for neutral information associated with salient stimuli also occur spontaneously without explicit instructions. Brain potentials could help understanding the mechanisms underlying maladaptive involuntary memories in trauma- and stress-related disorders.

LINGUAL GYRUS IN FORMING A FACE-DISCRIMINATION SYSTEM

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Lomonosov Moscow State University

Descriptors: face perception, source localization, lingual gyrus

The process of forming a system for detecting complex visual stimuli was researched. There were three sessions of the experiment. First, participants (N=29, age=18–28) viewed photographs of British cat faces which they were asked to memorize. Each face was presented for 800 ms and followed by a 1000 ms pause. Then, a participant had to choose the memorized face out of two similar images. That was a challenging task (64% of errors). In the second part of the experiment a single cat face was followed by a 3x3 matrix of similar stimuli among which a participant needed to find the face he just saw. The third session duplicated the first one in its design but it had a different set of stimuli (cat faces that were unfamiliar to the participants). In this session the percentage of correct responses was higher (86%). EEG was registered during the first and the third sessions (19 active electrodes). Visual evoked potentials were calculated. The sources of brain activity were computed using the dSPM algorithm (Dale et al., 2000) in BrainStorm SoftWare (Tadel et al., 2011) at 183–251 and 365–434 ms from the stimulus where the differences between ERPs were found (t-test, independent, by groups). In both sessions the lingual gyrus were active. Their activation had two maximum points (around 200 and 400 ms after the stimulus). The first maximum is higher in amplitude in the last session and the second maximum is higher in the first session. This finding suggests that forming a detecting system for face-like stimuli is a two stage process which involves activation of the lingual gyrus.

TRACKING THE TIME COURSE OF VISUAL PREDICTION IN AN ASSOCIATIVE MEMORY PARADIGM

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University of Illinois at Urbana-Champaign

Descriptors: visual prediction, N300, associative learning

Preparatory preactivation of visual features has been shown to facilitate image processing using behavioral and neurophysiological measures. We explored how the amount of predictive preparation time (i.e., the time between display of a visual scene cue and its recently associated novel object target) would modulate the timing, nature and amount of visual processing facilitation at the target. We recorded EEG as 76 participants learned paired associations between visual scenes and novel objects from novel object categories. At test, participants indicated whether an object matched a previously viewed scene. Critically, at test, the scene was previewed for either 200ms (N=24), 2500ms (N=24), or a variable 0–2500ms (N=28) prior to object onset. ERPs time-locked to object onset at test displayed a graded pattern of facilitation contingent on how closely the test object matched that presented with the scene at study. Critically, the time-course of this sensitivity varied with the amount of preview time. With long previews, graded facilitations emerged during the N300 time window. Instead, when participants had little time to develop predictions, fine-grained distinctions emerged only later, beginning at ~300–400ms. Treating preview time as a continuous covariate, we were able to further assess the amount of preparation time necessary to observe effects of visual prediction. N300 effects of prediction emerged at ~500–1000ms preview time and remained fairly stable thereafter. This places an approximate lower bound on the amount of time to preactivate global visual structure.
TIP-OF-THE-TONGUE PHENOMENON: AN ERP STUDY
Sophie Shirenova, Stanislav Kozlovska, Alexander Vartanov & Andrey Kiselnikov
Lomonosov Moscow State University

Descriptors: tip-of-the-tongue phenomenon, N400, evoked potentials

Introduction. The aspects of event related potentials (ERPs) in the Tip-Of-the-Tongue (TOT) state were researched. TOT is the state in which a subject fails to retrieve a word that is familiar to him/her. Methods. The participants (N=36, 16 females, mean age = 22.3, SD = 4.3) were asked to remember names of movie stars whose portrait photographs were presented on the screen. Each portrait was presented for 800 ms. ERPs (19 active electrodes, 800 ms after stimulus) were averaged for three conditions: “Know” - a participant remembered the name; “Don’t Know” - the participant did not know the name; “TOT” - a participant knew the name but failed to retrieve it. Statistical evaluation of the differences was executed using Student’s t-test. Results. No significant differences were found in the early components of ERPs. In all the conditions components typical for a visual evoked potential were present: N87, P120 in channels O1, O2; P300 in channels P3, P4. Significant differences were found in the N400 component (450–600 ms from the stimulus). In “Know” the amplitude of the component was significantly higher than in “TOT” and “Don’t Know”. In “Don’t Know” the amplitude was significantly lower than in “TOT”. We suppose that this component is responsible for name retrieval. Significant differences were also found in a positive wave around 750–800 ms from the stimulus in derivations P3 and T5, where the ERP for “TOT” was the highest in amplitude and the ERP for “Don’t Know” was the lowest. We assume that this is the time point when TOT occurs.

COLOR TEMPERATURE OF LIGHT AND EFFORT-RELATED CARDIAC RESPONSE: EFFECTS FOR COGNITIVE AND LISTENING TASKS
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Descriptors: lighting, effort, cardiac response

High color temperature white light with high proportion of short wavelength blue light induces a high alertness state, which should reduce the subjective demand of cognitive tasks and the associated effort investment. We tested this prediction in two between-persons studies that manipulated light color temperature across four levels (from 2800 K to 6500 K). Effort was assessed as beta-adrenergic activity on the heart, indexed by cardiac pre-ejection period (PEP). In Study 1, after a baseline period, participants (N = 74) spent 15 min under one of the lighting conditions and then performed a modified Sternberg task (5 min). We predicted that effort-related cardiac response should decrease with increasing color temperature of light. Study results confirmed this hypothesis: a single planned linear contrast was significant, F(3) = 2.17, p = .03, Cohen’s d = .51, showing that cardiac reactivity during task performance decreased with increasing color temperature of light. This contrast was also significant for PEP reactivity during the light exposure, F(3) = 2.36, p = .02, Cohen’s d = .55. Procedure of Study 2 (N = 57) was identical except that the task was a listening task. The linear contrast was significant for the mean PEP scores during the light exposure, t(56) = 2.40, p = .02, Cohen’s d = .64. During the task, PEP reactivity scores did not follow the same linear pattern but PEP reactivity was stronger in the 5000 K condition than in other lighting conditions. Our results provide the first evidence that lighting color temperature influences mental effort investment.

REWARD AND PUNISHMENT MOTIVATION DEMONSTRATE OPPORTUNITY IN DORSAL ANTERIOR CINGULATE DESPITE SALIENCE-ENCODING ACTIVATION
Jessica Lake¹, Jeffrey Spielberg², Zachary Infante³, Laura Crocker⁴, Cindy Yee⁴, Wendy Heller⁸ & Gregory A. Miller¹
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Descriptors: reward, punishment, functional connectivity

fMRI investigations have examined the extent to which neural activation associated with reward and punishment motivation is consistent with the encoding of valence vs. salience. However, the possibility of intermixed but distinct populations of neurons encoding reward and punishment has limited the extent to which regions can be regarded as exclusively encoding salience using fMRI. To circumvent this limitation, the present study examined the interaction of reward and punishment motivation and the functional connectivity of classically-defined salience-encoding regions. Participants completed a modified monetary incentive delay task, making a speeded response after each target. In a factorial design, cues presented prior to the target indicated whether monetary reward and/or loss could be expected if the response was or was not fast enough to the target, respectively. Evidence of behavioral and neural interactions of reward and punishment motivation involving dorsal anterior cingulate (dACC) indicates that these processes do not contribute only additively to behavioral performance and therefore do not support a simple salience-encoding account. Additionally, despite exhibiting classically-defined salience-encoding activation (increased activation during both reward and punishment motivation), dACC showed differential connectivity between these conditions, supporting differential neural communication according to motivational valence. These findings support the opponency of reward and punishment and demonstrate a novel fMRI method for specifying regional functionality.

FINANCIAL MOTIVATION DOES NOT SEEM TO IMPACT RESULTS USING THE COMPLEX TRIAL PROTOCOL VERSION OF THE P300-BASED CONCEALED INFORMATION TEST
Anne Ward, Evan Sitar, Joshua Wasserman & J. Peter Rosenfeld
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Descriptors: concealed information test, P300, psychophysiology

Level of subject motivation may impact the generalizability of concealed information test (CIT) research; in the lab, participants do not have their freedom (and potentially life) on the line as suspected criminals detained in field settings. While the electrodermal-based CIT effect is increased in groups with a greater motivation to beat the test (Meier et al., 2014)—suggesting enhanced effectiveness in real life settings—the effect of motivation on the P300-based CIT has not been established. Using a mock crime scenario and the complex trial protocol (CTP) version of the P300-based CIT (Rosenfeld et al., 2008), this study tested the impact of financial motivation on CIT results by instructing both paid and unpaid subjects on how to attempt to beat the test. Results showed no probe-minus-relevant differences in p-p P300s between the groups (unpaid = 6.6 microvolts, paid = 6.3 microvolts; p = .21); JZSBF = 2.92 favoring null, suggesting that financial motivation does not have much impact on P300-based CIT results. This supports the generalizability of P300-based CIT findings to applied settings. However, questions surrounding possible differences between motivation induced by financial incentive (i.e., reward) versus the desire to avoid punishment still exist and warrant future research.

Poster 3-092
YOU CAN'T EAT A LANDSCAPE: INVESTIGATING THE DISSOCIATION BETWEEN EMOTIONAL VALUE AND MOTIVATIONAL SALIENCE USING ERP'S
Colleen O’Leary, Claire Gorey & Geoffrey Potts
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Descriptors: emotion, motivation, evolution
Psychophysiological experiments typically use images from the International Affective Picture Scale (IAPS) as stimuli with universal values of valence and arousal. The assumption is most of the variance is captured by valence and arousal and this is correlated with motivational salience. Images of landscapes, while positive and mildly arousing, do not hold the same motivational salience as they do not represent an evolutionarily relevant resource such as food, sex, or social bonding. This three-experiment study shows that this distinction is related to differential activity in event-related potentials in regions of the brain associated with emotion and motivation. While valence and arousal explain the variance in the P3 measured in the centrotemporal region, evolutionary relevance explains additional variance in the medial frontal negativity (MFN) reflective of reward system activation. Study one demonstrates that the P3 during reward consummation is reflective of the valence and arousal of IAPS images, yet the MFN has reduced amplitude when using images from mixed categories when compared with monetary reward. Study two demonstrates that in anticipation of categorical, emotionally salient rewards, the social and food images elicit greater P3 amplitudes than do landscape or neutral images. In study three, the dissociation of MFN and P3 amplitude for landscape images only demonstrates this effect is dependent on the image’s evolutionary significance since the amplitude for the P3 and MFN were correlated for food, social, and monetary rewards only.

Poster 3-093
AMYGDALA INFLAMMATION AND ALTERED EMOTIONAL RESPONSES IN AUTOIMMUNE LIMBIC ENCEPHALITIS
Olga Schröder, Insa Schlossmacher, Constanze Möng, Nico Melzer & Thomas Straube
University of Muenster

Descriptors: limbic encephalitis, amygdala, arousal
Limbic encephalitis (LE) is an autoimmune-mediated disorder leading to pathological alterations in limbic structures, particularly amygdala and hippocampus. The behavioral and autonomic consequences of amygdala involvement in LE are widely unknown. Two different experimental designs were applied in the present study in order to (1) investigate emotional and autonomic responses to emotional stimuli in a sample of patients suffering from LE (n = 12) in comparison to healthy controls (n = 16) and (2) to explore assumable relations to inflammation-driven morphological alterations of the amygdala. Our analyses revealed significantly reduced skin conductance responses (SCR) and arousal ratings in LE patients in relation to controls; the difference was particularly pronounced for anxiety-inducing stimuli. Moreover, the degree of amygdala inflammation correlated with the decrease of SCRs. Additionally, the decrease of SCRs was associated with reduced reports of subjective arousal in the LE sample. The findings indicate a deficient modulation of sympathetic responses during emotional stimulation in patients with LE, that are potentially due to impaired amygdalar functioning.

Poster 3-094
DEFICIT OF VISUAL MEMORY IN DELAYED RECALL CONDITION IN ADHD CHILDREN
Sergey Kiselev
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Descriptors: ADHD, visual memory, prefrontal cortex
It is known that children with ADHD have deficit in prefrontal cortex function including deficit in working memory (Martinussen et al., 2012). In our previous research we have revealed that ADHD children have deficit in memory for faces and for names in delayed recall condition (Kiselev & Lvova, 2014; Kiselev & Lvova, 2016). The goal of this research was to examine the hypothesis that children with ADHD have deficit in visual memory in delayed recall condition. The experimental group included 17 children with ADHD at age 8–9-years. The control group included 17 typically developing children. The children from experimental and control group were matched for IQ, gender and age. Children from both groups were assessed with visual memory subset from Luria’s neuropsychological assessment battery. This subtest is designed to assess the ability to perform visual memory for objects in immediate and delayed conditions. Two-way ANOVA was used to reveal group differences in reproducing the objects in two conditions. We have not revealed significant differences between children from experimental and control group in the reproducing the objects in immediate condition. However, the interaction of condition type and group was significant (p<0.005). ADHD children were less successful in reproducing the objects in delayed condition. In view of the obtained results, it can be assumed that children with ADHD have specific (not global) deficit in memory in delayed recall condition.

Poster 3-095
COMMUNICATION FOR PEOPLE WITH DISORDERS OF CONSCIOUSNESS OR LOCKED-IN PATIENTS
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Guger Technologies OG

Descriptors: brain-computer interface, disorders of consciousness, locked-in syndrome
In this poster we present a vibro-tactile Brain-Computer Interface that serves for communication with patients suffering disorders of consciousness or are Locked-In. The patients are stimulated with three vibro-tactile stimulators. The EEG is measured to calculate the evoked potentials as reactions to the stimuli. For training, the users had to follow predefined tasks, such as “count the stimuli you feel on your left hand”. The BCI could then be calibrated, using machine learning techniques. In the communication runs the users were free to decide on which kind of stimuli they want to concentrate, thus providing YES/NO answers. Three patients and three healthy controls are assessed in one to three sessions. All six participants were able to communicate in at least one session. All evoked potentials (EPs) of the healthy subjects showed a P300 peak. The visual inspection of the EPs shows that the P300 was generally not the main signal that differed between the stimuli. In most patient data, the normative P300 is not apparent, still the BCI was able to distinguish the EPs of single stimuli. In the poster we will show which EPs result in successful communication and provide online results of communication tests for all participants. Our results further support the nascent consensus that BCI technology could be helpful for assessment of awareness in patients with disorders of consciousness. If a patient is able to correctly answer questions, where the answer is known, one could conclude there is consciousness left.

Poster 3-096
ELECTROPHYSIOLOGICAL CORRELATES OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN CHILDREN
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Descriptors: attention deficit hyperactivity disorder, EEG, ERP
EEG and ERP methods were combined with functional and behavioral tests in order to find psychophysiological correlates of Attention Deficit Hyperactivity Disorder (ADHD). In 32 boys with ADHD and 24 typically developing boys, aged 9–13 years, EEG was recorded at 20 scalp points in resting state, during intermittent photic stimulation (IPS) of 3–7 Hz and during performance of the Attention Network Test (ANT). The ADHD patients showed an increase in the EEG amplitude spectra of delta, theta and alpha waves, spontaneous and induced by IPS, in the frontal and left temporal areas. The patients had symmetrical distribution of the photic driving while in the controls, the right-side prevalence in the anterior regions was observed. Intrahemispheric EEG coherence in the ADHD patients was increased in the left hemisphere in the delta, theta and alpha bands. These results probably show relative inactivation of the frontal and left temporal areas, known to be responsible for voluntary attention in norm, and impaired in ADHD patients. The ERP characteristics during ANT corroborated the above results showing in the patients a reduction of the target late components in the left frontal and mid-frontal areas and of the analog cue components in the frontal leads. The target late components demonstrated in the patients the significant right-side prevalence, probably of a compensatory character. This asymmetry resulted in leading role of the right frontal and temporal ERP data in discriminating between ADHD patients and controls by hierarchical clustering of the ANT, ERP and WISC-III data.
Poster 3-097

FEW LASTING SEQUELAE OF CONCUSSIONS IN YOUNG ADULTS

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Descriptors: concussion

There is an increasing awareness of the behavioral and cognitive consequences associated with concussions. Many schools have instituted programs to obtain baseline measure performance of athletes prior to the start of a season. There are documented cases of permanent brain damage at the professional level resulting in dementia and personality changes. However, little is known of the cumulative damage that occurs in those playing youth sports. To assess whether the effects seen after concussion were long-lasting, we tested working memory, processing speed, and balance in 150 college students (72 female). Forty-one percent had had at least one concussion (mean 1.8). The average time since the most recent concussion was 35 months earlier. Working memory was assessed using the digit span task, which is included in the athletic department’s concussion assessment, and the Operation Span Task. Balance was tested in two ways: using the Nintendo Wii Fit Plus video game system and balance board and the standard Balance Error Scoring System (BESS) for measuring balance in a variety of poses. Processing speed was measured using a continuous performance task that required participants to detect the low frequency target. There were no overall differences between those with a history of concussion and those without. Balance scores related to scores on the digit span and working memory tests. The data suggest adolescents recover from concussions given time and when there have not been multiple repeated concussions.

Poster 3-098

TO WHAT EXTENT DOES MOTOR IMAGERY RESEMBLE MOTOR PREPARATION?

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Descriptors: motor imagery, motor preparation, lateralized alpha power

Motor imagery may be defined as the generation of an image of the acting self that lacks the final execution of a movement. This image is thought to be a simulation of the intended action from a first-person perspective. Recent studies with a Go/NoGo version of the discrete sequence production paradigm, in which a sequence of five finger movements was indicated by visuospatial cues, revealed that both motor imagery and motor preparation induced the learning of a fine hand motor skill. These findings suggest that there may be overlap in the processes activated during motor imagery and motor preparation. Twenty participants took part in an experiment in which they had to prepare, imagine, and execute a sequence of finger movements with the left or right hand. EEG was measured from 128 channels. Wavelet analyses were performed to determine response-side-related lateralizations in the alpha and beta bands. Analyses for the alpha band in the motor imagery condition showed decreased contralateral power with an initial parietal focus that became more occipital at the end of the time interval. A comparable pattern was observed in the motor execution condition. A reversal of this pattern was observed in the motor preparation condition, with an initial occipital focus that became more parietal at the end of the time interval. Comparable results were obtained for the beta bands. The current findings suggest that motor imagery and motor preparation are not equivalent, although they may only differ in the temporal order of the involved processes.

Poster 3-099

ENCODING OF SURPRISE ALONG THE HUMAN AUDITORY HIERARCHY

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Descriptors: mismatch negativity (MMN), frequency-following response (FFR), deviance magnitude

Encoding of surprise has been associated with a cortical, long-latency component of the human auditory evoked potentials (AEP) termed mismatch negativity (MMN). However, human electrophysiological correlates of surprise encoding have been recently found at shorter latencies, by the middle-latency response (MLR), and even attributed to subcortical structures by means of Frequency-Following Response (FFR). In animal studies, the disclosure of stimulus-specific adaptation (SSA) at different stations of the auditory system has supported the view that surprise detection based on regularity encoding is a common property of the entire auditory system. For example, both the MMN and SSA have been shown to depend on the magnitude of the physical difference between the auditory stimuli establishing a common background and those bringing the surprise. The aim of the experiment was to assess the effects of the magnitude of the frequency difference between a repetitive standard tone and different deviant stimuli in the MMN as well as in the FFR obtained to stimuli delivered in oddball blocks. As expected, MMN increased as a function of deviance when compared to the standard, but MMNs were similar when compared to the corresponding control stimuli. On the FFR, deviant stimuli yielded a significant effect which, however, was similar irrespective of deviance magnitude. These results suggest that the encoding of surprise is present along the auditory hierarchy, and that its magnitude is parsed out at cortical level, by a mechanism that is not associated to true deviance detection.

Poster 3-100

ALPHA OSCILLATORY ACTIVITY DIFFERENTIALLY REFLECT FALSE BELIEF AND COMPLEMENTATION SYNTAX PROCESSING IN SCHOOL-AGED CHILDREN

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University of Florida

Descriptors: false belief understanding, complementation, alpha

The current study aimed to compare the electrophysiological correlates of false belief understanding and complementation syntax in children using electroencephalography (EEG), focusing on oscillatory brain activity and large-scale connectivity. We utilized the unexpected location false belief scenario to implement a false belief and a true belief condition. Likewise, memory for complementation task was adopted to contain a false complementation and a true complementation condition. There were 12 different cartoon stories in each of the four conditions, presented in random order. Participants (N = 22; Mean age = 9.63 years; 11 male) watched the stories in animated vignettes. Each story contained five vignettes (picture-sound pairs) with the story narrative in the first three vignettes, a critical question asked in the 4th vignette, and two choices shown in the 5th vignette, where participants responded verbally and then clicked the mouse button to proceed to the next story. Wavelet analyses on single trials based on data from the 4th vignette were conducted to quantify the temporal dynamics of brain oscillations in response to the experimental manipulations. Results showed a sustained decrease in parietal alpha power (8–12 Hz) in false belief and true belief conditions compared to the two conditions of complementation syntax. Together with ongoing analysis of functional connectivity, these results suggest that neural population activity in the alpha band shows complementary sensitivity to mentalizing and syntax type in the typically developing population.
Poster 3-101
INCREASED CNV AMPLITUDES ASSOCIATED WITH FORCE PARAMETER MODIFICATION PREDICTS GOLF PUTTING PERFORMANCE
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Waseda University

Descriptors: CNV, force parameter modification, golf putting

Previous studies have suggested that the CNV may represent central motor programming and parametrization. Modification of motor parameters such as force to be exerted is among the essential properties for motor control. In this study, we investigated if an increase in CNV amplitude associated with force parameter modification predicts motor performance of a different motor skill (i.e., golf putting). To record CNVs, we used a two condition target force production task where participants (N=21) produced target forces by pressing force-sensitive keys in a ballistic manner with the right or left index finger. The target force was 10 N in the single condition, but 1 of 3 (4, 10, 16 N) pseudo-randomly required by a precue in the multiple condition (63 trials * 6 blocks for each task). On a different day, participants performed a golf putting task, aiming at a target from a distance of 6 m (8 trials * 2 blocks). The CNV was larger in the multiple than the single condition. Correlations between incremental increase of the CNV amplitude (CPz) and absolute values of deviation errors in putting (i.e., distance from the target) were calculated. We found a significant correlation for the absolute error (r = .44, p = .046), indicating that a greater increment in the CNV is related to better golf putting performance. Our results suggest that various motor skills may share a common process underlying force control, and thus the CNV can reflect an index of how well motor skills transfer among tasks.

Poster 3-102
DECEPTION IN SOCIAL CONTEXTS: AN EEG-STUDY OF KNOWN VS. UNKNOWN STIMULI AND THE INFLUENCE OF INDIVIDUAL DIFFERENCES
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Descriptors: deception, EEG, personality

This study investigated salience as a cognitive process and the influence of inter-individual differences during deception. The salience hypothesis predicts that known, deceptive (probe) stimuli are more salient than truthful, unknown (irrelevant) stimuli with probe stimuli evoking a more positive P3 amplitude. So far only two studies showed that sensitivity for injustice and Trait-BIS modulate the P3 amplitude in a deception task. We aimed at investigating the generalization of cognitive processes during to two social contexts. Similar to a traditional Concealed Information Test (CIT) 97 participants were asked to conceal their knowledge of previously learned faces. In the first social condition (familiarity) deceptive (probe) stimuli were unknown and irrelevant stimuli were known. In the second condition (trustworthiness) all stimuli were known and participants concealed trustworthiness (trustworthiness) all stimuli were known and participants concealed trustworthiness. The findings suggest that the salience hypothesis may share a common process underlying force control, and thus the CNV can reflect an index of how well motor skills transfer among tasks.

Poster 3-103
IS THE EARLY VISUAL ERP SENSITIVE TO LOW-LEVEL VISUAL STIMULUS PROPERTIES? A TEST OF LUMINANCE VS. COGNITIVE FACTORS
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Descriptors: visual ERP's, luminance, attention

It has been suggested that the early components of the visual event-related potential (ERP) is sensitive to low-level visual properties. We present 3 studies comparing the effect of luminance versus cognitive factors on the P1, N170 and P2. Study 1 examined the effect of ease of processing (stimulus degradation) on content judgment (living vs nonliving objects): Degradation (more noise) reduced amplitudes and increased latencies, but an interaction indicated that within the less degraded stimuli, content (living vs nonliving judgment) affected P100 amplitude. Study 2 was a one-back memory task with recognizable objects vs nonsense line squiggles: N170 amplitude and latency were affected by content. Luminance differences could not account for results in Studies 1 and 2. Study 3 examined the effect of luminance by varying grey scale levels of faces, houses, and rectangular patches. The N170 amplitude showed effects: stimulus type (p < .001; faces largest); luminance (p < .001; the dimmest producing the smallest), and an interaction (p < .001) such that faces yielded a strong luminance effect, houses a moderate one, and most importantly patches none at all. Taken together, the results from these studies suggest that these early visual ERP components are not affected by luminance per se. We propose that cognitively driven attention factors contribute their amplitudes.

Poster 3-104
THE IMPACT OF IONIC SEGREGATION ON AFTER-EFFECTS OF DIRECT CURRENT STIMULATION: MAGNETOENCEPHALOGRAPHIC CORRELATES
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Descriptors: MEG/EEG, brain stimulation, tDCS

Transcranial direct current stimulation (tDCS) is a promising form of non-invasive brain stimulation. Even though tDCS is gaining in its popularity, the exact mechanism of tDCS still remains unclear. Here we investigated whether ionic transport and segregation of charge mechanisms caused by tDCS may have a relevant impact on transient after-effects. Marked areas of a honeydew melon used as a volume conductor were stimulated with 2mA for 30 or 10 minutes with a central anode surrounded by four cathodes, a set-up which enables focused DCS stimulation. Before and after stimulation, melons were positioned on a swing construction within a whole-head-magnetoencephalography system and frequently triggered to move within the scanner in a controlled oscillatory fashion. Analysis of the event related magnetic fields identified oscillatory field changes at the sites of stimulation, but not at contralateral control sites. The amplitudes of the oscillation envelopes revealed an exponential change along minutes after stimulation. In fact, the modelled temporal gradient of the envelope approached zero around 15 minutes after 30 minutes stimulation and around 6 minutes after 10 minutes stimulation. Our results support the hypothesis that tDCS evokes ionic segregation, in turn provoking relatively prolonged after-effects of stimulation. These findings do not provide direct inferences on tDCS after-effects in humans. However, they might encourage more research on ionic segregation as a potential mechanism in humans which is currently neglected as it is assumed to decay within seconds.
Poster 3-105

PLACEBO ANALGESIA CHANGES THE MULTI-VOXEL REPRESENTATIONS THAT UNDERLIE PAIN AND PAIN EMPATHY

Isabella Wagner, Markus Rütgen & Claus Lamm
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Descriptors: multi-voxel pattern analysis, fMRI, pain empathy

Empathy for pain engages similar brain regions as a direct, painful experience. This suggests common representations for the two experiences that appear anchored in mid-cingulate and anterior insular cortices (MCC, AI). Definitive evidence for such common representations is, however, missing. We recently demonstrated that placebo analgesia reduces both pain empathy and self-pain (Rütgen et al., 2015). Here, we re-analyzed the fMRI data of this study. We used multi-voxel pattern analysis (MVPA) to investigate the neuronal representations of pain empathy and self-pain and how they were affected by placebo analgesia. Participants (placebo/control group, N=49/53) underwent fMRI while receiving painful and non-painful electrical stimulation, or when observing another person being exposed to such stimulation. MVPA primarily focused on MCC and AI was used to test representations of self- and other-directed stimulation (pain/no pain), and common or distinct representations between self- and other-directed stimulation (self/other). We found that MCC and AI representations of self-directed stimulation partly generalized to other-directed stimulation and vice versa. Self- and other-directed painful and non-painful stimulation were dissociable in the control group, but this was not possible for other-directed stimulation in the placebo group. Additional whole-brain searchlight results point towards altered prefrontal control processes following placebo analgesia. In conclusion, placebo analgesia appears to change neuronal representations that underlie direct pain and pain empathy.

Poster 3-106

AFFECTIVE MODULATION IN PAIN: A PSYCHOPHYSIOLOGICAL STUDY

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Descriptors: EEG, Motif-Synchronization, emotional modulation

The major aim of this research was studied the influence of emotional modulation on the Pain Matrix connectivity examining the EEG functional connectivity. We proposed a new association method known as Motif-Synchronization. This method was developed to provide information about the synchronization degree and direction between two nodes of a network by counting the number of occurrences of some patterns between any two time series. A sample of 20 univarsity students (10 male/10 female) viewed 8 blocks of unpleasant, neutral and pleasant pictures and black screen. Prior to the task, the warm-pain stimulation was calculated for each participant as 60% of pain tolerance. The task consisted on 3 min of baseline and 2 min of blocks (with 20 pleasant, unpleasant and neutral pictures and black screens) with random ITI between 6–24 s. The task was divided into two identical parts with 4 blocks each. Warm-pain stimulation was delivered after 18 s from the beginning of the blocks. At the end of each picture block participants evaluated unpleasantness thermal sensation. The EEG activity was recorded for all task. The results revealed that Motif-Synchronization method is able to discriminate differentially between the functional brain networks elicited by different experimental conditions in healthy controls. In line with others studies, our results showed that emotional conditions of participants have high impact in pain processing.

Poster 3-107

USING PSYCHOMETRIC TECHNIQUES TO EXAMINE THE RELATIONSHIPS BETWEEN EVENT-RELATED POTENTIALS AND PERSONALITY TRAITS

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Descriptors: five-factor model, event-related potentials, structural equation modeling

Past research has shown that event-related potentials (ERPs) and personality traits are related. However, findings have been mixed. Statistical techniques commonly used in personality assessment could aid in elucidating the relationships between ERPs and personality traits. This project focused on ERPs known to be involved in feedback processing (e.g., reward positivity; RewP; P3) and performance monitoring (i.e., error-related negativity; ERN) from samples of sizes ranging from 173 to 376 participants. First, the zero-order correlations between several ERPs and the five-factor model personality traits were examined. This approach allowed the examination of the relationship pattern rather than on the reliance on statistical significance. Results suggested that several ERPs correlate with multiple personality traits and vice versa. For example, RewP elicited from the monetary incentive delay task correlated with Neuroticism (r = −0.15), Openness (r = −0.12), and Agreeableness (r = −0.17). Next, structural equation modeling was used to identify a latent ERP and to examine whether this approach will clarify the unspecific relationships. Most ERPs seem to fluctuate within tasks and this approach can “extract” the common variance across a task. When applied to ERN, this approach resulted in a stronger correlation with Neuroticism (r = 0.10 to .12) and a weaker correlation with Extraversion (r = 0.06 to .03). Unexpectedly, correlation with Openness increased (r = 0.05 to .12). This project provides insight into the possible utility of psychometric techniques in ERP research.

Poster 3-108

MULTI-DOMAIN ASSESSMENT OF CALLOUSNESS

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Descriptors: callousness, psychoneurometric

Callous-unemotional (CU) traits in children with conduct problems portend an especially stable, severe course of antisocial behavior over the lifespan (Frick et al., 2005). Extending from the child literature, research with high-callousness adults is beginning to examine neural correlates of these traits, including reduced P200 and N170 brain-ERP responses to fearful faces (Brislin et al., 2017). However, our biobehavioral understanding of callousness lags behind current interest in measurement issues and quantification, and a valid and reliable cross-domain conceptualization of callousness in any age group has yet to be undertaken. The current work created a psychoneurometric callousness factor in an adult twin sample using self-report and brain-ERP variables, building on similar work for trait disinhibition and threat sensitivity (Patrick et al., 2013; Yancey et al., 2016). A one-factor solution was derived from two brain-ERPs from separate binocular rivalry and emotional Stroop tasks and a self-report callous-aggression scale. In turn, the extracted factor score related to criterion psychophysiological variables and related more strongly to psychoneurometric disinhibition than to threat sensitivity, consistent with the nomological net of callousness. TWIN-concordance analyses revealed evidence of heritability for this callousness factor. Taken together, these findings represent a step toward a multi-domain conceptualization of callousness that maximizes reliability and construct validity and helps to inform our understanding of this harmful characteristic.
FEEDBACK-EVOKED CORTICO-CARDIAC COUPLING IN RELATION TO ANXIETY AND CATECHOLAMINERGIC CHALLENGES

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Descriptors: cortico-cardiac coupling, anxiety, catecholamines

Motivationally meaningful stimuli, such as performance feedback, trigger coupling of electrocortical and cardiac responses. Moreover, this coupling may be a biomarker for anxiety. Using Cardio-Electroencephalographic Covariance Tracing, we could repeatedly show that centromedial single-trial EEG at the P300 latency intrathemindividually predicts subsequent cardiac deceleration (N300H component). While there is accumulating evidence for serotonergic modulation of the N300H, other neurotransmitters such as dopamine and noradrenaline may also be relevant as they play major roles in feedback processing and sympathetic cortico-cardiac transmission, respectively. Here, N = 54 healthy male participants received either the D2-receptor blocker sulpiride (200 mg, n = 18), the a2-adrenoceptor blocker yohimbine (10 mg, n = 18), or a placebo (n = 18). They then performed a gambling task in which they could win or lose varying amounts of money (0 cents, 10 cents, 1 Euro) in each trial. Feedback evoked a robust N300H across all participants. In line with previous studies, N300H magnitude was most pronounced in the 1 Euro condition and negatively correlated with dispositional anxiety in the placebo group. Moreover, it was positively correlated with anxiety in the sulpiride group. Yohimbine did not significantly affect N300H. Taken together, the N300H is a reliable index of cortico-cardiac coupling in response to feedback and is sensitive to dispositional anxiety. In the absence of general catecholaminergic coupling effects, the role of dopamine might vary with different levels of anxiety.

AYAHUASCA PROMOTES BRAIN EMOTION REGULATION MECHANISMS AND ANXIOLYTIC EFFECTS: AN fMRI STUDY

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Descriptors: psychedelic, emotion regulation, fMRI

Although ayahuasca has been proposed as potentially therapeutic as anxiolytic and antidepressant, few studies have been carried out so far investigating their effect on brain emotional processing. The aim of this study was to measure the effect of ayahuasca on brain response to emotional aversive faces, using functional magnetic resonance imaging (fMRI). Nineteen regular ayahuasca users participated in this study evaluated in two fMRI sessions before and after ayahuasca intake. Pictures of neutral (A) and aversive (B) faces were presented in a blocked design. They were asked just to identify the gender of the faces. Subjective mood states were evaluated during the procedures, using a visual analogue mood scale (VAMS). Images were acquired in a 1.5 T scanner and analyzed using statistical maps obtained in a general linear model with random effects. The amygdala responded bilaterally to aversive faces of before ayahuasca intake, but no activation was found after. Furthermore, after intake, ayahuasca enhanced the activation bilaterally in the insula, and also in the right dorsolateral prefrontal cortex. In the psychometric VAMS subscale, ayahuasca attenuated anxiety (p < 0.05), and there was a correlation between cognitive impairment reduction and the activation of dorsolateral prefrontal cortex (r = 0.58, p < 0.01). Brain emotional processing after ayahuasca intake to aversive stimuli had a pattern similar to emotion regulation mechanism by reducing anxiety and defensive responses in the amygdala, while enhancing cognition and responses in the insula and prefrontal cortex.

AFFECTIVE EVALUATION OF BODY IMAGES IN ANOREXIA NERVOSA

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Descriptors: affective startle modulation, eating disorders, body image

Anorexia nervosa is characterized by fear of weight gain. This is reflected in amygdala activation during confrontation with distorted photographs of oneself simulating weight gain. In contrast, photographs of emaciated women induce startle attenuation, suggesting a positive valuation of extreme slimness. To combine these findings, we applied an affective startle modulation paradigm containing photos of the participants simulating weight gain and photos simulating weight loss. We assessed eye-blink startle responses via EMG in 20 women with anorexia nervosa (AN; mean age = 25 years; mean BMI = 23) and 20 healthy control women (HC; mean age = 25 years; mean BMI = 23). We were able to replicate affective startle modulation of standard positive, negative, and neutral pictures, except for an absence of startle attenuation for positive pictures in AN. Body images did not modulate the startle response in either group. This was in contrast to the subjective ratings, in which the AN group indicated negative valence and high arousal for distorted body images. The body photographs used in our study emphasized general body shape and it appears that this was not threatening to AN patients. Photos highlighting body details might produce different results. Considering that body image exposure, a frequently used intervention tool for AN, aims at fear reduction through habituation, it is essential to determine which aspects of the body actually elicit fear responses to maximize therapy outcome.
EMOTIONAL EGOCENTRIC BIAS (EEB) DURING SOCIAL PAIN IN AUTISM SPECTRUM DISORDER (ASD): BEHAVIORAL AND NEUROPHYSIOLOGICAL EVIDENCE

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Descriptors: self-other distinction, autism spectrum disorders, MRI

Empathy, the ability to feel with another person, has already been widely studied in both neurotypical as well as clinical populations, being fundamental for everyday social interactions. However, such social skill is not free from error. Since humans primarily use their own emotions and perceptions in guiding their thoughts about conspecifics, such a self-projection mechanism can lead to empathic judgements that are egocentrically biased towards one’s own perspective – resulting in an EEB. In this context, the ability for Self-Other Distinction (SOD) plays an essential role during empathic interactions, mainly because it avoids confusion between self and others’ emotions. Since multiple studies have shown impairments regarding Theory of Mind in individuals with ASD, it may be possible to observe differences in distinguishing their own feelings from those of other individuals. By means of a virtual ball-tossing game, aimed at inducing congruent or incongruent feelings of social inclusion/exclusion between the participant and a confederate, we investigated the ability of SOD in 17 participants with autism spectrum disorders (ASD) together with 17 matched controls both on a behavioral and neurophysiological level. The results indicated a significant EEB during incongruent emotional empathic judgements. Interestingly, autistic subjects exhibited significantly more egocentric empathic judgements than controls when the degree of alexithymia was kept constant. The present study adds valuable preliminary insights to the investigation of social cognition in this population.

BRAIN ACTIVITY DURING EXPOSURE TO TRAUMATIC MEMORIES IN PTSD

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Descriptors: PTSD, memory, MEG

Traumatic experiences often lead to the development of intrusive memories involving sensory fragments of the traumatic event. Although intrusive memories constitute a core symptom of posttraumatic stress disorder (PTSD), their underlying brain mechanism remains unclear. Moreover, it is unknown whether this mechanism is restricted to incidents of trauma recollection or constitutes a more general information processing impairment also apparent in response to affectively neutral imagery. To answer these questions, a script-imagery paradigm was conducted where PTSD participants and trauma-exposed controls listened to their trauma or to a neutral narrative and were subsequently asked to imagine it in detail while their brain activity was measured using magnetoencephalography (MEG). PTSD participants exhibited a distinct pattern of activation in response to traumatic versus neutral conditions in multiple frequency bands. Of note, PTSD patients showed increased high-gamma activity in response to trauma compared with neutral conditions in visual areas, while controls did not show such an increase. An additional altered pattern of activation was apparent in the delta band in auditory and somatosensory regions. These findings indicate information processing impairments in PTSD that include increased response to the traumatic event but also altered response to neutral narratives. Based on these findings we suggest a sensory-bound experience of PTSD patients when recalling their trauma, alongside sensory desensitization in response to neutral stimuli.

PHYSIOLOGICAL HABITUATION TO AVERSIVENESS AND NON-SUICIDAL SELF-INJURY: A TEST OF ACQUIRED CAPABILITY FOR SUICIDE

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Descriptors: non-suicidal self-injury, habituation, suicide

The Interpersonal Theory of Suicide (ITS) suggests that individuals must overcome self-preservation motives through repeated exposure to painful or provocative events before engaging in lethal self-injury. Although most research testing this element of the ITS has focused on prior suicide attempts, one pathway by which this capability for suicide may be acquired is through non-suicidal self-injury (NSSI). One way to examine acquired capability is by studying individual differences in habituation to aversiveness. Thus, the current study examined whether a history of NSSI predicts rate of physiological habituation in a clinical sample from an ongoing study on vulnerabilities to psychopathology. History of NSSI was assessed using the SCID-S, and electromyography recorded from the orbicularis oculi muscle was used to assess initial reactivity and habituation to six 40-ms, 103-dB bursts of white noise. Mixed model analysis revealed a significant main effect of Time and a significant Time x NSSI interaction. Follow-up simple slopes analyses indicated that subjects without a history of NSSI evidenced a decline in startle responding, whereas those with a history of NSSI did not. Additionally, preliminary analyses of initial reactivity (i.e., response to first startle probe) indicated that those with a history of NSSI exhibited attenuated initial reactivity relative to those without a NSSI history. Importantly, all findings remained after controlling for prior suicide attempts. These preliminary findings suggest that NSSI may be a pathway by which capability for suicide is acquired.

TEMPORAL STABILITY OF SEMANTIC PROCESSING DEFICITS IN SCHIZOPHRENIA AND THEIR LINK WITH SYMPTOMS

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Descriptors: ERP, schizophrenia, executive function

Extant literature has consistently shown deficits in semantic priming in schizophrenia and other psychotic disorders, as indicated by reduced N400 amplitude. Studies to date have largely been cross-sectional, however, and the temporal stability of these deficits and their longitudinal links with illness characteristics remain unknown. The current study examined symptom severity and the N400 at two time points across a four-year follow-up. The sample consisted of 63 individuals with schizophrenia or other psychotic disorders (affective psychosis, substance-induced, not otherwise specified) from the Suffolk County Mental Health Project, a longitudinal study of first-admission psychosis. The first N400 assessment occurred 15 years after first hospitalization and the second assessment was at year 19. Participants completed a picture-word matching task to elicit the N400 at both assessments. N400 amplitude for both unrelated pairs and related pairs correlated significantly across assessments (r = .28, p < .05; r = .41, p < .05, respectively), although the correlations were small, indicating relatively low long-term temporal stability of these neural measures. Controlling for 15-year N400 amplitude to unrelated pairs, 15-year disorganized symptom severity uniquely predicted reduced N400 amplitude four years later; no evidence was found for the reverse association. These data suggest substantial temporal variability of semantic processing deficits in late-phase psychosis, as well as potential prospective links specifically with disorganized symptoms.
Poster 3-117

NORMATIVE BEHAVIOUR DURING REPEATED TRUST INTERACTIONS AND ITS ASSOCIATION WITH PSYCHOPATHIC TRAITS IN AN INCARCERATED AND A COMMUNITY SAMPLE

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Descriptors: psychopathy, skin conductance, repeated trust game

Even though psychopaths have a reputation of violating social norms on a regular basis, normative behaviour of psychopathic individuals in incarcerated and community samples during repeated interactions is poorly understood. We addressed this gap by conducting a study directly comparing a forensic sample of 26 male offenders and a community sample of 25 male volunteers with varying degrees of psychopathic traits, measured with PCL-R and PSI-R respectively. We measured anticipatory skin conductance responses (aSCR) to fairness and reciprocity decisions during a repeated trust game. Although both samples chose exploitative fairness twice as often as other fairness strategies, this malicious bias was not apparent in reciprocity strategies. Between sample differences only arose in the norm adherent behaviour: the community sample chose more often equalizing fairness, yet less often benevolent reciprocity than the incarcerated sample. For norm adherent decisions (specifically equal reciprocity), aSCR was positively related with PCL-R Factor 2 in the incarcerated sample. For benevolent strategies clear divergent patterns appeared: in the community sample PPI Factor 1, and PPI coldheartedness were positively related to aSCR during benevolent reciprocity. In the incarcerated sample PCL-R Factor 2 was negatively related to aSCR for both benevolent fairness and reciprocity. In conclusion, norm violations during repeated interactions are rather subtle, and aSCR patterns in normative behaviour differ greatly within and between psychopathic traits in incarcerated and community samples.

Poster 3-118

CROSS-FREQUENCY PHASE-AMPLITUDE COUPLING AT REST AND DURING SOCIAL THREAT IN HIGH AND LOW SOCIALLY ANXIOUS INDIVIDUALS: AN INDEX OF AFFECTIVE CONTROL?

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Descriptors: cross-frequency coupling, social anxiety, EEG

Cross-frequency coupling (CFC) between neural oscillations is suggested to constitute a mechanism for information transfer and encoding. In anxiety disorders, CFC between delta (1–4 Hz) and beta (13–30 Hz) is argued to reflect the cross-talk between cortical and subcortical brain regions, thereby offering a putative measure of emotion regulation. To test this notion, the current study examined delta-beta phase-amplitude coupling (PAC) in high (n=20) and low (n=32) socially anxious women during resting-state EEG and while participating in a threatening self-presentation task. For the first time, we used the debiased PAC method, which is less affected by spurious coupling than amplitude-amplitude coupling (AAC) or unbiased PAC. A composite measure of three frontal electrodermal (F3, Fz, F4) was used to examine early and late stages of resting-state, anticipation of threat, and recovery of threat. Low socially anxious women generally showed high delta-beta PAC (except during late resting-state and early anticipation), while high socially anxious women showed weak delta-beta PAC (during resting-state, and late anticipation and recovery). This indicates that delta-beta PAC might not reflect a socially-anxious state, as delta-beta AAC is posited to reflect, but rather a psychophysiological index of affective control, which goes away in socially anxious individuals.

Poster 3-119

A NEUROCLINICAL ASSESSMENT OF TRAIT LIABILITY FOR DEPRESSION

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Descriptors: reward, depression, neuroclinical

Major Depressive Disorder (MDD) can manifest variously, and differing subtypes of depression have been proposed to account for alternative expressions of MDD and their distinct comorbidity patterns. The current study focused on a subgroup of depressed individuals who exhibit trait-like depression – a variant of depression marked by an early onset and high rates of recurrence. In order to enhance the specificity of assessment of this form of depression, we combined diagnostic indicators of dispositional depression with a neurophysiological indicator of depression proneness – the Reward Positivity (RewP; Hajcak Proudfit, 2015). The RewP is a brain potential response that has been shown to index sensitivity to reward, and prior work has shown that reduced RewP at younger ages predicts later development of MDD. Within a sample of 201 adult participants, we found that the RewP covaried with symptoms of trait-depressive conditions (i.e., dysphoric disorder, depressive personality) but not with current-state depression. When trait-depressive symptoms were combined with RewP-reduction into a composite score, this neuroclinical composite showed improved specificity over trait-depressive symptoms per se – relating strongly to MDD but negligibly to fear disorder symptoms. This work provides evidence that dispositional liability for depression can be quantified more precisely by anchoring psychological measures of depression proneness to a neurophysiological index of a core depression-relevant process (i.e., reward sensitivity).

Poster 3-120

THETA-BETA MATURATIONAL FREQUENCY COUPLING IN ATTENTION DEFICIT AND CONTROL CHILDREN AND ADOLESCENTS

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Descriptors: attention deficit, power-to-power frequency coupling, theta-beta rhythms

The resting EEG provides non-invasive spectral markers of brain function, with no need of complex experimental protocols. We have previously found a correlation between theta and beta spectral power along development in control subjects, indicating a co-maturation between these two rhythms. We hypothesized that ADD patients would show a different spectral power values compared with healthy subjects, and different power-to-power theta-beta maturation coupling. Open eyes resting state EEG was recorded in a sample of 36 controls and 36 ADD subjects (6–17 years old). The power spectral density (PSD) from 0–46 Hz was computed. ANOVAs to compare spectral power between control and ADD subjects were obtained. PSD correlations of the whole range of frequencies were computed in order to observe possible differences in the co-maturation of the different brain rhythms in both groups of subjects. An increase in delta power in ADD subjects with respect to control subjects was obtained, indicating a predominance of slow waves in ADD subjects. While control subjects presented a significant correlation between low frequency rhythms and beta rhythm, ADD subjects presented a reduced maturation frequency-coupling between these rhythms. The increase of low frequency rhythms in ADD suggests a developmental delay in ADD children, given that power of brain rhythm is decaying with age in normal subjects. The lack of maturational frequency-coupling between low frequency rhythms and beta suggest a differential pattern of development in ADD children with respect to controls.
NEURAL AND BEHAVIORAL INDICES OF SELF-REFERENTIAL BIAS PREDICT DEPRESSIVE SYMPTOMS IN ADOLESCENT GIRLS

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Descriptors: depression, late positive potential, self-referential bias

Negative self-referential processing bias has been theorized to play a causal role in the development of depression. Currently depressed adults and adolescents, compared to healthy individuals, endorse and recall more negative than positive self-relevant adjectives. In addition, they show an enhanced late positive potential (LPP), an event-related potential (ERP) reflecting sustained attentional engagement during the processing of negative relative to positive adjectives during the self-referential encoding task (SRET). An enhanced LPP to negative words in the SRET has been shown to index vulnerability for depression in early adolescent girls. The present study included 55 girls aged 8 to 14 years with no lifetime history of depression, and examined whether ERP and behavioral measures of self-referential processing during the SRET prospectively predicted self-reported depressive symptoms at a 2-year follow-up assessment. Results indicated that participants with an enhanced LPP to negative words had increased depressive symptomatology at the 2-year follow-up. Additionally, the increased recall of endorsed negative words (i.e., negative recall bias) predicted depressive symptoms. Importantly, the LPP and recall bias were significant predictors independent of each other and independent of other prominent risk factors. The present study provides novel evidence that abnormal electrocortical reactivity to negative self-referential words and negative recall bias prospectively predict depressive symptoms in adolescent girls.

PREDICTING SYMPTOM SEVERITY AND THERAPY-OUTCOME? AN RDOC APPROACH USING HIGH FREQUENCY HEART RATE VARIABILITY AND FEAR CONDITIONING

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Descriptors: prediction of symptom severity, HRV, fear conditioning

The RDoC initiative aims at developing a classification of mental disorders based on dimensional behavioral and physiological markers. Disturbances in heart rate variability (HRV) and fear conditioning/extinction are associated with a variety of psychopathologies. In the current study, we measured HRV and fear conditioning/extinction to predict symptom severity and therapy outcome in a sample of 186 patients diagnosed with Depression (n=69), Anxiety Disorders (n=53), comorbid Depression and Anxiety (n=40) or other mental disorders (n=24). Symptom severity was assessed with the Brief Symptom Inventory before and after 20 sessions of cognitive behaviour therapy. Results indicate that higher symptom severity was associated with lower HRV and enhanced UCS expectancy for CS−cues during acquisition and extinction of fear in patients with anxiety disorders as well as the comorbid group, but not in depressed patients. To test whether the sample could be classified according to the patients HRV score, we divided the sample in three dimensional groups (n=62 each) of low, medium or high HRV. We found largest symptom severity for the low, intermediate severity for the medium, and lowest symptom severity for the high HRV group. Moreover, in the high HRV group only, better therapy outcome was associated with enhanced safety learning as indexed by enhanced positive evaluation of CS−cues during fear acquisition. In sum, the current study shows that a pattern of resting HRV and fear conditioning/extinction may serve as a potential biomarker for symptom severity and therapy outcome.

IDENTIFYING STATE-DEPENDENT MODULATIONS IN FUNCTIONAL CONNECTIVITY: A GROUP THEORETIC BASELINE CORRECTION

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Descriptors: baseline, covariance, manifold

Functional connectivity varies as a function of variables such as task, condition, and baseline, but currently there is no baseline-correction reported in the literature for functional connectivity matrices. This is because the group structure of covariance matrices is not closed under subtraction; i.e. the difference between covariance matrices is not necessarily a covariance matrix. However, the modulation in functional connectivity may itself be an important predictor, distinct from functional connectivity. For example, modulation in functional connectivity may be small if the baseline connectivity is near some optimal state. Conversely, it is possible that modulations in functional connectivity encode relative information about the stimulus, independent of the baseline. Here a new method is presented to find a conditional connectivity matrix, indicative of modulations in connectivity relative to baseline. In a Flanker paradigm, 30 participants (23 female) aged 18–24 (m: 19.14) were asked to identify the center letter in a string of 5 letters. An omnibus permutation test was performed using the Euclidean distance between the matrix logarithms of the baseline-corrected connectivity. Functional connectivity was significantly modulated relative to baseline following an incorrect response, F(2,28) = 27.41, p < .001. This modulation in connectivity was strongly correlated to the ERN Z scores, r(30) = 0.72, p < .001. These effects were not apparent when a simple linear subtraction between functional connectivity matrices is used for the baseline correction.
Poster 3-125
A UNIFIED MODEL OF EVENT-RELATED POTENTIALS AS PHASES OF STIMULUS-TO-RESPONSE PROCESSING
William Gavin, Brittany Taylor & Patricia Davies
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Descriptors: contingent negative variation (CNV), individual differences, structural equation modeling
Much current research is devoted to detecting stable brain measures to aid in clinical diagnoses or describe developmental changes. Many of these studies continue to focus on a single component of an event-related potential (ERP) in isolation from other components, ignoring the inter-related nature of neural processing. Furthermore, all psychophysiological measures are affected by individual differences in physical and mental state that inflate measurement error. The present study tested a model of systematic neural processing that successfully predicts task behaviors (reaction times; RT) while accounting for individual differences.

Poster 3-126
NOREPINEPHRINE AND THE SUBJECTIVE EXPERIENCE OF TIME: P3 AMPLITUDE AND PUPIL DILATION PREDICT TEMPORAL OVERESTIMATION
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Descriptors: time perception, P3, pupil dilation
Why does time appear to slow down when a surprising event occurs? Current research suggests that this subjective time dilation is due to an arousal response. In line with this, we have previously reported that the P3, an event-related potential (ERP) component that is affected by arousal, predicts temporal overestimation. Because the P3 has been suggested to reflect a correlate of a phasic release of norepinephrine (NE), we proposed that this neurotransmitter release is the neurophysiological equivalent of the arousal response underlying time dilation. To further test this hypothesis, the present study investigated whether another index of NE release, the pupil dilation response, also predicts time dilation. To this end, we investigated ERPs and pupil dilation following infrequent oddballs of different durations that participants had to estimate relative to a reference. As expected, overestimations were preceded by a larger P3 amplitude and a larger pupil dilation response than correct estimates and underestimations. Further, the number of standard stimuli interspersed between oddballs affected all three dependent variables in the same direction with larger numbers being associated with a longer perceived duration, a larger P3 amplitude, and a larger pupil dilation response. Finally, all three measures were correlated over participants. Together, these results suggest that time dilation shares a common mechanism with the P3 and pupil dilation, which presumably is a pronounced phasic release of NE.

Poster 3-127
TEMPORAL CONSTRAINTS OF USING AUDITORY EFFECTS FOR ACTION OPTIMIZATION
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Descriptors: self-induced sounds, auditory feedback, motor control
Voluntary actions are intentional, that is, we perform them to cause various effects. These action-effects provide information on whether the action was successful or not; thus allowing the optimization of the movement. In three experiments we examined how delays between an action and the auditory action-effect influenced action adaptation. Participants applied force impulses to a force-sensitive resistor in a self-paced schedule. In experiment 1 and 2, force impulses were followed by tones with constant delays (0 to 1600 ms in separate conditions), or (in a further, separate condition) no tone was presented. The applied force was significantly reduced for delays below 200 ms, whereas for longer delays it was not affected by the presence or absence of auditory feedback. In experiment 3, we examined the effect of prior experience on action optimization. Two groups of participants applied force impulses to the force-sensitive resistor, eliciting tones with a 200-ms action-effect interval, but beforehand they were exposed to different action-effect delays in long (10 min) adaptation blocks. Participants who were exposed to a 400-ms delay could much more efficiently optimize the actions in the subsequent 200-ms delay condition in comparison to participants who were exposed to a condition with no action-effect delay. These results suggest that the influence of self-induced sounds on motor control processes is limited by a 200-ms time-window. It seems, however, that this window for action-effect integration is not rigid: it can be modulated by prior experience.

Poster 3-128
FAST AND ACCURATE SACCADIES IN CHILDREN WITH AUTISM SPECTRUM DISORDERS
Marine Siwiątsczyk, Klara Kowarski, Joelle Malvy, Magali Batty & Marianne Latinus
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Descriptors: ASD, saccades, development
Atypical sensory processing is part of the diagnostic criteria of Autism Spectrum Disorders (ASD). Accordingly, atypical visual exploration with less precise and more heterogeneous saccades for both social and non-social stimuli has been reported in ASD. This could be the manifestation of underlying difficulties in oculomotor control. We assessed visuo-guided saccades in 21 children with ASD (73 months [32–138]) and 21 age-matched controls (74 months [32–122]) to investigate a subset of oculomotor functions in ASD. The target could appear in one of 8 positions. Eye movements were monitored with an SMI eye-tracking system (500Hz). Region of interests (ROI) were defined as the target for accurate saccades, the zone between the center and the target for hypometric saccades, and the zone after the target for hypermetric saccades. The number of recorded trials was significantly correlated with children’s age for both groups (p < 0.05). There were more accurate saccades than hypo- and hypermetric saccades in both groups (p<0.001). In addition, ASD were significantly faster (261ms) than control children (282ms, p=0.03) to reach any ROI (e.g., time-to-ROI) despite similar saccade velocity, latency and number of saccades. This was partly explained by a significant correlation between the number of saccades and time-to-ROI in the ASD group only (p<0.01). Contrarily to previous reports, children with ASD were as accurate as control participants, yet faster. Future studies should explore attentional modulations of saccades in social and non-social visual search paradigms.

Poster 3-129
LINEAR REGRESSION ANALYSIS SEPARATES N1 SENSORY SUPPRESSION FROM MISMATCH NEGATIVITY
Timothy Murphy, Brian Coffman, Sarah Haigh & Dean Salisbury
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Descriptors: linear regression, mismatch negativity, sensory adaptation
There is debate whether Mismatch Negativity (MMN) reflects neural processes engaged in deviance detection or simply reflects the difference between suppressed and non-suppressed N1 sensory responses. We performed an analysis using linear regression and dummy coding to determine if the effect of N1 suppression can be separated from the MMN. MMN data were acquired from 100 healthy controls. Tones were presented at a 330ms SOA and comprised standard tones (1000Hz, 50ms, 80%), pitch deviant tones (1200Hz, 50ms, 10%), and duration deviant tones (1000Hz, 100ms, 10%). After preprocessing and segmenting the data, a Matlab script built a matrix out of dummy variables that labeled tone pitch, duration, and position in relation to the overall task. Matrices constructed from each individual were then concatenated into a larger group predictor matrix. Similarly, participant ERP responses to individual tones were put into matrix form and concatenated into a larger group matrix. A multivariate linear regression model was then run using the matrix of dummy code variables as the predictor variable and the matrix of individual ERP responses as the response variable. An analysis of activity at site FCz revealed MMNs to pitch deviants (125ms peak, beta = -2.8 microvolts, p<0.001) and duration deviants (194ms peak, beta = -2.0 microvolts, p<0.001) as well as a statistically significant reduction in N1 at task completion (133ms peak, beta = +1.1 microvolts, p<.001). These results suggest that it is possible to isolate N1 suppression from the MMN.
TAGGING THE NEUROPHYSIOLOGICAL MECHANISMS OF COMPETING SPATIALLY OVERLAPPING VISUAL STIMULI USING SIMULTANEOUSLY RECORDED ELECTROCORTICAL AND HEMODYNAMIC SIGNALS

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Descriptors: EEG-fMRI, visual cortex, ssVEP

Performance on and the evoked visuocortical response to visually cued tasks decreases with concurrently presented motivationally relevant information, suggesting that emotionally arousing information is prioritized at the cost of less emotional yet task-relevant stimuli. However, hypotheses conflict regarding the neurophysiological networks which underlie such cost-related changes in visuocortical activity. The current study simultaneously recorded hemodynamic signals and evoked electrocortical potentials from participants who were instructed to report instances of coherent among otherwise incoherent motion of a random-dot kinematogram (RDK) which flickered on-and-off at a rate of 4.28 Hz for a duration of 11.61 seconds to drive a steady-state visual evoked potential (ssVEP), a measure of continuous visuocortical engagement. The RDK was overlaid on an image of varying in emotional valence which flickered on-and-off at 6 Hz, thus driving a separate ssVEP. These two ssVEPs, when transformed into the frequency domain, may be distinguished and extracted from each other and background noise in single-trials, and used to inform predictive models in concurrently recorded BOLD activity. Whereas parietal, frontal, and insular cortical regions covaried with picture evoked ssVEPs, RDK evoked ssVEPs predicted BOLD activity in primary visual cortex. Picture but not RDK evoked ssVEPs predicted BOLD in primary visual cortex for arousing relative to neutral content, suggesting that cortical representation of motivationally relevant visual information is prioritized amid competing stimuli.

IS ATTENTION FOR INTERNAL BODILY SIGNALS AN INDICATOR FOR ATTENTIONAL PROCESSING OF EXTERNAL STIMULI?

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Descriptors: interoception, cardiac: interoceptive awareness, attention

Almost every cognitive and practical activity requires attention functioning. Based on the assumption that the perception of bodily signals (interoceptive awareness) is an indicator for self-focused attention the present study investigated whether interoceptive awareness moderates attention to external stimuli. In the study we compared 25 participants with high and 25 participants with low cardiac interoceptive awareness in regard to diverse standardized psychometric tests (alertness, vigilance, divided attention, go/nogo, visual discrimination) while heart rate and heart rate variability were monitored. Participants with high cardiac interoceptive awareness showed significant better performance in regard to the intensity as well as the selectivity aspect of attention than participants with low cardiac interoceptive awareness: They had shorter reaction times in tonic alertness, attended more stimuli during visual discrimination, and showed shorter reaction times as well as less mistakes in a dual- and go/nogo-task. No significant differences were observed for vigilance and physiological measures during test execution. The results provide evidence that individuals with high cardiac interoceptive awareness do not only show high self-focused attention but also enhanced attention processing for external stimuli. Thus, the ability to perceive internal bodily signals may facilitate information processing. Interoceptive awareness may also be considered an indicator for general superior attention functioning.

VECTORSH PSYCHOPHYSIOLOGICAL APPROACH TO STUDY TEMPORAL MICROGENESIS OF CONSCIOUSNESS

Andrey Kiselinskova, Tina Geguchadze, Alexander Vartanov, Stanislav Kozlovsky & Julia Marakhsina
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Descriptors: consciousness, brightness, vector psychophysiology

We offer to study brain mechanisms of consciousness analyzing the most elementary qualia by the example of perception of homogeneous brightness stimuli. Relation of multidimensional structure of such perception (subjective estimation) and neural (VEP) levels can be effectively researched via E.N. Sokolov (2003) ‘Vector psychophysiology’ approach. 1. 9 homogeneous achromatic stimuli were successively presented on 22” CRT-screen. Brightness of stimuli was logarithmically distributed from 1 to 80 nt. 16-leads EEG was recorded and 600 ms-VEP to abrupt changes of stimuli were calculated resulted in 16×(9×9−1)×16×72 VEP. 2. Subjective estimation of dissimilarity in pairs was conducted (scale 1–9) resulted in 9×(9−1) matrix. VEP-matrix and psychophysical matrix were averaged across 20 subjects. 3. Psychophysical matrix was correlated with every 2 ms-VEP-matrix (0–600 ms) in each lead resulted in dynamics of relation between neural activation and conscious reply. 1. Multidimensional scaling of subjective data resulted in 2D spherical model: 9 stimuli forming a semi-circle in psychophysical space. 2. Dynamics of relation between VEP and subjective estimations were revealed via distributed spatiotemporal pattern of significant correlations between these 2 variables. Pronounced correlations (>0.8) were found in 100–150 ms latency in posterior region (P120 component in occipital leads), then correlations shifted to anterior regions and returned back to occipital area. This dynamics confirms G. Edelman & G. Tononi (2000) ideas of reentering microgenesis of consciousness.

THE INFLUENCE OF PRE-STIMULUS PHASE ANGLE ON POST-STIMULUS WAVEFORMS IN THE AUDITORY ODDBALL PARADIGM IN INDIVIDUALS WITH BIPOLAR DISORDER AND NON-PSYCHIATRIC CONTROLS

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Descriptors: phase angle, prestimulus activity, auditory oddball

In electroencephalographic (EEG) studies of cognition and perception, researchers typically analyze neural activity following sensory stimuli. However, prestimulus oscillatory activity has been shown to associated with perception of threshold-level sensory stimuli, post-stimulus spectral power, and event-related potentials (ERPs). Reduced P300 ERPs in response to target auditory stimuli in bipolar disorder (BD) and schizophrenia are thought to index deficits in context updating, but relationships to prestimulus activity have not yet been reported. We measured P3 ERPs in the auditory oddball paradigm in 75 subjects, including individuals with BD with (BDP) and without (BDNP) current psychotropic features, and healthy controls (HC). Alpha phase angle was categorized into four bins of ascending and descending quarters of the sine wave. We performed a linear mixed model to measure the influence of group and phase angle on single trial P3 amplitude. Results indicated an expected main effect of group with highest P3 amplitudes in HC, lowest in BDP, and intermediate values in BDNP. We also found a main effect of alpha phase angle on P3 amplitude such that two phase angles were strongly related to higher P3 amplitude in HC and BD groups. Future directions will involve analysis of phase angle influence on standard stimulus processing as well as the relationship between phase angle and post-stimulus time-frequency responses.
EFFECTS OF VIEWING TWO KINDS OF PLEASANT AFFECTIVE PICTURES ON SLEEP PARAMETERS IN SUBSEQUENT NIGHTTIME SLEEP: EXAMINING THE AMOUNT OF EACH STAGE OF SLEEP
Toshikiko Sato
Nagano University

Descriptors: sleep, positive emotion, psychomomography
Nighttime sleep is often disturbed emotional arousal regardless of emotional valence (i.e., whether emotion is pleasant or unpleasant), but an effect of positive emotion on nighttime sleep is less understood. Using psychomomographic recordings, this study aimed to determine the effect of elicitation of positive emotion on the amount of each sleep stage in healthy participants. The six participants underwent four all-night polysomnographic measurements in sleep laboratory. The first night was for adaptation, in which participants viewed no pictures. One of three picture-viewing tasks—viewing and rating arousing pleasant (e.g., amusement parks, aquatic sports, skydiving), relaxing pleasant (e.g., flowers, larger herbivorous animals, countryside landscapes) or neutral pictures—was randomly assigned for the second, third, or fourth measurements performed over three consecutive nights. Participants engaged in the task one hour before bedtime on each night, where they were presented 20 pictures one by one consecutively and were asked to rate each picture on the basis of both affective valence and arousal scales of the self-assessment manikin (SAM) method employed by Lang, Bradley, & Cuthbert (2005). The pictures used in these tasks were drawn from the International Affective Picture System (IAPS; Lang et al., 2005). The 8-hour polysomnographic measurements obtained after the tasks revealed that the amount of the REM sleep stage was significantly greater after the arousing pleasant task than the neutral task (p < 0.05).

TESTING THE INTERACTION WITH A SELF-AVATAR USING BEHAVIORAL MEASURES
Galina Menshikova & Natalia Krasilschikova
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Descriptors: interaction, a self-avatar, psychophysiological reactions
It was shown that behavior reactions may be used as reliable measures to appreciate the copresence during interactions between humans and embodied agents in virtual environments. Previous work revealed that the consistency of sensory information within different modalities affected the effectiveness of copresence. In our study we investigated the subject’s behavior reactions in the situation of mismatch between visual and proprioceptive information using the CAVE virtual reality system. The experiment consisted of two parts. In the first part the participants were asked to perform body movements (to raise and lower hands and legs) which were exactly copied by a self-avatar displayed in front of them. The exercises should be repeated several times for 5 minutes to persuade the participants of being embodied in their own avatar. In the second part the participants performed the same task but at a certain moment, determined in advance by the researcher, saw a self-avatar displayed actions unrelated to her/his body movements. The physiological reactions (summary EMG activities) were recorded during the performance of both the first and second parts to measure the sense of presence during interactions with her/his own avatar. The results showed that EMG activities were significantly higher for the second condition when the consistency of participant’s and avatar’s movements was broken. Our data support that interaction paradigms that are based on maximizing the consistency between visual and proprioceptive data to increase the sense of presence in virtual environments.

MONITORING SOCIAL INTERACTION IN ADOLESCENTS AND YOUNG ADULTS WITH ASD USING EYE TRACKING
Magali Battu, Elise Archambault, Marianne Latimus, Frédérique Bonnet-Brilhault & Romuald Blanc
University of Tours

Descriptors: autism spectrum disorders, gaze
Autism spectrum disorder is a neurodevelopmental condition characterized by deficits in social interaction. The lack of interest for social information has been largely reported by investigating visual exploration of social stimuli in laboratory conditions. Therefore these data need to be considered cautiously, as they may not reflect real difficulties in everyday life. This study aimed to measure gaze behaviors using a mobile eye-tracking system in 6 adolescents/adults with ASD (M=18 years old) during a social skills training group, closely approaching an ecological situation. Gaze behaviors were analyzed according to the type of social interaction (when the subject wearing the glasses was talking, when a therapist was talking, when other participants were talking). For each of these situations, the relative time spent looking at 1) the interlocutor, 2) other group’s participants, 3) elements outside the social scene was measured. On average, when the subject wearing the glasses is talking, the relative time spent looking at the interlocutor (45.42% ± 18.79) and at outside elements (44.94% ± 15.70) are slightly equivalent to the distribution obtained when the therapists were talking. However, when other participants were talking, the subject looked at them only 28.55% of the time (± 20.52), his gaze was mostly oriented to outside elements (61.41% ± 20.26). Moreover, individual results will be presented in order to illustrate the well-known heterogeneity of the ASD, and its consequences when considering personalized and targeted therapeutics.

THE ROLE OF DORSAL ANTERIOR CINGULATE CORTEX IN SOCIAL EXCLUSION: EVIDENCE FROM A MODIFIED CYBERBALL PARADIGM
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Descriptors: social exclusion, EEG, cyberball
Dorsal anterior cingulate cortex (dACC) and anterior insula (AI) are implicated in physical and social pain. During the Cyberball task, a paradigm for investigating social pain following social exclusion (SE), dACC and AI show greater activation during SE than during social inclusion (SI). However, greater dACC activation during SE may be attributed to violating an expectancy of SI rather than to social distress per se. The present study sought to determine whether dACC activation during SE is associated with an expectancy violation or social distress. EEG from 96 sites in 31 healthy participants during a modified Cyberball task were fit to a source model with six regional sources, including dACC and AI. dACC activation was smaller for exclusion throws during SE than for exclusion throws during SI and was unrelated to changes in state positive and negative affect or to social distress scores. AI activation was similar for exclusion throws during SE and SI. Lower AI activation was associated with greater social distress scores and smaller decreases in negative affect scores from pre-task to post-task measurements. dACC activation may be reduced during SE due to a decrease in expectancy violations following prolonged exclusion or to fatigue effects associated with the longer SE phase of this modified paradigm. Although AI activation was related to affective responses, dACC was not observed to be associated with social distress. Thus, dACC activation during SE appears may be better accounted for by activation associated with expectancy violations rather than by social distress.

DIFFERENCES IN FEAR STARTLE POTENTIATION BETWEEN PERCEIVED INGROUP AND OUTGROUP FACES
Dora Georgiou & Georgia Panayiotou
University of Cyprus

Descriptors: intergroup anxiety, startle reactivity, prejudice
In a world that is rapidly becoming global, it is crucial to understand the processes involved in interaction between self-identified groups of people and the potential results of such interaction. Current research posits that emotion may have a greater impact on the outcome of intergroup interaction than social cognition. Within the context of this study, conducted in Cyprus, the negative affective dimension of prejudice – intergroup anxiety – is examined through indices of fear startle amplitude, potentiation and latency. Particularly, by exposing Greek Cypriot participants (N = 65) to contact with faces that they believe to be either Turkish Cypriot (Outgroup), Spanish (Neutral) or Greek Cypriot (Ingroup) in a picture viewing paradigm, we compare fear reactivity and habituation to the ethnic group depicted in a between groups analysis. In actuality, the subjects are exposed to the same set of faces. Results indicate no differences in fear startle amplitude and potentiation between groups (Ingroup, Outgroup, Neutral). Discussion focuses on characteristics of negative affectivity in the form of intergroup anxiety and potential explanations of this association.
Poster 3-139

DOES CHARISMATIC LEADERSHIP SYNCHRONIZE FOLLOWERS’ BRAINS? A MEG STUDY
Abraham Goldstein, Yuval Harpaz & Yair Berson
Bar-Ilan University

Descriptors: charismatic speakers, inter-subject correlations, MEG

Charismatic leaders have strong impact on feelings, beliefs, and behaviors of group members, effects shown to facilitate emotional and behavioral contagion in groups. One hypothesis is that charismatic leaders achieve behavioral contagion by increasing the similarity in followers’ brain activity. Whereas imaging research demonstrated that brains “tick together”, indicated by higher inter-subject correlations (ISC), in response to captivating visual stimuli, the role of social interactions in causing such effects remains unknown. We examined the extent to which exposure to a charismatic (vs. non-charismatic) leader can increase ISC, by presenting videotaped messages by a professional actor to 40 students while recording MEG. ISC (calculated as mean correlation between the power time-course of subject pairs) were higher in response to charismatic vs. non-charismatic speech, particularly in beta and gamma bands. Exposure to the charismatic speech elicited higher ISC localized to areas related to action observation, but the overall levels of activity were not different between conditions. ISC in visual and auditory areas were uniform across conditions, suggesting that the effects of charismatic leaders go beyond mere attention. In addition, the degree of ISC correlated with self-report measures of affect and speaker evaluation. Future research may establish the role of neuro-synchronization in enhancing behavioral and emotional contagion and consequent crowd behavior.

Poster 3-141

AT THE HEART OF HARM: CAN RESTING HEART RATE VARIABILITY BE USED TO INDEX ACTION-BASED AVERSION?
Drew Parton & Jared McGinley
Towson University

Descriptors: action aversion, heart rate variability, morality

Many researchers and philosophers have suggested that humans have an innate system of morality. Facets of cardiovascular functioning have often been used to index pro-social attitudes and behaviors. A recent study found that subjects who engaged in prototypically (yet harmless) violent acts showed a physiological stress response, suggesting that individuals find some acts immoral, even without harmful consequences (Cushman et al., 2012). The present research replicates and expands upon that study with the addition of heart rate variability (HRV) and self-reported aversion to each action. Overall, subjects reported greater negative affect compared to aversive neutral acts supporting the validity of the original study, F(30) = 2.185, p = .037. However, only two actions were significantly more negative than their corresponding neutral act. Simple linear regressions were performed separately for the aversive and neutral conditions, using baseline HRV to predict total negative act reactions. Also, the results showed that HRV did not significantly predict negative reactions in either the neutral (F(1,13) = 0.261, p = .618) or the aversive conditions (F(1,11) = 0.972, p = .345). There was also a marginally significant decrease in heart rate over time in the aversive condition (F(2,50) = 2.569, p = .087), possibly suggesting sympathetic withdrawal, which is contrary to the findings in Cushman et al. (2012). The present research demonstrates the limitations of this action-aversion paradigm, and also demonstrates the limitations of using HRV as an index of pro-social attitudes.

Poster 3-142

THE INTER-SUBJECT NEURAL SYNCHRONIZATION DURING JOINT ATTENTION: A HYPERSCANNING FUNCTIONAL MRI STUDY
Ayumi Yoshisaka1, Takahiko Koike2, Eri Nakagawa2, Motofumi Sumiya2, Shuntaro Okazaki2, Norihiro Sadato2 & Hiroki Tanabe1
1Nagoya University, 2National Institute for Physiological Sciences

Descriptors: neural synchronization, hyperscanning fMRI, joint attention

In real-time communication, we exchange much information with each other. Because individuals might influence each other’s brain activity through their behaviors, inter-subject neural synchronization is one of the possible neural mechanisms of social interaction. To test this hypothesis, we examined inter-subject neural synchronization during social communication using hyperscanning functional magnetic resonance imaging (fMRI). To generate real-time social interaction situation, joint attention (JA) paradigm was used in the present study. Twenty-two same gender pairs (44 volunteers) were participated. They performed JA task in the hyperscan-setting MR scanners. To compare the synchronization of the brain activity between real pairs and pseudo-pairs (non-pairs), we analyzed the residual time-courses data (i.e. subtracted task-related brain activity) during the JA task or control solo task. The results showed that, brain activities in the pars triangularis of inferior frontal gyrus, temporo-parietal junction, caudal medial prefrontal cortex, and superior temporal sulcus, were more synchronized between the real pairs than between the non-pairs during JA task, whereas no significant difference of synchronization of the brain activity between real pairs and non-pairs was found during the control solo task. The results revealed that synchronized brain activity was enhanced between the real interacting persons, and indicate that these synchronized regions might form a common psychological ground to progress a cooperation task such as JA task smoothly.
EVALUATING CREATIVE IDEAS: INSIGHTS FROM ERPS AND CHANGES IN THE UPPER ALPHA BAND

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Described: creativity, event-related potentials, upper alpha band

Thus far, electrophysiological research on creativity has employed production tasks and measured changes in the alpha band in time windows lasting several seconds, while participants produced creative ideas. These studies had, however, limited temporal resolution, which made it difficult to identify specific cognitive processes underlying creative thinking. In the current study, we employed a modified version of the alternate uses task, in which participants evaluated word pairs representing the common, creative, and impossible uses of objects according to how (im)possible and (un)common they seemed. In the even-related potential (ERP) analysis, a graded effect was found, with impossible uses evoking the largest, common the lowest, and creative intermediate N400 amplitudes. Moreover, greater power in the upper alpha band was observed in the creative than common condition in the time window between 400–1000 ms. Interestingly, this effect was absent in the lower alpha band, which differs from previous reports in which an increase in both the upper and lower alpha bands was found. The graded N400 effect can be interpreted as reflecting increased activity in semantic memory needed to evaluate the creative word pairs. The difference in the upper alpha band might index increased semantic processing demands and larger inhibition of task-irrelevant information on creative than common trials. Since task demands remain comparable on all trials, these findings seem directly related to cognitive processes involved in evaluating creative ideas.

SILENT READING WITHIN VERB GENERATION: TASK EFFECTS ON MEG EVOKED RESPONSE TO WRITTEN WORD

Anna Pavlova, Anna Butorina, Anastasia Nikolaeva, Andrey Prokofyev & Tatiana Stroganova
Moscow State University of Psychology and Education

Described: visual word recognition, top-down modulation, magnetoencephalography (MEG)

Silent reading (SR) and verb generation (VG) are supposed to share visual word recognition process up to a point of the activation of the presented word meaning. In the current MEG study (N = 33), we examined whether the task to produce an associated verb affects brain activity at the pre- and post-semantic processing stages of the presented noun. We compared spatio-temporal pattern of brain response evoked by a noun cue depending on whether they were read silently without additional task (SR) or in order to produce the related verb (VG). We found that the task demands penetrated into early (191–227 and 306–340 ms) and late (462–619 and 676–891 ms) stages of written word processing by enhancing brain response under VG versus SR condition (p < 0.0001, FDR-corr.). Using minimum norm estimation technique, we localized the cortical sources of the early differential response to inferior occipito-temporal regions and anterior temporal cortex bilaterally suggesting more elaborated orthographic form processing and lexicosemantic analysis under VG task. The late effect was related to concurrent activation of the associative auditory areas in the middle and superior temporal gyri and articulators representations in the ventral motor cortex engaged into mapping phonemes onto the articulatory motor programs during speech perception. Thus, our results suggest that a remote goal plays a pivotal role in the recruitment of cortical structures underlying orthographic, semantic and sensorimotor dimensions of silent reading.

THE DEFICIT OF BRAIN HOLISTIC MECHANISM IN RUSSIAN-SPEAKING CHILDREN WITH SPECIFIC LANGUAGE IMPAIRMENT

Sergey Kiselev & Inna Volik
Ural Federal University

Described: specific language impairment, holistic brain mechanism

Children with specific language impairment (SLI) have difficulties producing and understanding language (Bishop, 1997). The brain mechanism of this developmental disorder is still not understood. The goal of this research was to examine the hypothesis that children with SLI have deficit in brain holistic mechanism. Experimental group included 20 Russian-speaking children with SLI at the age of 6–7. The control group consisted of 20 children. The children from experimental and control group were matched for IQ, gender and age. We used the Rey-Osterieth Complex Figure Test to assess the brain holistic mechanism in children. There is opinion that part-oriented strategy in copying Complex Figure is related to weakness in holistic processing (Luria, 1973). One-way ANOVAs by group revealed significant differences (p < 0.05) between the groups for number of spatial errors in the Rey-Osterieth Complex Figure test. Most important, in comparison to children from control group the majority of children with SLI (70%) had immature (part-oriented) strategy in copying Complex Figure. In view of the obtained results it can be assumed that children with specific language impairment have deficit of the specific brain mechanism responsible for holistic processing.

SEMANTIC DISCRIMINATION OF VIBROTACTILE LINGUISTIC STIMULI IN SUBJECTS WITH PROFOUND DEAFNESS: AN FMRI STUDY

Vanessa Ruiz-Stovel, Geisa Gallardo-Moreno, Andrés González-Garrido & Fabiola Gómez-Velázquez
Universidad de Guadalajara

Described: profound deafness, vibrotactile, semantic

Delayed and impoverished language acquisition in children with profound bilateral deafness has an impact on cognitive development. Therefore, this challenge to acquire language conventionally undermines the exploration of vibrotactile stimulation as an alternative sensory substitution method that might allow the discrimination of oral language. Using a 3T scanner, we studied the changes in neurofunctional activation patterns -BOLD signal- in 12 profoundly deaf participants after a 10 to 12-week training period (15 sessions; 45-min each) that focused on the vibrotactile discrimination of words, specifically color names. A small device worn on the left index finger delivered sound-wave stimuli. The fMRI block-design paradigm that was performed, before and after the training, consisted of two vibrotactile discrimination Go/NoGo tasks. One task involved the discrimination between two pure tones with different duration (T: 500 ms; NT: 250 ms) and the other involved semantic word discrimination (T: Mexican flag colors -red, white or green-; NT: other colors -brown, blue, black or pink-). Our results confirm that a training program in vibrotactile linguistic discrimination modifies behavioral performance and neural metabolic activity. The most significant changes observed in the color > tone contrast after the training were a left lateralization of frontal region activations implying that word discrimination via the somatosensory pathway might involve transmodal higher-order language processing areas.
NEURAL INDICES OF SPEECH ENCODING IN MONOLINGUAL AND BILINGUAL CHILDREN

Valerie Shaffer1, Yan Yu2, Tanja Rinker3 & Monica Wagner2
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Descriptors: development, bilingualism, neurophysiology

Previous studies have shown that neural measures of speech processing at left and right temporal sites are sensitive to language status, specifically distinguishing children with typical language development from those with disorders (Shaffer et al., 2011). It is unclear what these temporal site measures reflect, but some evidence suggests that they are sensitive to language-specific experience (Wagner et al., 2014). The current experiments used electrophysiological measures to examine neural indices of English-vowel processing in children exposed exclusively to English compared to those exposed to English and Spanish. Over 100 children from 3 months to five years of age participated in the study. Results revealed that the T-complex to the English vowel (which is not a phoneme in Spanish) increased in positivity from three months to five years of age, but that the increase was more rapid for monolingual than bilingual Spanish-English learners of English. This finding is in accord with a study of 5–6 year old Turkish-German children, in which German monolingual children showed more positive T-complex responses to a German vowel than Turkish child learners of German (Rinker et al., 2017). In addition, the amount and type of experience with English influenced processing. Taken together, these findings suggest that the T-complex reflects tuning to the specific phonetic patterns of a language. Additional studies will be needed to determine whether continued experience with the second language leads to a neural pattern that is similar to that found for monolinguals.

WITHIN SUBJECT COMPARISONS OF LATE POSITIVE COMPONENTS IN GROUPS THAT DIFFER WITH AGE AND FAMILIAL SINISTRALITY

Michelle Leckey & Kara Federmeier
University of Illinois at Urbana-Champaign

Descriptors: ERP

The P600 – a late, positive ERP component – has been linked to syntactic processing, as P600 effects have been seen in response to syntactic violations as well as during complex sentence processing. A P600 response has also been seen to violations of thematic constraint, when the more semantically related N400 component may have been expected. Given a number of similarities between the P600 and the more general P3b component, some have proposed that the P600 is a P3b, with differences in latency and amplitude reflecting the complexity of linguistic structure. Previous work has found that the P600, like the P3b, is response aligned, and is modulated by saliency, task relevance and subjective probability, all of which are known to modulate the P3b. Despite these similarities, no one has yet made direct comparisons between them when they are elicited within the same person using component-typical tasks. In the current study 48 young adults with differing familial sinistrality profiles and 24 older adults, were given three tasks, each of which is known to elicit one of the components of interest. These included a visual oddball (P3b), as well as morphosyntactic and thematic role violations (syntactic/semantic P600). Each of the tasks elicited the desired components, and analyses suggest similarities between the syntactic P600 and the P3b, providing further evidence that these components may be related. However there are differences between these components and the semantic P600, suggesting that the semantic and syntactic P600 may be reflecting different types of processing.

BLOCKING VISUAL AND PAIN PERCEPTION BY HYPNOSIS

Barbara Schmidt, Ewald Naumann & Wolfgang H.R. Milner
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Descriptors: hypnosis, EEG, cognitive neuroscience

Suggestions given under hypnosis can block perceptual processes. We present evidence from two experiments, using ERPs and behavioral data. In the first experiment, vision was blocked by the suggestion of a wooden board in front of participants’ faces while they counted visual stimuli on a screen. The amplitude of the P300 response to visual stimuli was reduced under the blocking suggestion compared to a non-blocking control condition. Further, the reduction of the P300 amplitude was associated with the number of visual stimuli missed while hypnosed. In the second experiment, pain perception was blocked by the suggestion of a glove filled with analgesic gel while electrical pain stimuli were given on the back of the hand. We compare the amplitude of the P260 response to pain stimuli in the hypnosis condition to that of an attention-distracting condition and a stimulation condition where participants acted as if they were hypnotized. Further, we analyzed the association between P260 amplitude reductions with the reduction of pain ratings. Results show that hypnosis is a powerful tool to block perception in different modalities. We conclude that early perceptual and later cognitive processes can be dissociated under hypnosis. This implies that hypnosis affects the communication between primary sensory areas and secondary stimulus processing areas of the human brain.

PUPILLARY RESPONSES TO FACIAL ATTRACTIVENESS DURING THE RATING OF LIKEABILITY AND LEADERSHIP QUALITIES

Helene Kreyssa, Carolin Altmann, Franziska Keller & Stefan Schwenberger
Friedrich Schiller University Jena

Descriptors: pupillary responses, attractiveness, person perception

Arousing and emotionally relevant stimuli have been claimed to elicit pupil dilations in a perceiver. We tested modulations of pupil dilation by facial attractiveness, using photographs which had been pre-rated for attractiveness (50 highly attractive, 50 medium attractive, 50 unattractive faces; 25 females each). Participants rated likeability (Study 1) or leadership qualities (Study 2) of the depicted individuals. In Study 1, attractiveness interacted with face gender (500–1500 ms from onset), with unattractive female faces eliciting smaller pupil size changes than more attractive female faces, and than male faces generally. Subsequently (1500–3000 ms), attractiveness interacted with both face and participant gender: Female participants showed the smallest dilations for attractive female faces, whereas male participants’ pupils made no such distinction. Study 2, by contrast, found a main effect of attractiveness, with smallest dilations for unattractive faces (500–1500 ms). Independent of attractiveness, a subsequent interaction between face and participant gender (1500–3500 ms) reflected that own-sex faces elicited greater pupil size changes than opposite-sex faces. These results suggest that effects of facial attractiveness on the pupil are small, occur quite early, and are affected by the gender of both face and perceiver. Despite identical stimuli, the effects also appear to depend on the task. More pronounced attractiveness effects during the (arguably) more demanding task of assessing leadership qualities may point to a moderating role of cognitive effort.

ERROR TRACKING AND AGE: ELDERLY DEMONSTRATE REDUCED ERROR RESPONSE IN DRIVING TASK

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1University of Victoria, 2University of British Columbia

Descriptors: feedback error-related negativity, electroencephalography, aging

Automobile use is often a difficult and complex task. Once initiated in operating a vehicle, we are affected by many different variables such as course adjustment, speed, trajectory, and spatial awareness. Many cognitive functions work in unison to accomplish this task. It is known that failure of any one of these systems may lead to a vehicular incident, or collision. There are many factors which may influence a decline in these faculties, one being the aging process. In order to determine an age-related determinant of motor errors, a human-event related potential (ERP) known as the error-related negativity (ERN) was indexed via electroencephalography (EEG). The ERN is known to be associated with the detection and correction of errors, with a rich connectivity to dopaminergic reward systems. This signal is thought to originate from the anterior cingulate cortex (ACC; Holroyd & Coles, 2002), age-related deficits such as atrophy may affect the modulatory effect of the ERN. In the current study, we contrast error-detection and correction behaviours and electrophysiological data between two age populations (young adults and old adults) in a mock-driving task. Present evidence demonstrates a diminished capacity in error-correction in elderly populations. This is consistent with prior literature, as reduced ERNs have been observed in aged populations in various conditions (Eppinger et al., 2008). To date there is little evidence linking motor errors. Data in the current study show a reduced ERN in aged populations and an increased frequency of collisions.
Poster 3-153
MULTI-SYSTEM APPROACHES: UNDERSTANDING STRESS AND WORKING MEMORY IN CHILDREN
Nancy Tsai & Jodi Quas
University of California, Irvine

Descriptors: working memory, children, salivary alpha-amylase
Working memory (WM) is a strong predictor of academic outcomes. Individuals differ in their WM abilities, and such variation could be due to conditions that tax the WM system, such as arousal. Research examining the influence of arousal, typically as indexed via stress-sensitive physiological markers (e.g., cortisol), has yielded conflicting results. In adults, negative associations between arousal and WM have emerged. What remains unclear concerns how arousal affects WM in children, a noteworthy omission given that WM exerts a profound influence on learning outcomes in childhood. Quesada et al. (2012) failed to uncover any significant associations between cortisol responses to a laboratory task and WM in 8–10 year olds. It is unclear whether arousal indexed via multiple stress response systems (e.g. the HPA axis and SNS) or whether these associations would vary across a wider age range. We exposed 101 8–14 year olds to the Trier Social Stress Test-Modified (TSST-M) and indexed arousal via multiple stress response systems with repeated saliva samples collected and assayed for cortisol and alpha amylase (sAA) to index HPA and SNS activity. Approximately 20 minutes after the TSST-M ended, children completed an n-back task, an established measure of WM. Our findings reveal age-dependent differences for WM performance: as age increases, high SAA, regardless of cortisol level, is associated with improved WM performance. Subsequent analyses will examine stress response changes over time as predictors of WM performance.

Poster 3-154
THE 'POWER' OF FRONTAL MIDLINE THETA AND POST-ERROR SLOWING TO PREDICT PERFORMANCE RECOVERY: EVIDENCE FOR COMPENSATORY MECHANISMS
Emilio Valadrez & Robert Simons
University of Delaware

Descriptors: errors, theta, slowing
Past studies utilizing cognitive control tasks have noted that trials following errors are characterized by slowed reaction time (RT). Despite the assumption long held by researchers that this slowing is compensatory (in the service of post-error performance recovery), studies consistently show that post-error trials are no more accurate than post-correct trials. As a result, it has been proposed that post-error slowing (PES) is merely an orienting response that serves no cognitive control purpose. Frontal midline theta (FMT) oscillations may represent another compensatory mechanism serving cognitive control processes, yet past studies relying on event-related potentials have failed to find an association between FMT and post-error accuracy. The present study investigated the potentially adaptive role of PES and FMT oscillations during a flanker task using within-subject and trial-by-trial comparisons. Error-trial FMT time-frequency power and PES each positively predicted post-error accuracy ($p = .032$ and $p < .001$, respectively), but error-related negativity (ERN) amplitude did not. Additionally, neither error-trial FMT time-frequency power nor ERN amplitude predicted PES. Overall, results supported the characterization of error-trial FMT and PES as two separate mechanisms that do serve cognitive control purposes and independently predict performance recovery following errors. Results also suggested that time-frequency power may be a more robust measure of error-related FMT than ERN amplitude.

Poster 3-155
INFORMATIVENESS AND UNCERTAINTY BOTH INFLUENCE THE SPN COMPONENT DURING OUTCOME ANTICIPATION
Wioleta Walentowska1, Katharina Paul2, Mario Carlo Severo2, Agnes Moors3 & Gilles Porro2
1Jagiellonian University-Krakow, 2Ghent University, 3KU Leuven

Descriptors: SPN, reward anticipation, informativeness
The Stimulus Preceding Negativity (SPN) reflects outcome anticipation, varying in size with stimulus informativeness, as well as uncertainty. Here we examined possible changes in the amplitude of the SPN component during reward anticipation when these two factors were considered concurrently. EEG (64-channel) was recorded while 30 participants performed a speeded GoNoGo task in which fast and correct actions were systematically associated with a positive outcome (informative condition), or when positive feedback was delivered randomly (uninformative condition). In Experiment 1, when uncertainty was low (as positive feedback was less frequent than negative one), neither feedback’s informativeness nor valence influenced the SPN amplitude. However, in Experiment 2, when uncertainty was kept high (as both feedback types were equiprobable), the SPN was reliably larger for informative relative to uninformative feedback. Importantly, it was also larger in anticipation of positive compared to negative feedback. These ERP results were observed irrespective of which baseline (either pre- or post-response) was selected for correction, and which reference montage (either common average or linked mastoids) was eventually used for data preprocessing and component measurement. Taken together, these ERP findings suggest that reward anticipation, as captured by the SPN, is influenced by informativeness and uncertainty concurrently.

Poster 3-157
THE P300 AND THE LC-NE SYSTEM: NEW INSIGHTS FROM TRANSCUTANEOUS VAGUS NERVE STIMULATION (TVNS)
Mathias Weyma1, Carlos Ventura-Bort1, Hannah Genheimer2, Janine Winkler3, Julia Wendt4 & Alfons Hamm3
1University of Potsdam, 2University of Würzburg, 3University of Greifswald

Descriptors: P300, norepinephrine, transcutaneous vagus nerve stimulation
Recent research suggests that the P300 may be closely related to the activation of the locus coeruleus-norepinephrine (LC-NE) system. To test this relationship, we applied transcutaneous vagus nerve stimulation (TVNS) while participants performed an oddball task. Using a within-subject design, 20 healthy participants received continuous TVNS and sham stimulation on two consecutive days (stimulation counterbalanced across participants). During stimulation, oval non-targets, normal-head (easy discrimination) and rotated-head (hard discrimination) targets were presented (see Begleiter et al., 1984). As a marker of noradrenergic activation, we collected salivary alpha-amylase (sAA) before and after stimulation. We found that TVNS successfully activated the noradrenergic system, as indicated by an increase of sAA. Interestingly, larger P300 amplitudes to targets, relative to standards, were observed during active TVNS, compared to sham stimulation, and only for the easy but not hard targets. Critically, the P300 increase was associated with stronger sAA activity after TVNS, but not after sham stimulation. Our results support the assumption that, at least under low cognitive load, the P300 is modulated by TVNS via the noradrenergic system. Future research is needed to investigate whether TVNS also facilitates other processes, such as learning and memory.

Poster 3-158
THE EFFECTS OF UNCERTAINTY ON BETA SUPPRESSION AND RESPONSE TIME ACCURACY
Ricardo Wilhelm, Hunter Threadgill & Philip Gable
University of Alabama

Descriptors: beta suppression, motor preparation, inhibition
Past research has found beta suppression over the motor cortex to be a reliable indicator of preparatory states of movement. Greater beta suppression is associated with faster reaction times. However, the role of beta suppression in response inhibition has not been examined. The present study sought to investigate the relationship between beta suppression and inhibition by using a cued Go/No-Go task in a modified Monetary Incentive Delay Task. In this task, participants were given trial cues indicating they could win money in pre-go trials by correctly responding to go (responding quickly) and no-go (making no response) targets. Post-go trials had similar go/no-go targets, but could not result in monetary gain. One third of trial cues indicated a go target would appear, and the rest of the trial cues indicated it was uncertain whether a go or no-go target would appear. Results revealed that trials where it was uncertain whether a response would need to be inhibited (uncertain trials) evoked less beta suppression in pre-go vs. post-go trials. Uncertain pre-go trials also evoked the least accurate response times compared to all other conditions. Across all trials, beta suppression was correlated with faster reaction times. Overall, these results suggest that motor preparation is reduced when responses may need to be inhibited. Reduced motor preparation results in less accurate response times.
THE IMPACT OF RESOURCE DEPLETION AND MINDFULNESS ON ERROR MONITORING
Xiaojian Yu, Geoffrey Potts & Emanuel Donchin
University of South Florida

Descriptors: mindfulness, resource depletion, error monitoring

Resource depletion refers to the state when self-control capacity is reduced after effortful control, while mindfulness is associated with enhanced self-control capacity. Previous research has suggested that resource depletion impairs performance in subsequent tasks also requiring self-control, and practicing mindfulness can counteract this impairment in performance. The current study examined the impact of these two mental states (resource depletion and mindfulness) on task performance and error monitoring. Two videos were used to induce different mental states: resource depletion and mindfulness. Subjects were instructed to suppress yawning while watching a yawning video to reach the resource depletion state, and to practice mindfulness meditation while watching a mindfulness meditation tutorial video, the control condition was when subjects were told not to suppress yawning while watching the same yawning video. EEG was recorded from 30 subjects during the modified Eriksen flanker task following each video. The error-related negativity (ERN), an index of the error monitoring systems, were measured to determine the impact of these two mental states have on the error monitoring system. The results showed a smallest ERN in the resource depletion condition, representing a weaker error monitoring system after resource depletion; a largest ERN in the mindfulness condition reflecting an enhanced error monitoring system; the control condition had a medium ERN, thus an intact error monitoring system.

SATURDAY, OCTOBER 14, 2017
POSTER SESSION IV

Poster 4-001
DISSOCIATING ALZHEIMERS AND AMNESTIC MCI USING ERP-BASED NEUROMETRICS
Paul Kieffaber1, Hamid Okhravi2 & Wendel Friedl1
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Descriptors: neurometrics, alzheimer’s

Although early detection of cognitive decline associated with Alzheimer’s disease (AD) may be critical to successful treatment and prevention, the detection process is complicated by the fact that overt behavioral changes often do not manifest until neurodegeneration is quite advanced. Electroencephalography (EEG) holds promise in this area, and measurements of both resting and event-related brain activity have been identified as potential indicators of cognitive decline. Event-related potential- (ERP-) based markers may be particularly sensitive to functional changes associated with neurodegeneration, but are rendered clinically impractical due to the time required to assess multiple ERP components using standard techniques. This study was designed to evaluate the sensitivity and clinical practicability of a nested neurometric battery for the detection of subtle changes in sensory and perceptual function associated with amnestic mild cognitive impairment (aMCI) and mild AD. The task was well tolerated in a patient sample, and allowed extraction of resting EEG and ERP profiles reflecting multiple neurocognitive domains. Results suggest that profiles of ERP-based measurements may be used to differentiate between individuals at different levels of cognitive impairment, and comparisons of ERP profiles with existing neuropsychological and volumetric data support the potential utility of this procedure in clinical settings.

Poster 4-002
THE IMPACT OF NATURAL AGING ON BEHAVIORAL AND ELECTROPHYSIOLOGICAL INDICES OF PERCEPTUAL DECISION MAKING
David McGovern1, Aoife Hayes1, Simon Kelly2 & Redmond O’Connell1
1Trinity College Dublin, 2University College Dublin

Descriptors: aging

Most cognitive tasks share a common requirement to translate sensory information into a goal-directed action. Yet, while the effects of aging have been investigated on a range of cognitive functions, relatively little research has focused on how aging impacts this perceptual decision making process. Furthermore, extant studies have been limited to investigating the role of aging on perceptual decision making via model fitting to behavioral data from young and old participants and require verification from electrophysiological studies. Here we recorded 64-channel EEG as participants performed either a contrast change detection task or a continuous random dot motion task. Our signals analysis approach allowed us to isolate separate neural signals representing the sensory encoding, decision formation and motor preparation stages of a perceptual decision. Pretarget alpha power over posterior electrodes provided an index of attentional engagement to the task. On the random dot motion task, older adults were less accurate and displayed longer reaction times than their younger counterparts and this was accompanied by a shallower build up of the decision formation signal. However, on the contrast change task the older group outperformed the younger group by detecting more targets. Analysis of the EEG data revealed a higher degree of alpha desynchronization in older adults, implying that their behavioral advantage was due to better task engagement. This task dependence of our results suggest that a decline in perceptual decision making may not be an inevitable consequence of aging.

Poster 4-003
TOP-DOWN MODULATION IN THE CATEGORIZATION OF NATURAL SCENES
Andrea De Cesarei, Shari Cavichi, Antonia Micucci & Maurizio Codispoti
University of Bologna

Descriptors: categorization, natural scenes, ERPs

The perception and categorization of natural scenes is performed quickly, accurately and with little need of attentional resources. Moreover, the earliest neural signatures of categorization are observable few hundreds milliseconds from scene onset. Here we investigated how the top-down context, in which categorization is performed, modulates the processing of natural scenes. To this end we briefly (20 ms) presented natural scenes, and asked participants to categorize them according to one of several possible questions (animal or vehicle; indoor or outdoor; one or two). Critically, we manipulated the top-down context in which questions were asked, by varying the sequence of questions; specifically, in some blocks the same question was repeated through several successive trials (sustained condition), while in other blocks the question changed from trial to trial (mixed condition). An early negative ERP modulation was observed for targets compared to nontargets; this early relative negativity was left lateralized on occipitotemporal sensors. This early negative modulation was anticipated in the sustained condition, but did not differ in amplitude or topography between the two conditions. Later in time, a P3 was observed in the sustained condition, and this P3 was more pronounced for targets than to nontargets. No P3 modulation was observed in the mixed condition. The results suggest that specific stages of processing are sensitive to different features of the top-down context in which categorization is performed.
REWARD’S IMPACT ON ATTENTION: CUE-LIKE OR TARGET-LIKE?
Constanza de Dios & Geoffrey Potts
University of South Florida

Descriptors: event-related potentials, reward, motivation
The study used event-related potentials (ERPs) to investigate how similarly reward behaves to exogenous cues versus endogenous targets. Exogenous cues produce perceptual representation in posterior sensory cortex and thus elicit the N1 ERP, being larger to cued stimuli. Endogenous targets require frontal evaluation of relevance and elicit the P2a, being larger to targets versus distractors. Because reward engages frontal mechanisms of evaluation, we hypothesized that reward absent instruction or cue will elicit a P2a much like endogenous targets. To test this idea, our design manipulated reward outcome (reward, non-reward, neutral), stimulus type (targets, distractors), and cue validity (valid, invalid, uncued) in a Pooner cuing task. Correct keypresses to instructed targets or non-responds to distractors were given points if the imperative stimuli appeared in the reward location, but given no points if they appeared in the nonreward location. No reward was possible on neutral trials. We predicted that uncued rewarded distractors would elicit a P2a similar to that produced by instructed targets on neutral trials. This would be signified by greater evidence in favor of similarity over difference of their mean amplitudes in a Bayes factor t-test, a method that can provide evidence for or against hypotheses not offered by frequentist approaches. As predicted, there was more evidence in favor of P2a similarity to instructed targets, and less evidence in favor of N1 similarity to validly-cued stimuli. Results suggest that reward may exert more target-like effects on attention.

ELECTROPHYSIOLOGICAL MEASURES OF ATTENTIONAL CONTROL PREDICT PERFORMANCE ON A CONCURRENT WORKING MEMORY TASK
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University of Auckland

Descriptors: working memory, N2pc, EEG
While working memory and selective attention have traditionally been viewed as distinct processes in human cognition, there is now a growing body of literature which demonstrates significant overlap between these two constructs. One line of evidence for the presence of this relationship comes from between-subject designs in which individuals low in working memory capacity show greater interference in standard attention-based tasks. The specific neural mechanisms involved in this interaction are still unknown, however three lateralised ERP components have been identified as ideal candidates for studying the neural underpinnings of attention processes, N2pc, Ptc, and SP CNV have been associated with object selection, attentional disengagement, and short term maintenance of target features respectively. In this set of experiments we measured these components during the delay period of a working memory task in order to see whether they could predict performance on the working memory task. The results showed that individuals who produce a larger Ptc during visual search are predicted to perform faster and more accurately on the working memory task. They also demonstrate that the strength of this effect is modulated by the presence of distraction in the working memory task. These results suggest that individual differences in working memory performance are specifically related to individual differences in the ability to disengage from distraction, and that the presence of distraction during working memory encoding effects subsequent visual search performance.

NEWS HIGHLIGHTING GENDER IDENTITY OF MODELS IN FASHION ADS AFFECT RESPONSES TO THE ADS THEMSELVES
Glenna Read, Xia Zheng, Lucia Cores Sarria, Yanqin Lu & Robert Potter
Indiana University

Descriptors: attention, autonomic arousal, advertising
Recent advertising campaigns have been lauded in news media for including models along a range of gender identities (Davis, 2014). This study examines how news stories highlighting gender identity influence psychophysiological responding to ads featuring models with different gender identities. In a between-subjects design, participants (n = 246) read news stories about fictitious fashion companies that used either transgender (experimental condition) or non-professional (control condition) models in ad campaigns. The news stories did not contain any images. After reading the stories, all subjects viewed 40 high quality images of professional models drawn from a web search and professionally integrated with a brand logo. Half of the models in the images publically identify as transgender, the other half do not. Corrugator activity, heart rate (HR), and skin conductance were recorded during image presentation. Results demonstrate that, compared to ads following news stories in the control condition, subjects had significantly less HR deceleration and exhibited less autonomic arousal to ads following stories about gender identity. There was no significant difference between story type in physiological valence response. Subjects also had increased HR deceleration to transgender compared to cisgender models, whereas arousal and valence reactions were unaffected. Ads with transgender, compared to cisgender, models elicited increased attention. News stories about gender identity of models used in ads campaigns decreased attention and arousal in response to the ads themselves.

SUSTAINED ATTENTION TO EMOTION TARGET CATEGORIES: AN ERP STUDY
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Descriptors: emotion and attention, sustained attention, event-related potentials
Sustained attention influences early stages of stimulus processing. Emotional stimuli can both enhance attentional engagement via arousal and narrow/broaden attention via valence. The present study adapted a hold/release paradigm using emotion words to examine arousal vs. valence effects on sustained attention in a category-matching task. Participants (n = 39) were presented with pairs of words and had to decide whether they both matched the target category for each block (negative, positive, or neutral) while electroencephalography (EEG) was recorded. In an attention-hold condition the first stimulus presented matched the target category and the participant must attend to the second stimulus to decide if both match. In an attention-release condition the first stimulus does not match the target category. Reaction times (RTs) were faster in the negative and positive target blocks as compared to the neutral target blocks, indicating that the arousal dimension of emotion enhanced attention in both emotion target blocks. When comparing negative and positive target matches directly, faster RTs for negative hits than positive hits were found, indicating narrowing of attention in the negative-target block. Multiple indices of emotion-target blocks enhancing attention to the target stimuli were found in the event-related potential (ERP) data (all p’s < .05), particularly in the P3 being enhanced on hold conditions to negative and positive compared to neutral matches. ERP support for the narrowing effect of negative stimuli on attention was not as clear.

EMPATHY FACILITATES THE ATTENTIVE PROCESSING OF CUES SIGNALING A PAIN STIMULUS TO THE PARTNER
Lingdan Wu, Ursula Kirmse, Tobias Flasch, Ganna Botandin, Anna Kenner & Harald Schupp
University of Konstanz

Descriptors: attention, emotion, LPP
Empathy motivates helping and cooperative behaviors and plays an important role in social interactions and personal communication. The present research examined the hypothesis that a state of empathy guides attention processes towards stimuli significant to other people in similar ways as to stimuli relevant for the self. Towards this end, perceptual and meaning units of the experimental stimuli need to be dissociated in order to assure that the brain signature of attention is not driven by emotionally diagnostic perceptual features. Accordingly, sixteen couples in romantic partnerships were examined in a paradigm in which symbolic cues signaled the delivery of a Pain or Nopain stimulus to the partner or the self while dense sensor event-related potentials (ERPs) were recorded. The results showed that cue stimuli signaling Pain compared to Nopain stimuli to the partner elicited a later anterior negativity (EPN) and late positive potential (LPP). Notably, the brain signature of attentive processing mediated by empathy for the partner’s pain was similar in topography and latency to the EPN and LPP modulations elicited by cues predicting pain for the self. These findings demonstrate that a state of empathy can modulate the attention capture to symbolic stimuli relevant for the partner which derive their significance from verbal instruction. From a broader perspective, states of empathy appear to regulate attention processing according to the perceived needs and goals of the partner.
Poster 4-009
ATTENTION, HEART RATE AND SKILLED MOTOR PERFORMANCE: EFFECTS OF TASK DIFFICULTY
Jennifer Henderson & Christopher Ring
University of Birmingham

Descriptors: heart rate deceleration, performance, golf putting
Recent research has suggested, that heart rate (HR) deceleration prior to skilled motor performance is indicative of attentional focus. For instance, elite golfers exhibit a drop of about 20-beats-per-minute in the 5-seconds before they putt. Under the premise that increased task difficulty requires greater focus of attention, the current study aimed to improve our understanding of this bradycardia, and further validate its association with performance and attentional processes. 40 golfers of varying ability (20 expert, 20 novice), completed baseline and 7 counterbalanced 9-ball putting conditions on an artificial surface. Conditions were designed to manipulate difficulty by altering putt distance, hole size, and surface gradient. HR (electrocardiogram) was measured throughout, with performance outcome determined by the number of holed putts in each condition. Performance was significantly affected by condition difficulty (P<.05). Similarly, condition difficulty affected several aspects of the cardiac pattern, including peak-to-trough amplitude, peak-to-trough timing, and the rate of the HR deceleration. The latter was also found to correlate with performance. To conclude, HR deceleration in the seconds preceding a skilled motor task was affected by variations in task difficulty, thus improving our understanding of the attention-performance relation.

Poster 4-010
UNCERTAINTY-RELATED HYPERVIGILANCE IS LINKED TO IMPAIRED TARGET PROCESSING AND PERFORMANCE
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Descriptors: uncertainty, late positive potential/LPP, behavioral interference
Increased emotional and attentional responses to unpredictable events may impinge on performance. We thus examined if attentional capture by unpredictable distracters is accompanied by impaired target processing. Thirty-four undergrads performed a cued emotional interrupt task while event-related potentials (ERPs) were recorded. Behavioral targets blinked during task-unrelated presentation of neutral or negative pictures (distracters) and a preceding cue was either predictive or nonpredictive of distracter valence. We separated fast and slow trials according to within-subject median splits of response times (RT), contrasting more and less effortful performance, respectively. We examined centrotemporal distracter-locked LPP (dLPP) and target-locked P300 (tP300) as well as target RT and tested between-subject relationships between uncertainty-induced modulations of these variables. Unpredictable compared to predictable pictures were associated with increased dLPP amplitudes. Contrastingly, tP300 amplitudes were decreased for targets after unpredictable distracters, especially on fast trials. Similarly, RTs were slower for targets after unpredictable distracters, but only on fast trials. Uncertainty-induced dLPP and tP300 modulations were correlated negatively but unrelated to behavior. Thus, increased attention to unpredictable distracters is accompanied by impaired attentional and behavioral target processing, perhaps explaining part of the aversiveness linked to uncertainty. This may be especially true for patient groups known to express uncertainty-related hypervigilance.

Poster 4-011
TOP DOWN CONTROL OF ATTENTIONAL CAPTURE: EMOTION AND DISTRACTOR FREQUENCY
Antonia Micucci1, Vera Ferrari2, Andrea De Cesare1 & Maurizio Codispoti1
1University of Bologna, 2University of Parma

Descriptors: attention, emotion, ERPs
The present study examined whether attentional capture by task-irrelevant emotional stimuli is modulated by distractor frequency. Participants performed an orient-termination discrimination task (centrally presented Gabor patches) while being simultaneously exposed to distractor pictures presented peripherally (left or right) for 150 ms. Each distractor picture was never repeated across the experimental block, and could be either an emotional or neutral scene. EEG was recorded from a 64-channel electrode array. In experiment 1, the likelihood (expectancy) with which a distractor occurred was manipulated between blocks (80% vs 20%). In each block, half of the distractors were neutral and half were emotional. Results demonstrated that both behavioral emotional interference and the affective modulation of the Late Positive Potential (LPP) were reduced in the high (80%) compared to the low distractor frequency condition (20%). A second experiment was conducted to disentangle whether the effects were due to the frequency of emotional distractors (40% vs 10%) or to the overall distractor likelihood. Similar to experiment 1, emotional interference was reduced with frequent distractor occurrence despite emotional distractors were equally rare (10%) in the two blocks, suggesting that an inhibition of attentional capture by emotional stimuli can be proactively activated. Differently, the emotional modulation of the LPP did not vary with distractor frequency in experiment 2, indicating that rare emotional stimuli engage motivational systems despite the context in which they occur.

Poster 4-012
INFLUENCES OF STIMULUS SALIENCE ON VISUAL MISMATCH NEGATIVITY IN A ROVING ODDBALL PARADIGM
Insa Schlossmacher, Maximilian Bruchmann & Thomas Straube
University of Muenster

Descriptors: visual mismatch negativity, salience, roving oddball
While the existence of a visual counterpart of auditory mismatch negativity has been established in the last decades, several open questions concerning modulatory influences on visual mismatch negativity (vMMN) still remain a topic of ongoing debate. In particular the influence of stimulus salience on vMMN has not yet been investigated systematically. From a methodological perspective the often used standard oddball paradigm has been criticized as it confounds stimulus frequency with low level stimulus features if not otherwise controlled. In this study we tested 22 subjects with a roving oddball paradigm, where the first stimulus in a sequence is the deviant which – after several repetitions, e.g. the fifth one – turns into the standard. This is advantageous in such that deviant and standard share the same physical properties and do not differ in overall frequency. We presented stimulus sequences of three different geometrical figures made from line segments, while the subjects solved an attention demanding color-discrimination task. Concurrently, salience was manipulated by varying the length of the lines. ERP amplitudes were clearly modulated by salience, while vMMN was not. Independently of salience, a negative difference between deviant and standard stimulus was observed at posterior electrodes from 150 to 200 ms, thus demonstrating the viability of the roving oddball paradigm for vMMN elicitation. Despite that, the influence of stimulus salience on automatic deviance detection still remains unresolved.

Poster 4-013
INCREASED ALPHA ACTIVITY INDICATES ATTENTION DIVERSION IN HIGH WORRIERS: AN ELECTROPHYSIOLOGICAL INVESTIGATION
Ling Peng, Hans Schroder & Jason Moser
Michigan State University

Descriptors: anxiety, electroencephalogram, alpha
Here, we present results of a re-analysis of data from a previous study examining associations between emotion regulation and worry (Moser et al., 2014). This reanalysis examines the relation between worry and alpha activity elicited by informative cues instructing participants to either re-appraise or passively view forthcoming unpleasant images. Higher alpha activity is thought to index internal focus, thereby indicating less attention to the task at hand. It was previously suggested that individuals with higher worry engage in anticipatory preparations to reappraise unpleasant pictures, which would be reflected in greater alpha activity during cue processing. We tested this possibility in this re-analysis. Results indicated that higher worry scores were related to more overall cue-locked alpha activity – across both regulation and passive viewing trials—at the frontal electrode site Fz (r = .27, p = .04). These findings suggest that worryers may allocate more attention to their internal mental environment which results in reduction of resources dedicated to the emotion regulation task at hand. This research provides initial insights into the minds of worriers as they prepare to engage in emotion regulation processes.
Poster 4-014

ERP MEASURES OF ATTENTION AND COGNITIVE CONTROL DURING NEW AUDITORY WM TASKS: PRELIMINARY FINDINGS FOR N1 DIPOLE AMPLITUDE

Jürgen Kayser1, Craig Tenke1, Lindsey Casal-Roscu2, Jorge Alvarenga2, Kenneth Hugdahl3, John Jonides4 & Gerard Bruder4
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Descriptors: event-related potential (ERP), auditory WM, attention

We developed a new auditory working memory (WM) paradigm to dissect the role of perceptual “bottom-up” and “top-down” attention or inhibitory control processes in WM that would be of particular value in studies of cognitive function in schizophrenia. ERPs (72 sites) were recorded twice (1 wk retest) from 29 healthy adults during encoding, maintenance, and item retrieval in three auditory WM tasks (I: Ignore; S: Suppress; R: Remember) consisting of listening to a series of 4 letters alternately presented to left and right ear (L/E; 600 ms interstimulus intervals). While encoding, the contralateral N1 dipole amplitude for LE was enhanced with LE and reduced with RE presentations; these modulations were not seen when attending to RE, or for S and R tasks. These findings suggest that early top-down modulation of perceptual bottom-up asymmetries during auditory stimulus encoding are primarily under control of a right-lateralized attention network.

Poster 4-015

PROCESSING THREATENING AND NON-THREATENING DISTRACTORS UNDER LOAD: THE ROLE OF SELF-REPORTED SOCIAL ANXIETY AND HEART RATE VARIABILITY

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Descriptors: attentional bias, perceptual load, heart rate variability

A considerable amount of research suggests that Socially Anxious individuals are hypervigilant to threatening facial stimuli such as angry expressions. Existing literature suggests that mechanisms like Emotion Regulation (e.g. resting state Heart Rate Variability) and Perceptual Load capacity may play a crucial role on attentional allocation to threatening stimuli. Here we examined whether interference by different types of distractors (threatening faces and objects, neutral faces and objects) is affected by Load, Social Anxiety and Heart Rate Variability. Eighty-eight students from University of Cyprus, performed a visual letter-search task. Participants searched for an X or Z target letter among small Os (Low Load) or among other similar angular letters (High Load). An irrelevant, to the task, image of stimulus was presented in pseudorandom order on 50% of the trials. A repeated measures ANOVA with Load, Distractor type and Distractor presence showed a main effect of Load (participants were slower in high Load compared to low Load condition) and presence (participants were slower in distractor present trials compared to distractor absent trials). Social Anxiety was not associated with task performance. On the contrary, Heart Rate Variability indexes like rMSSD was positively correlated with Reaction Time for distractor present trials, whereas Low Frequency was negatively related with Reaction Time in faces present trials. Results are discussed based on the Neurovisceral Integration Model, suggesting the link between Emotion Regulation and threat related attentional bias.

Poster 4-016

TEMPORAL UNCERTAINTY GIVES RISE TO PREMATURE INITIATION OF PERCEPTUAL DECISION FORMATION IN THE HUMAN BRAIN

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Descriptors: temporal uncertainty, evidence integration, perceptual decision making

Computational modeling and neurophysiological data suggests that perceptual decision-making involves integrating noisy sensory evidence towards an action-triggering threshold. The present electrophysiological study shed light on how this process is affected when the timing of sensory evidence is uncertain. Participants completed a discrete trial two alternative forced choice contrast discrimination task in which they monitored left and right tilted overlaid gratings in order to detect and report a subtle contrast change occurring after one of three temporal delays that varied unpredictably between trials. Varying the temporal delay had a substantial impact on behaviour and electrophysiological signatures of decision formation. For longer delays participants responded faster but committed a higher proportion of premature false alarms and fast errors. Underpinning this, two key neural signatures previously shown to reflect evidence accumulation (centroparietal positivity) and motor preparation (lateralised beta) both exhibited clear pre-evidence build-up that was predictive of RT. Together these findings support the interpretation that under conditions of uncertainty for the timing of evidence onset, evidence integration is initiated prematurely giving rise to increased noise at the decision level. The question remains as to whether pre-evidence integration occurred due to suboptimal feedforward signals triggering the integrator prematurely or due to strategic timing of integration onset designed to maximize overall reward outcomes based on knowledge of the task structure.

Poster 4-017

EXPLORING THE NEURAL BASIS OF METACOGNITION IN DECISION-MAKING

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Descriptors: perceptual decision-making, metacognition, confidence judgements

Establishing the neural mechanisms through which the brain enables us to evaluate the quality of our choices has gathered considerable interest from neuroscience over the past decade. Much research within this domain focused on the extent to which confidence and perceptual decision-making rely on shared versus distinct mechanisms, however it has proven difficult to definitively address this issue using non-invasive human brain recordings. Previous work has identified a Centractor-Parietal Positivity (CPP) in the human event-related potential which traces the evidence accumulation process underpinning decision making and which predicts the timing and accuracy of perceptual reports. Here, we sought to determine whether the CPP also accounts for graded reports of decision confidence. We adopted a novel version of the random dot motion paradigm in which stimulus presentation was interrupted at random intervals by the presentation of a confidence dial on which participants simultaneously indicated the direction of motion and their confidence in their choice via a saccade. We found that subjects adopted behavioural strategies congruent with dimensional reports of confidence. Observed on other paradigms (e.g. lower confidence for correct vs incorrect decisions). Electrophysiological analyses will determine the extent to which the amplitude of the CPP at dial onset accounts for reported confidence.
**Post 4-018**

**ANTAGONISTIC INTERACTIONS BETWEEN MICROSCACADES AND EVIDENCE ACCUMULATION PROCESSES DURING DECISION FORMATION**

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Descriptors: microsaccades, eye movements, EEG

Despite their small size, microsaccades can impede stimulus detections if executed at inopportune times. Although it has been shown that microsaccades evoke both inhibitory and excitatory responses across different visual regions, their impact on the higher-level neural decision processes that bridge sensory responses to action selection has yet to be examined. Here we show that when human observers monitor stimuli for subtle feature changes, the occurrence of microsaccades long after (>800ms) change onset predicts slower reaction times, and that this is accounted for by momentary suppression of neural signals at each key stage of decision formation - sensory evidence encoding, evidence accumulation, and motor preparation. Our data further reveal that, independent of the timing of the change events, the onset of neural decision formation coincides with a systematic inhibition of microsaccade production, persisting until the perceptual report is executed. These findings highlight antagonistic interactions between microsaccade occurrence and evidence accumulation.

**Post 4-019**

**EFFICIENCY OF STRATEGIC ADAPTATION IN OLDER ADULTS IN A PERCEPTUAL DECISION MAKING TASK**

Jessica Dully & Redmond O’Connell

Trinity College Dublin

Descriptors: aging, speed-accuracy trade-off

Within the domain of cognitive aging, findings indicate that older adults exhibit less flexibility in choice reaction tasks requiring participants to switch between an emphasis on responding as quickly as possible versus responding as accurately as possible. It remains unclear whether this is due to poorer strategic adaptation, some other age-related factor (e.g. delays in sensory encoding or motor execution), or both. In the present experiment, healthy older adults (65-80 years) and younger adults (18-35 years) engaged in a two-alternative contrast discrimination task (n = 30), consisting of two superimposed leftward/rightward gratings which gradually changed in relative contrast. Stimuli were presented under two different speed pressure conditions, imposed via verbal instruction to participants, as well as feedback in the form of points. Instructions to switch between tasks were given on a block-by-block basis. Young participants showed a greater behavioural effect of speed emphasis, while old participants were less flexible at adapting their speed-accuracy trade-off. Continuous 128-channel EEG data was recorded, to allow for probing of the distinct stages of the sensorimotor hierarchy (sensory encoding, evidence accumulation, and motor preparation). Electrophysiological analyses will explore the neural origins of reduced flexibility on the part of the elderly participants. This will add insight to performance differences between younger and older adults, and will establish an idea of the limitations faced by older adults in this domain.

**Post 4-020**

**MOTOR AND EVIDENCE ACCUMULATION SIGNALS TRACE STIMULUS-RESPONSE INCONGRUITY IN THE SIMON EFFECT**

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Descriptors: perceptual decisions, Simon effect, LRP

The ‘Simon Effect’ is characterised by slower reaction times when a stimulus is presented on the opposite side of the visual field to the responding effector. This behavioural effect is commonly assumed to arise from conflict at the motor level but the possibility that other processing levels in the sensorimotor hierarchy may also play a role has not been examined. To this end, we used EEG to simultaneously track indices of evidence accumulation and motor preparation during performance of a motion discrimination task in which participants indicated the direction of coherent motion in one of two bilateral patches. Participants detected coherent motion at near ceiling accuracy; however ‘congruent’ trials (where coherent motion side matched correct response side) were reported significantly earlier than ‘incongruent’ trials. The lateralised readiness potential (LRP) exhibited an early lateralisation reflecting the location of coherent motion, followed by a lateralisation that reflected the motion direction. In addition, the build-up of the Centro-Parietal Positivity evidence accumulation signal was faster on congruent than incongruent trials; an effect that occurred significantly later than the initial LRP deviation. These results indicate that the Simon Effect does not solely arise from conflict at the motor level but also from subtler effects on the perceptual decision making process itself.

**Post 4-021**

**SEX & DRUGS & STARTLE REFLEX**

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Descriptors: startle reflex, sex differences, drug effects

Startle response is modulated by the exposure to emotional stimuli. Nevertheless there is a wide variability in this response that hinders the interpretation of the underlying mechanisms involved. The aim of the present study is to analyze the influence of sex and the use of commonly used legal drugs like tobacco, alcohol or caffeine. The sample was composed by 318 young adults, 152 women (21.18 ± 3.4 years old) and 166 men (22.25 ± 4.2 years old). Forty-five slides (15 pleasant, 15 neutral and 15 unpleasant) were presented from the International Affective Picture System. Multiple Analysis of Variance indicate sex differences in startle response (F (3, 314) = 10.18; p<.001). Post-hoc analyses indicate significant differences for the three valences: pleasant (F (1, 316) = 20.73; p<.001), neutral (F (1, 316) = 27.84; p<.001) and unpleasant (F (1, 316) = 23.54; p<.001). Analysis for toxicological habits indicate significant differences for startle response between smokers and non-smokers (F (3, 314) = 4.06; p<.007) with differences for the three valences: pleasant (F (1, 316) = 1.92; p=.007), neutral (F (1, 316) = 2.46; p=.002) and unpleasant (F (1, 316) = 2.59; p=.002). No significant differences appear for alcohol consumption response (F (3, 314) = 1.10; p=.35), neither for excitant drinks intake (F (3, 314) = .43; p=.73). Our results indicate the participation of variables such as sex or smoking in the variability of the emotional modulation of the startle reflex response.

**Post 4-022**

**SELF-REPORTED EMPATHY AND THE EXPERIENCE OF CHILLS**

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Descriptors: chill experience, empathy, skin conductance

Chill experiences are a common phenomenon in response to music and sounds and go along with symptoms such as chills and goose bumps which indicate high emotional arousal. It has been suggested that the chill experience is a residual response that once served a social function such as initiating nurturing and protecting behavior evoked by the offspring’s separation call (Panksepp et al., 2002). Thus, it appears plausible that a person’s level of empathy could be crucial for his susceptibility for chills. In the present study we examined the relation between self-reported empathy assessed by the IRI-28 questionnaire and experimentally induced chill experiences of pleasant and unpleasant nature. 15 healthy students listened to a selection of 6 music excerpts and 6 harsh sounds and provided subjective report about their chill experiences. We also recorded skin conductance response (SCR) which can be seen as an indicator of associated bodily changes. The numbers of music- and sound-induced chills were negatively correlated with the social distress subscale, suggesting that especially the ability to deal with tense interpersonal settings might be an important determinant of chill experiences. Furthermore, the number of pleasant chills was also positively correlated with the perspective taking subscale. However, there was no association between SCR and one of the subscales. The results suggest an association between self-reported empathy and chill experiences and hence support the idea that chills regardless of valence reflect a social mechanism of caretaking.
EMOTIONAL AROUSAL AND ATTENTION BIAS TO FEMALE BODY SHAPES

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Mid Sweden University

Descriptors: pupil dilation, emotional arousal, body dissatisfaction

Body dissatisfaction has been considered an important factor in the development and maintenance of eating disorders, mainly because the comparison with the predominant thin ideal that is present in mass media leads to increased body dissatisfaction. The present study aimed to study the attentional pattern and emotional reactions evoked when young women were exposed to pictures of female bodies with different shapes. Fifty-five women, aged 18 to 30 years, were exposed to a series of pictures containing four photos of women with different body shapes, ranging from a slim to a heavy one, exposed in a 2x2 array during 3 seconds. Body Shape Questionnaire was used to divide participants into two groups; high and low body dissatisfaction. Pupil dilation was used to investigate the emotional arousal elicited by the exposure. Two conditions were compared: a free-viewing condition and a condition where the participants were asked to look at the pictures they considered to be the most similar to their own body shape. The direction of the gaze and pupil dilation were recorded continuously by means of an eye-tracker. The results showed an attentional bias in the body dissatisfaction group, i.e., women looked longer to the slimmest picture in the array and less for the picture they considered to be the most similar to their own body shape. The attentional bias was more pronounced in the high body dissatisfaction group, with a larger pupil diameter observed when women were instructed to compare the pictures with their own bodies, reflecting higher emotional arousal in this condition.

AVOIDANCE AND ESCAPE: INDIVIDUAL DIFFERENCES IN DEFENSIVE BEHAVIOR

Christopher Sege, Margaret Bradley & Peter Lang
University of Florida

Descriptors: avoidance/escape, anxiety, autonomic/reflex physiology

Just as animal defensive responding functionally adapts to different threat contexts, human reactions to aversion also vary across different defensive contexts. Because escape and avoidance are critical in maintaining human clinical anxiety, this study examined human defensive responding in contexts where aversive exposure is certain but can be escaped, compared to where aversiveness is threatened but can be completely avoided. Additionally, the effect of trait anxiety on context-dependent defensive reactivity was studied. Cues signaled that a fast button press would either terminate exposure to a disgusting scene (escape), block exposure completely (avoid), or not alter uncontrollable exposure to aversive scenes. Blink startle reflex and autonomic reactions were measured along with behavioral indices for highly anxious (n = 20) participants, moderately anxious (n = 25) participants, and less anxious (n = 25) participants. For all participants, startle reflexes were potentiated in contexts of certain exposure, even if escape was possible, compared to avoidance contexts. Moreover, startle reactivity increased linearly with increasing anxiousness specifically in the escape context. F(1, 68) = 11.6, p < .001. Results suggest that protective reflexes are engaged when aversive exposure is certain but not when it can successfully be avoided, and that increasing trait anxiety is associated with greater reflex potentiation particularly in an escape context.

CONTENTMENT EVOCKES GREATER RELATIVE RIGHT FRONTAL ACTIVITY

Lauren Neal & Philip Gable
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Descriptors: frontal EEG asymmetry, emotion, electromyography

Emotions motivate humans to approach or avoid stimuli in their environment. While emotion theorists associate all positive emotions with approach-motivation, there may be some positive emotions associated with withdrawal-motivation. Post-goal states of contentment may be subjectively positive, but still prompt an individual to withdraw from the environment to protect and savor goal objects. The current study examined whether contentment (vs. neutral) activated greater right frontal activity, a measure of frontal asymmetry associated with withdrawal motivation, and greater zygomatics major activity, a measure associated with positive affect. Participants first wrote an essay evoking contentment or neutral affect. Then electroencephalography (EEG) and electromyography (EMG) were assessed during a resting period. Contentment evoked greater relative right (less relative left) frontal activation. Participants in the contentment condition also demonstrated marginally more activity of the zygomatics major than participants in the neutral condition, suggesting that the content state was experienced as positively valenced. Physiological evidence suggests that contentment is potentially experienced as a positive withdrawal-motivated state.
**Poster 4-029**

**EFFECTS OF EXOGENOUS TESTOSTERONE ON SOCIAL REWARD AND PUNISHMENT ANTICIPATION IN SOCIALLY ANXIOUS AND HEALTHY WOMEN: AN ERP STUDY**

Jacobien van Peer, Dorien Enter, Bob Bramson & Karin Roelofs
Radboud University Nijmegen

**Descriptors:** social anxiety, event-related potentials, testosterone

Recent studies suggest that anticipation of social incentive information may be altered in Social Anxiety Disorder (SAD), with increased anticipation of social punishment and/or decreased anticipation of social reward. As testosterone plays an important role in social information processing, and testosterone administration has been found to have socially anxiolytic effects, we investigated the effects of testosterone administration on social reward and punishment anticipation in 19 female patients with SAD and 19 healthy controls (HC). Event-related potentials were recorded during a Social Incentive Delay task. Results showed significantly increased Contingent Negative Variation (CNV) amplitudes after cues signaling social reward or punishment compared to neutral cues, suggesting a stronger feedback anticipation or target preparation. A significant SAD × Cue × Time interaction indicated that this effect was most pronounced in HC, and that SAD participants also showed increased late (≥1500 ms) CNV amplitudes to neutral cues. This finding reflects an increased response preparation effort after neutral cues in SAD compared to HC, which may be either due to a general increased motivation to avoid mistakes or a decrease in differentiation between cues. Testosterone did not affect the CNV amplitudes. However, additional analyses of frontocentral theta and parietal alpha oscillatory activity will be presented, which include effects on induced (rather than just evoked) activity, and hence may be more sensitive to detect testosterone effects.

**Poster 4-030**

**PERCEPTION OF EMOTIONAL EXPRESSIONS IN AN ASYMMETRICAL FACE: A PSYCHOPHYSIOLOGICAL ANALYSIS**

Alexander Vartanov, Alexandra Galanina, Andrey Kisel’nikov, Stanislav Kozlovskiy, Julia Marakshina & Sophie Shirenova
Lomonosov Moscow State University

**Descriptors:** emotional expression, facial asymmetry, ERPs

Association between face expression and brain asymmetry is relevant for emotion perception. Interrelation of face expression and emotion perception was researched. Using FaceGen program 7 emotional expressions (anger, disgust, fear, sadness, joy, surprise and calmness) were created for one face. Six expressions were assessed from 2 to 5 on an intensity scale (calmness was equal 1 point on the scale). Beside that two asymmetrical faces were created for each emotion. These faces had different intensity of an emotion on the left and on the right side (2|4, 4|2). Participants (N=42, age=23.5 ± 3.8, right-handers) needed to estimate the 6 emotions of 37 faces using intensity scale from 1 to 9. Stimuli were shown via Presentation SoftWare, EEG was registered (19 channels, 10-20 system). Event related potentials (ERPs) were averaged in BrainWin program for 18 stimulus separately (2|4, 3|3, 4|2 for 6 emotions, each stimulus were presented 50 times). Other stimuli were shown 5 times each, ERPs were not calculated for them. Significant differences (Student’s t-test, p≤0.05) in estimated scores were found between 2|4 vs 4|2 stimuli for joy and sadness. Notably, for joy 2|4 score of emotion intensity was lower than 4|2 score (3.3 < 4.2) for 4|2 vs 2|4 stimuli, while for sadness it was the opposite (> 3.3 vs 4.2). Significant differences were found in the ERPs for joy between 4|2 faces and 3|3 faces in the components P50 (F3 and T3 channels), P200 (T6, Cz) and N200 (F8). Perception of a 2|4 face differed from the symmetrical face in P450 component (T5). Thus, face asymmetry affects emotion intensity assessment.

**Poster 4-031**

**THE PSYCHOPHYSIOLOGY UNDERLYING COSTLY FEARFUL AVOIDANCE DECISIONS**

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**Descriptors:** fear, avoidance, startle

Avoidance behavior is perhaps the most critical maintaining factor for anxiety disorders. Notwithstanding recent progress, the majority of studies into the psychophysiology of anxiety have focused on passive viewing paradigms unable to model the dynamics involved in such debilitating coping behavior. We have developed a paradigm that allows to actively approach and avoid potentially threatening stimuli (signaling risk of electric shock) while recording the psychophysiology leading up to such decisions. In addition a potential rewarding outcome was included to reward approach behavior (monetary gain), to model avoidance behavior that is pervasive and costly. This paradigm successfully induced a strong approach-avoid conflict as reflected in behavioral outcomes in healthy participants (N=24): more avoidance during threatening situations which was reduced when a rewarding outcome was available. Startle eye-blink amplitude recorded via electromyography was found to be elevated in the anticipation of decisions that can lead to the electric shock outcome. Finally, we show initial evidence that increased startle responses during the anticipation of decisions that do not involve threat are associated with more costly avoidance behavior. Replication and extension of these findings is currently ongoing in two independent datasets and will be presented at the meeting, however these findings already indicate that costly avoidance behavior may share a common mechanism with the psychophysiological fear responding to non-threatening situations.

**Poster 4-032**

**LONG-TERM EFFECTS OF AFFECTIVE HABITUATION OF THE LATE POSITIVE POTENTIAL**

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**Descriptors:** habituation, emotion, event-related potentials

Repetition studies demonstrated that the viewing of highly familiar emotional pictures continue to elicit a larger Late Positive Potential (LPP) than neutral ones. However, the amplitude of this emotional modulation can be attenuated with massive repetition. In this study, we examined the nature of the processes underlying the reduction of the LPP emotional modulation with stimulus repetition, to clarify if this amplitude decrease reflects only a short-term habituation effect or also the contribution of long-term memory processes. To this aim, the same set of pictures that were repeatedly presented in day 1 was then represented in day 2 (one day apart). Stimuli were further repeated in day 2, throughout a new habituation phase, which allowed us to evaluate the initial recovery of the LPP affective response after one-day break. EEG was recorded from a 256-channel electrode array. Results showed that repetition effects on the LPP affective response persisted after one-day break, showing a similar reduced magnitude of the LPP emotional modulation between the end of the habituation phase of day 1, and the beginning of the habituation phase of day 2. These findings indicate that the reduction of the LPP emotional modulation with stimulus repetition is not due to short-term habituation processes but to long-term memory changes. Altogether, the present findings suggest an interplay of attentional and long-term memory processes in affective habituation of the LPP.
Poster 4-033

DO INDIVIDUAL DIFFERENCES IN FRONTAL ASYMMETRY PREDICT THE CONTROL OF EMOTIONAL DISTRACTION?

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Descriptors: attention, cognitive control, EEG

Individual differences in frontal hemispheric asymmetry (FA), as indexed by alpha oscillation, are linked to a vulnerability to emotional disorders. Yet, the underlying mechanism mediating this relationship is still unclear. Grimshaw and Carmel (2014) proposed the asymmetric inhibition model (AIM), which associates FA with emotional control. Specifically, the model predicts that leftward asymmetry is associated with control of negative distraction, and rightward asymmetry is associated with control of positive distraction. In this EEG study, we tested the AIM directly: After medial FA was assessed during resting state, 72 women completed an emotional distraction task to measure their ability to inhibit emotional stimuli. Participants were asked to identify a letter presented at the periphery of the visual field, while on 25% of trials task-irrelevant positive (erotic images), negative (gory images), and neutral distractors were presented at fixation. As expected, participants showed slower reaction times for emotional than for neutral distractors. However, in contrast to the predictions made by the AIM, there was no relation observed between FA and the ability to inhibit positive or negative distractors. Interestingly, exploratory analysis revealed that participants with leftward FA in combination with leftward parietal asymmetry showed greater distraction from both positive and negative distractors. This might indicate a neural correlate for optimal control of emotional stimuli, regardless of valence.

Poster 4-034

INTERACTION OF THE LPP AND LIFE STRESSORS PREDICTS CHANGE IN DEPRESSIVE SYMPTOMS IN ADOLESCENT FEMALES

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Descriptors: LPP, depression, adolescents

Adolescent females represent a high-risk group for the development of depression which is thought to result from the interaction of increased life stressors during adolescence with greater biological vulnerabilities among females compared to males. Identifying predictive biomarkers for experiencing depression following stress may aid in the identification of vulnerable individuals as well as the selection of new targets for treatment. The late positive potential (LPP) is a promising candidate biomarker: a blunted LPP to both positive and negative emotional stimuli is associated with depressive symptoms and risk. In this study of 143 adolescent girls ages 8 to 14, we examined the moderating effect of the LPP on the association between life stress and changes in depression over the course of 1 year. The baseline LPP to positive IAPS pictures (LPP pos) moderated the relationship between baseline stress exposure and the change in depressive symptoms from baseline to follow-up. When LPP pos was blunted, life stress predicted increases in depressive symptoms, and when LPP pos was potentiated life stress was associated with decreases in depressive symptoms. This moderation effect was driven by family and school stressors, and the prediction of ineffectiveness and anhedonic depressive symptoms. A similar trend-level pattern was found for the LPP to negative pictures. In sum, these findings suggest that LPP pos may be a useful biomarker in identifying those individuals at heightened risk for depression following life stressors.

Poster 4-035

LATE POSITIVE POTENTIAL TO FOOD AND EMOTIONAL CUES IN HEALTHY WOMEN AND OBSESE BINGE EATERS

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Descriptors: food, late positive potential, binge eating disorder

Brain potentials tend to provide scarce support to the common notion that obesity is accompanied by hyper-reactivity to food cues. To increase the motivational salience of food cues, we presented images of personally irresistible foods to a group of obese binge eaters and their corresponding healthy controls, while we recorded central and peripheral physiological measures. Affective images (erotic, attacks, and neutral objects) were included as control cues. Here we focus on motivational salience as indexed by the late positive potential. Consistent with several studies, obese and controls did not differ in their reactions to food and emotional cues, showing the expected emotional modulation of the LPP. However, we also investigated whether brain reactions of obese bingers and controls supported the existence of a common phenotype, that, in line with recent proposals, emerges as a function of reactions to food and natural rewards rather than Body Mass index/BMI. Thus, we ran cluster analysis on LPP data, with the goal of identifying subgroups of individuals based on the amplitude of their LPP to food cues. Results showed that some individuals, regardless their BMI assigned moderate-moderate motivational salience to food and simultaneously showed increased reactions to natural rewards (erotic), whereas others reacted excessively to food cues but meagerly to natural rewards. The data emerged replicate and extend an existing study, that focused on an indistinct obese sample, giving evidence of the existence of such endophenotype also in obese women who suffer from binge eating disorder.

Poster 4-036

MAKE NO MISTAKE: YOU ARE BEING WATCHED

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Descriptors: ERP, ERN, threat

Error related negativity (ERN) is an event related potential (ERP) derived from response time locked electroencephalographic (EEG) measurements, associated with action monitoring and error detection in the behavioral response system. The ERN manifests as a more negative waveform in error trials compared to correct trials, with onset of the ERN occurring shortly before (~50 ms) an erroneous response and peaks 100 ms later (~50 ms). In this experiment we examined if the ERN was modulated by emotional information by presenting pictures of faces with different emotional expressions (Angry, Happy, and Neutral). An Eriksson Flanker task with a Go/NoGo variant was presented superimposed on the pictures, with a stimulus onset asynchrony (SOA) between 500 ms and 1083 ms. Participants should either respond to a congruent or incongruent arrow task or inhibit their response based on the color of the arrows. The results showed that Angry faces preceding a response error led to an increased ERN, with the largest amplitudes at centro-parietal midline, compared to both Happy or Neutral faces preceding an error performance. This indicates that affective modulation on a trial by trial basis influences the ERN, demonstrating a rapidly adapting performance monitoring system receptive to transient emotional responses.
Poster 4-037

BRAIN ASYMMETRY AND TYPE OF AGGRESSIVE BEHAVIOR

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Descriptors: aggression, brain asymmetry, frontal cortex

The neurobiological bases of different type and level of young aggression was studied. The Wagner’s Hand test and Bass-Perry questionnaires were used for determining the initial level and type of aggression. According to test results were selected the participant with high level of aggression and divided onto 2 groups: with opened and latent aggression. To assess the functional state of the brain, visual evoked potentials (EPs) of the left and right hemispheres of frontal and temporal cortex activity were recorded. The experimental psychological parameters of functional state of hemispheres also were investigated. It was revealed that the subjects with open aggressive behavior were characterized by the right temporal cortex high activity and low level of frontal cortex activity. At the same time at opened high aggressive young was registered a left-handed auditory. The subjects with a high level of aggressiveness, but characterized by low level of open aggressive behavior, a high level of right frontal cortex activity were recorded. They are also characterized by motor asymmetry with the prevalence of the left arm. Various brain area’s determination of different type and level of aggressiveness was revealed.

Poster 4-039

EMOTIONAL SOUNDS BOOST ATTENTION TO EMOTIONAL FACES: AN EYE-TRACKING STUDY

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Descriptors: visual attention, sounds, faces

In everyday life, emotional facial expressions are often accompanied by vocal utterances. For example, when we see a happy face, then we also hear a laugh. Such social stimuli are particularly relevant especially for individuals with social anxiety. How emotional voices influence the perception of emotional facial expressions and what role social anxiety plays in this perception has hardly been investigated so far. Thus, in the present study, we presented pictures of happy and angry faces in combination with congruent, incongruent or no emotional utterances. First results (n=60) show that congruent combinations (angry face - angry voice and happy face - happy voice) are looked at longer than incongruent combinations (angry face - happy voice and happy face - angry voice). But interestingly, all participants spend more time looking at angry and happy faces combined with angry voices than angry and happy faces combined with happy voices or with no voice. Moreover, in high (HSA) compared to low socially anxious participants (LSA), the viewing pattern is different. HSA participants tend to show avoidant behavior by looking less at both angry and happy faces when associated with angry voices compared to happy voices. These data suggest that visual perception of emotional faces can be influenced by emotional sounds, and that social anxiety modulates these effects. The importance of multi-modality of social stimuli in the development and maintenance of social anxiety will be discussed.

Poster 4-040

BRAIN RESPONSES TO FOOD AND EMOTIONAL STIMULI IN BULIMIA NERVOSA

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Descriptors: obesity, late positive potential, food

To investigate the motivational relevance of food and other emotional cues in bulimic and healthy women, we presented images of personally irresistible foods, interspersed with emotional images of erotica, neutral objects, and human attacks, while we recorded peripheral and central physiology. To decrease the feelings of shame that are also present when women look at erotic stimuli, pleasant pictures consisted of erotic couples, visually less explicit and slightly lower in arousal. All stimuli were displayed within a pseudo-randomized passive picture-viewing paradigm. Here, we focus on the late positive potential as an index of motivational salience. For all participants, the overall pattern of the LPP was consistent with previous findings, with emotional compared to neutral stimuli prompting the largest responses. In particular, the largest LPP responses occurred during erotic pictures, followed by unpleasant content, whereas food and neutral pictures were associated with the smallest LPP amplitudes. However, an interaction between picture category and group indicated that women with bulimia nervosa tended to show larger late positive potential to food and erotic cues, whereas bulimic and healthy women did not differ in their reactions to neutral and unpleasant stimuli. Interestingly, these same stimuli did not prompt larger responses in obese women with binge eating disorder (Poster 4-35). Taken as a whole, the data seem to suggest that the compensatory rather than the binge eating episodes that characterize bulimia nervosa might be capable of altering the motivational salience of food and body-related cues.

Poster 4-041

EMPATHY FOR WHOM? EXAMINING THE CONFLICT RELATED NEGATIVITY DURING EMPATHY CHOICE

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Descriptors: empathy, EEG, decision-making

Recent research has demonstrated that individuals perceive empathy to be effortful, aversive, and difficult, and avoid it for that reason. Here, we investigate empathy avoidance in the context of close-others. Sixty undergraduates (N = 60) at the University of Toronto Scarborough completed the Empathy Selection Task during EEG recording. During the task, individuals made a series of binary choices between responding to an image from their perspective, or responding from the perspective of someone else. In the present investigation, the empathy target was either a stranger or a close-other. Results demonstrate that the conflict-related negativity (CN) during empathy choice differed by empathy target, suggesting that individuals experience different levels of conflict during decisions to empathize with a stranger versus a close-other.
Poster 4-042

THE ROLE OF UNSPECIFIC COGNITIVE ACTIVITY IN ATTENUATING EMOTIONAL RESPONSES IN REAPPRAISAL TASKS

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Jagiellonian University

Descriptors: reappraisal, emotional regulation, LPP

Reappraisal is one of the most efficient emotion regulation strategy which is based on changing the interpretation of affective stimuli. It decreases unpleasant experience together with markers of emotional activation. On the other hand, it is known that affective responses can also be augmented by various cognitive tasks. As typical reappraisal tasks require cognitive effort to elaborate emotional stimuli, it is possible that the observed reduction of emotional arousal is partly due to an unspecific cognitive activity. In the study we aimed at examining whether task possibly similar to reappraisal but without cognitive change can also modulate the intensity of the emotional responses. Three groups watched emotional pictures: a reappraisal group, typical passive control group and a ‘retro’ group, trained in cognitive elaboration of emotional stimuli other than cognitive change. The late positive potential (LPP) was indistinguishable in the reappraisal and ‘retro’ groups, which showed an equal decrease in its amplitude compared to the control group in the case of negative stimuli. However, subjective reports of emotional valence showed a decrease in negative feelings in the reappraisal group only. We discuss this inconsistency and also conclude that the LPP component observed in reappraisal tasks is under additive influence from the cognitive change itself and from unspecific cognitive activity.

Poster 4-043

SUPPORT VECTOR MACHINE PREDICTION OF BLENDED EMOTIONAL REACTIONS TO FILM: CONTINUOUS SELF-REPORT, FACE AND NECK EMG

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Descriptors: support vector machine, blended emotions, EMG

Machine learning (ML) techniques are useful for detecting and predicting complex patterns in multivariate data, making these algorithms potentially valuable in psychophysiological analysis. Support vector machine (SVM) algorithms are flexible, robust, and capable of “learning” to make numerical prediction. SVMs were trained on continuous self-reported emotions and surface EMG (over frontalis, corrugator supercilii, levator labii, orbicularis oris, depressor anguli oris, sternocondilomastoid, and trapezius). Recording were acquired while participants viewed six films from the DZA Film Collection known to elicit reports of blended emotion (disgust co-reported with anger or fear). Using only sparse data (amplitude percent change from baseline for all variables from a subset of participants), SVMs were trained separately to predict two continuous emotion self-report timeseries. Preliminary analysis reveals moderate correlations across participants between predicted and reported emotion timeseries for anger and fear, but poor associations for disgust during fear-eliciting films. Multi-level modeling contrasts on the root mean squared error over time further supported the correlation pattern. Error disparities between film types may imply differences in the interaction between these two blended emotion combinations. Additional variables, model optimization, prediction perturbation attempts, and changes in error over time are further considered.

Poster 4-044

FOCUSING ATTENTION INHIBITS EMOTIONAL RESPONSES: P3A AND LPP EVIDENCE FROM THREE-STIMULUS ODDBALL PARADIGM

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Descriptors: emotion regulation, late positive potential, attention manipulation

Studies in clinical psychology have suggested that manipulation of attention is an important factor in regulating emotions. Attention manipulation in previous studies was conducted using oral instructions, and causal effects of attention manipulation on emotional regulation was unclear. Therefore, we experimentally investigated whether or not focusing attention leads to emotional regulation using a three-stimulus oddball paradigm consisting of a standard circle (70%), a target circle (10%), and two types of deviant pictures (neutral and unpleasant; 10% each). We manipulated task difficulty at two levels, easy and difficult, by varying the discriminability between standard and target circles. Event-related brain potentials (ERPs) in response to the two types of deviant pictures in easy and difficult tasks were compared to assess the effects of focusing attention on emotional responses. The results indicated that P3a reflecting attentional focusing was elicited at around 250–500 ms by both neutral and unpleasant pictures with a larger amplitude in difficult compared to easy tasks, regardless of the valence of the picture, which replicated the well-known effect of task difficulty on P3a. Moreover, the late positive potential (LPP) reflecting an emotional response was elicited at around 750–1000 ms by unpleasant compared to neutral pictures, with a smaller amplitude for difficult compared to easy tasks. These results provide empirical evidence that enhancing the focus of attention on deviant pictures leads to the inhibition of emotional responses.

Poster 4-045

AFFECTIVE TARGET STIMULI ATTENUATE BEHAVIORAL AND ELECTROPHYSIOLOGICAL INDICES OF THE ATTENTIONAL BLINK

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Descriptors: attention, affect, electrophysiology

In the present study, 25 healthy undergraduate volunteers completed an attentional blink (AB) task while EEG was recorded. In the task, a stream of stimuli was presented using Rapid Serial Visual Presentation (RSVP) containing one, two, or no targets; each stimulus was presented for 85ms. The first target (T1) and second target (T2) were words that were either neutral (e.g., BUCKET) or affective (e.g., MURDER); filler stimuli were a series of strings of letters, numbers, and symbols. There were twenty trials each of affective T1 with neutral T2 (AN) or affective T2 (AA), and of neutral T1 followed by neutral T2 (NN) or affective T2 (NA). All stimuli were matched for length, frequency, and arousal. T1 stimuli were always presented as the fifth stimulus in the string, and T2 stimuli were either immediately after T1 (lag1), with one intervening stimulus (lag2), or with seven intervening stimuli (lag8). Behaviorally, there was greater accuracy for affective T2 (NA, AA) than neutral T2 (NN, AN) (ps < .05); the largest difference was for AA. In terms of P300 amplitude, at T2 for lag2, there was a trend-level main effect such that affective T2s generated larger amplitudes than neutral T2s (p = .16). In terms of latency, affective T2 targets of difficult compared to easy targets was later than 300 ms compared to neutral targets (p = .002). Together, this study suggests that affective T1 may prime attention to search for additional affective stimuli, and thus, these findings support the “boost and bounce” hypothesis of the AB.
DANGEROUS ROADS: INVESTIGATING HOW VARIATION IN AVERSE CONTENT IN HIGHWAY SAFETY VIDEOS IMPACTS MESSAGE RESPONSES

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Descriptors: emotion, media, health

Public health organizations have spent millions of dollars on video campaigns that attempt to persuade individuals to engage in healthy behaviors. The effectiveness of these videos often comes down to how negative emotional content is presented. This study investigates how variation in aversive content presented in highway safety videos impacts processing and self-reported evaluation of the message. The experiment was grounded in the Limited Capacity Theory of Motivated Mediated Message Processing which led to the general hypothesis that consistently high aversive messages will lead to more cognitive resources allocated to encoding the message, more intense negative emotional response and be perceived as more persuasive compared to consistently low aversive messages as well as messages that switch from low to high aversive content. A 3 (Tone: low/high/ high switched) X 3 (video) repeated measures within subject experiment was conducted. Participants (N = 75) were males aged 20–25, a population likely to engage in risky driving behaviors. Heart rate, skin conductance, and facial EMG (Corrugator region) was recorded. Participants completed self-report measures of perceived message effectiveness after each video. Results indicated significant Tone X Time interactions on all psychophysiological measures that supported the general hypothesis. Further support was found in significant effects of message tone on all self-report measures of effectiveness. Results support the conclusion that highway safety videos that consistently present aversive content are likely to be most effective.

ALPHA POWER AND EMOTIONAL REACTIVITY DURING NARRATIVE IMAGERY

Robert Henderson, Margaret Bradley, Christopher Sege, Vanessa Dominguez, Katja Hillbrandt, Nicola Sambuco, Andreas Keil & Peter Lang
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Descriptors: EEG alpha power, anxiety, psychopathology

Large-scale neural oscillations in the alpha range (8–12 Hz) are increased during mental imagery of single words relative to imagery of visual geometric shapes (Bartoch et al., 2015). In the present study, we explored fluctuations in EEG oscillatory activity during narrative mental imagery of emotional scenes in a sample of patients with anxiety and mood disorders as well as control participants (n=240). In addition to continuous dense array EEG monitoring, we measured startle reflexes, facial EMG, skin conductance, and heart rate throughout the session. Participants first read and then imagined standard and personal scenes that represented a range of affective contents. Each script was visually presented for a 9 s read period. Following reading, the participant was instructed to continue to vividly imagine (for 12 s) participating in the described scene. After the imagery period, there was an 18–20s variable relaxation interval. Results indicated a significant reduction in alpha power (alpha blocking) during the read period and enhanced alpha power during active narrative imagery, compared to relaxation. Alpha power was reduced when participants imagined personally constructed fear scenes, relative to neutral, content. Individual variation in alpha power was also associated with questionnaire indicators of psychopathology. These results are consistent with the view of alpha power as an indicator of internal cognitive processing and suggest that alpha power may be a useful indicator of emotional reactivity in clinical assessment or treatment contexts.

PARASYMPATHETIC AND SYMPATHETIC COMPONENTS OF SHAME AND ANXIETY AMONG SURVIVORS OF INTERPERSONAL TRAUMA

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Descriptors: respiratory sinus arrhythmia, shame, acceleromotor

Shame is a pervasive emotion in survivors of interpersonal trauma (IPT). However, the physiological response of IPT survivors to recollections of their own traumatic experiences has yet to be investigated. In the current study, 60 participants narrated their IPT experiences to a research assistant for five minutes while their heart rate (HR) and impedance (cardiac output [CO]) were recorded with psychophysiological measures, and head movements via electroencephalogram (EEG) accelerometer, which allows for better understanding of the unique contribution of the parasympathetic and sympathetic branches of the autonomic nervous system. Changes in residual state-reported shame scores were related to changes in RSA, r = −.274, p = .034. Also trait-level shame was associated with more head rocking movements, r = .305, p = .031. In addition, residual anxiety scores from baseline to the narrative task were negatively correlated with HR, r = −.294, p = .023. In addition, state-level anxiety was related to changes in RSA, r = −.287, p = .026. Furthermore, PTSD symptoms were related to lower CO, a measure of sympathetic involvement, during the narrative task, as well as the recovery phase. Taken together, these results suggest greater parasympathetic contribution to the change in cardiac regulation. These results speak of the importance of using physiological data collection methods that allow for better understanding of the specific parasympathetic and sympathetic components of physiological correlates of shame and anxiety, especially in survivors of IPT.

TRAIT THREAT SENSITIVITY AND ELECTRODERMAL RESPONSES TO PREDICTABLE AND UNPREDICTABLE ACOUSTIC STIMULI

Marcia Pasqualini, Sheri Brown, Grace Tibbetts, Kristen Brown, Wendy Hanrock, Malika Chakrabarti, Sandy Neidinger, Brianna Dunwoody & Jason Webber
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Descriptors: electrodermal activity, fear, individual differences

Trait threat sensitivity (TTS) refers to response to acute threat, reflecting a predisposition toward fear vs. boldness. Individual differences in TTS have been shown to be normally distributed in the population, and are believed to reflect differences in reactivity of the brain's defensive system (Patrick et al., 2013). High TTS as measured by self-report has been associated with increased fear-potentiated startle, although not when accompanied by depression (Yancey et al., 2015). We examined whether TTS predicted electrodermal activity at baseline and in response to aversive acoustic stimuli. Participants were 31 students and employees (21 women), with a mean age of 28.3 years, who completed the TF-44 (Patrick, 2017; a measure of TTS) and the CES-10, a brief measure of depression. Using a repeated-measures design, participants viewed pleasant slides under the following conditions: (1) baseline with no sound; (2) unpredictable sound (95 dB white noise for 50 ms), and (3) predictable sound (cued by 5 beeps). Our predictions that individuals with higher TF-44 scores would show more non-specific skin conductance responses (NS-SCR) and higher mean SC level at baseline, and higher amplitudes SCR to acoustic stimuli, were not supported. However, higher TF-44 scores were associated with less habituation to acoustic stimuli, when controlling for depression. Thus, individuals with greater dispositional fear appear to continue to respond to threat longer than those with less fear, although this pattern is moderated by depressive symptoms.
LOWERING RESTING HEART RATE VARIABILITY IS SIGNIFICANTLY ASSOCIATED WITH A GREATER NEED FOR COGNITION IN MEN BUT NOT WOMEN

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Poster 4-054

HEART RATE VARIABILITY, THE NEED FOR AFFECT, AND TRAIT ANXIETY: AN UPDATE ON A MEDIATED RELATIONSHIP

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Poster 4-053

THE RELATIONSHIP BETWEEN BODY MASS INDEX AND HEART RATE VARIABILITY REACTIVITY AND RECOVERY FOLLOWING GRADED EXERCISE

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Poster 4-052

ON THE RELATIONSHIP BETWEEN MEDIA MULTITASKING AND TASK SWITCHING PERFORMANCE

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Descriptive: media multitasking, task switching, strategy difference

Typically, higher media multitaskers (HMMs) switch tasks more often than lower media multitaskers (LMMs). The present study investigated how the extent of media multitasking is related to task-switching processes. Forty participants completed a media use questionnaire that assesses the extent of media multitasking and performed a number-letter task. During this task, participants classified numbers based on the odd and even categories (i.e., a number task) and letters on the Korean consonant system (i.e., a letter task). They saw a cue word “number” or “letter” indicating which task to perform and then a target showing both a number and a Korean consonant. The cue word was repeated or switched to the other cue word across consecutive trials. A switch cost was defined as a difference between task-repeat and task-switch trials. Results showed a significant quadratic trend in each BMI group over time (each p < .001), such that HRV decreased from baseline while exercising, and increased when sitting again. However, individuals in the high BMI group showed a significantly greater decrease in HRV from baseline to graded exercise in comparison to the moderate BMI group (F(1,54) = 5.35, p = .025). Results also showed that individuals in the high BMI group showed significantly lower HRV at recovery compared to baseline than individuals in moderate BMI group (F(1,46) = 5.14, p = .028); indicating that the high BMI group’s HRV did not recover to the degree of those in the moderate BMI group. In sum, these data are consistent with our previous report, and extends the association between BMI and HRV activity into the domain of physical exercise; implication will be discussed.

Poster 4-051

LOWER RESTING HEART RATE VARIABILITY IS SIGNIFICANTLY ASSOCIATED WITH A GREATER NEED FOR COGNITION IN MEN BUT NOT WOMEN

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Poster 4-054

HEART RATE VARIABILITY, THE NEED FOR AFFECT, AND TRAIT ANXIETY: AN UPDATE ON A MEDIATED RELATIONSHIP

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Poster 4-053

THE RELATIONSHIP BETWEEN BODY MASS INDEX AND HEART RATE VARIABILITY REACTIVITY AND RECOVERY FOLLOWING GRADED EXERCISE

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Poster 4-052

ON THE RELATIONSHIP BETWEEN MEDIA MULTITASKING AND TASK SWITCHING PERFORMANCE

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Descriptive: media multitasking, task switching, strategy difference

Typically, higher media multitaskers (HMMs) switch tasks more often than lower media multitaskers (LMMs). The present study investigated how the extent of media multitasking is related to task-switching processes. Forty participants completed a media use questionnaire that assesses the extent of media multitasking and performed a number-letter task. During this task, participants classified numbers based on the odd and even categories (i.e., a number task) and letters on the Korean consonant system (i.e., a letter task). They saw a cue word “number” or “letter” indicating which task to perform and then a target showing both a number and a Korean consonant. The cue word was repeated or switched to the other cue word across consecutive trials. A switch cost was defined as a difference between task-repeat and task-switch trials. Results showed a significant quadratic trend in each BMI group over time (each p < .001), such that HRV decreased from baseline while exercising, and increased when sitting again. However, individuals in the high BMI group showed a significantly greater decrease in HRV from baseline to graded exercise in comparison to the moderate BMI group (F(1,54) = 5.35, p = .025). Results also showed that individuals in the high BMI group showed significantly lower HRV at recovery compared to baseline than individuals in moderate BMI group (F(1,46) = 5.14, p = .028); indicating that the high BMI group’s HRV did not recover to the degree of those in the moderate BMI group. In sum, these data are consistent with our previous report, and extends the association between BMI and HRV activity into the domain of physical exercise; implication will be discussed.
Poster 4-055

HEART RATE VARIABILITY, EMOTION REGULATION, AND RISK TAKING AMONG LATE ADOLESCENTS

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University of Missouri - Kansas City

Descriptions: heart rate variability, emotion regulation, risk taking

Current models of adolescent risk-taking post underdeveloped regulatory brain regions coupled with very active emotional processing brain regions result in adolescents’ unique proclivity towards risk-taking. Using heart rate variability (HRV) as an objective measure of regulatory capacity, this study examined HRV in adolescents and its relations to self-reported emotion regulation (ER), self-reported risk-taking and behavioral risk-taking on a laboratory task. After a 5-minute baseline participants completed 32 trials of Stoplight, a computer simulated driving task to assess risk-taking, followed by the Difficulties in Emotion Regulation Scale and a Risk-Taking Inventory. The behavioral and self-report measures of risk-taking were moderately correlated (r = .32) yet correlations between baseline HRV and risk-taking as measured by the laboratory task (r = -.16) and the self-report measure (r = .13) were modest. The relationship between baseline HRV and subcomponents of ER were complex: HRV had a moderate inverse correlation with Lack of emotional clarity (r = - .35) and a strong inverse correlation with Difficulty engaging in goal directed behavior (r = -.53) but weak correlations with remaining subscales. Only Lack of emotional awareness correlated with self-reported risk-taking and none of the emotional regulation subscales were related to the behavioral risk-taking measure. These preliminary results suggest that baseline HRV may serve as an indicator of specific domains of ER processes within the adolescent population but that other aspects are related to risky decisions.

Poster 4-056

TEMPORAL AND SPATIAL ORGANIZATION OF PERSISYLVIAN BRAIN ACTIVITY FOLLOWING SYLLABLE PRESENTATION TO FOUR MONTH OLD INFANTS

Kathy Low, Monica Fabiani, Daniel Hyde, Renee Baillargeon, Cynthia Fisher & Gabriele Gratton
University of Illinois at Urbana-Champaign

Descriptions: language, optical imaging, auditory processing

The ability to discriminate syllables is an essential component in language processing. Infants are capable of discriminating basic syllable changes and functional magnetic resonance imaging has shown that they engage a similar network of brain regions to that seen in adults. Here, we explore the temporal organization of this brain activity in four-month-old infants using the event-related optical signal (EROS). In adults, EROS has been shown to provide localized maps of brain activation with a temporal resolution on the order of milliseconds, corresponding to the neuronal activity typically measured with event-related electrical potentials. We recorded EROS from 160 channels covering bilateral temporal and lateral frontal cortical areas while infants heard the syllables /e/ and /o/ presented with unequal probability (80/20 counterbalanced) as in a standard oddball paradigm. All syllables, independent of probability, lead to bilateral activation of auditory cortex starting around 100 ms followed later by inferior frontal activity. When comparing deviant (low probability) syllables to standards, the earliest difference emerged around 250 ms in superior and middle temporal gyrus and was followed by a deviance response in inferior frontal regions. In sum, EROS provided a window into the temporal organization of the network of persisyylvian brain areas recruited when 4-month-old infants hear syllables and detect syllable changes.

Poster 4-057

WHO IS NAUGHTY AND NICE: EEG ASYMMETRY AS AN INDEX OF SOCIAL EVALUATION FROM SIX MONTHS TO SIX YEARS

Teresa Taylor-Partridge, Paisley Pauli & Anastasia Kravchenko
University of the Incarnate Word

Descriptions: social evaluation, EEG asymmetry

The purpose of the current study was to test the use of EEG frontal asymmetry as a neural correlate of approach/avoidance motivation from 6-months to 6-years in response to the characters who behaved positively or negatively toward another character in an animation. Twenty-three children (mean age = 24.9 months; 11 females) participated in an EEG study while they viewed videos of a shapes performing positive and negative behaviors toward a circle (helping vs. hindering, giving vs. taking, cleaning vs. messing up, and caressing vs. hitting). Assignment of valence to shape was counter balanced. After each set of videos, a static image of shapes displayed for 5 seconds each. EEG for static images was acquired using Biosemi EEG system. A frontal asymmetry index was calculated by subtracting the log transform of the average alpha power at F3 from F4. Positive indices relate to approach motivation. Paired sample t-test resulted in significant differences when participants viewed static images of positive characters versus negative characters, t(22) = 2.63, p < .01, with a large effect size, r = .49. Overall, participants showed greater left activation (Mean = -.04, SD = .14) to positive characters suggesting approach motivation and greater right activation (Mean = .04, SD = .18) to negative characters suggesting avoidance motivation. Results suggest that infants and children are projecting motivation to approach or avoid static images of the characters after seeing those characters perform positive or negative actions in the animations.

Poster 4-058

INTERACTIONS AMONG FEARFUL/SHY TEMPERAMENT, EXECUTIVE FUNCTIONS, AND FRONTAL-PARIETAL EEG COHERENCE IN THE PREDICTION OF CHILDHOOD ANXIETY

Martha Ann Bell¹, Ran Liu² & Christy Wolfe²
¹Virginia Tech, ²Bellarmine University

Descriptions: temperament, executive function, EEG coherence

Many children with fearful/shy temperament are at risk for developing anxiety (Buss, 2011). Shy children perform more poorly on executive function tasks (Wolfe et al., 2014) and they exhibit task-related EEG patterns indicative of arousal rather than task performance (Wolfe & Bell, 2014). We examined longitudinal associations among temperament, cognition, and EEG to determine if they are independent contributors to early anxiety or if they interact in their contributions. Participants were 157 typically-developing children. Mothers completed a temperament questionnaire when children were 24 mo to report child fear/shyness. At 36 mo, children completed an executive function battery. We recorded EEG during an attention task at 48 mo (frontal-parietal EEG coherence) and mothers completed the Child Behavior Checklist (CBCL), Anxious/Depressed Scale. In the final model of hierarchical regression, 24 mo temperament (beta = -.37, p < .001), 36 mo executive function (beta = -.16, p < .02), 48 mo frontal-parietal coherence (beta = -.15, p < .03) and the 3-way interaction between temperament, executive function, and frontal-parietal coherence (beta = .15, p = .049) explained 31% of the variance in CBCL Anxious/Depressed at 48 mo. Simple slopes testing showed that 24 mo fearful/shy temperament predicted 48 mo Anxious/Depression only for children who had both low executive function and low fronto-parietal coherence (p < .03). Our data suggest fronto-parietal functional connectivity and executive functions as protective factors for fearful/shy children who might be at risk for later childhood anxiety.

Poster 4-059

PERSONALITY PREDICTORS OF CARDIOVASCULAR RESPONSES TO A GRATITUDE TEXTING INTERVENTION

Jolanta Eno & Łukasz Kaczmarek
Adam Mickiewicz University in Poznan

Descriptions: positive interventions, gratitude, cardiovascular reactivity

Gratitude is a positive emotion that has been related to several individual and relational benefits. Moreover, brief gratitude interventions (e.g., writing a gratitude letter) have been validated as effective in increasing well-being. However, some studies indicated that the expression of gratitude via interventions may be difficult and burdensome for some individuals. Little is known about physiological costs and benefits of gratitude expression. We expected that more grateful individuals would appraise gratitude interventions as more challenging and less threatening, and in turn, experience healthier cardiovascular reactivity patterns following a gratitude intervention. Volunteers (N = 196), were asked to send a neutral and a grateful text message (in a counterbalanced order) to their friends using their mobile phones. Their cardiovascular responses were monitored via impedance cardiography. We found that more grateful individuals perceived the interventions as more challenging and less threatening. Challenge appraisal, in turn, experienced healthier cardiovascular reactivity patterns following the gratitude texting intervention. These findings present a physiological evidence that personality determines health-benefits from gratitude interventions.
Poster 4-060
SHORT-TERM MEDITATION INCREASES HYPNOTIZABILITY AND BRAIN NETWORK EFFICIENCY
Yi-Yuan Tang1 & Shaowei Xue2
1Texas Tech University, 2Hangzhou Normal University

Descriptors: meditation, hypnotizability, efficiency
Our previous studies have indicated that short-term integrative body–mind training (IBMT) improves self-regulation and increases related brain activity and network efficiency at the midline structure. Here we extend our work to investigate whether IBMT affects hypnotic susceptibility and related brain network. Thirty-four healthy undergraduates (17 females, mean age 21.6 years) participated and received 30 min IBMT each session with 10 hours in total. The hypnotic susceptibility was assessed through the Stanford Hypnotic Susceptibility Scale (SHSS). The subjects were divided into two groups on basis of the individual hypnotic susceptibility score - the low-susceptible group (SHSS score < 5, 16 subjects) and the highly susceptible group (SHSS > 5, 18 subjects). We employed network analysis approach based on weighted graph theory to investigate training effects on topological properties of the cortical network. Brain networks derived from resting-state fMRI with different hypnotic susceptibility scores before and after 10 h of IBMT were constructed and compared. The results demonstrated that IBMT increased hypnotic susceptibility and the low-susceptible group exhibited a significant larger node degree and clustering coefficient and smaller nodal average path length in the ventral medial prefrontal cortex and posterior cingulate cortex after training, while these larger network values were positive to efficiency of information processing. Our results suggest that short-term meditation increases hypnotizability and brain efficiency.

Poster 4-061
NAME CONDITIONING IN EVENT-RELATED POTENTIALS
Boris Kotchoubey & Yuri Pavlov
University of Tuebingen

Descriptors: classical conditioning, passive oddball, P3
In the acquisition phase of two experiments, two harmonic tones (CS+ and CS−) were paired with a participant’s own name (UCS+) and different names (UCS−), respectively. In the subsequent test phase CS+ and CS− were presented as two rare deviants (p = .15 each) together with a third tone (standard, p = .70) that had not been previously paired with any other stimulus. The most stable effect was the increase of the Event-Related Potential component N3 (peak latency about 390 ms) to CS+ compared with CS- during the acquisition phase, and the significant inversion of this effect (i.e., larger N3 to CS− than to CS+) at the beginning of the test phase. The effect was lacking in the third (control) experiment, in which UCS (names) were masked and participants were unable to recognize them as comprehensible words.

Poster 4-062
EVIDENCE FOR A SPATIAL DIFFERENTIATION OF CONDITIONED RESPONSES IN UNILATERAL TRACE EYEBLINK CONDITIONING DEPENDING ON CONTINGENCY AWARENESS
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1University of Trier, 2Wake Forrest University

Descriptors: tEBC, startle, conditioning
Trace eyeblink conditioning (tEBC) depends on hippocampal activation as well as conscious contingency awareness (CA) and has therefore been proposed as a simple model of declarative memory. In classical delay conditioning, which occurs independently from CA, laterality effects, i.e. stronger conditioned responses (CR) ipsilateral to a unilaterally applied unconditioned stimulus (US), have frequently been reported. However, whether spatial information is also acquired in tEBC and whether this depends on CA is unclear. Here we report on two related studies addressing these questions. In experiment A, involving 4 blocks of conditioning (30 trials each), participants (N=80) were presented with tones of 3 different frequencies coupled to either a left, right or no airpuff (US: 15psi 50ms) with a trace-interval of 1 s. Frequency-laterality coupling was counterbalanced across participants. CRs were recorded bilaterally from orbicularis oculi via EMG and scored as maximum activation in a time window of 400 ms preceding US. CA was assessed with a structured interview after conditioning. In experiment B, aimed at further investigating spatial and temporal components of CA, participants (N=34) had to additionally predict airpuff timing and side by button press. In line with previous findings, tEBC was found to rely on CA in both studies. Moreover, there was strong evidence for a spatial component in tEBC. However, spatial and temporal CA were highly correlated. Taken together, behavioral and questionnaire data support the notion of tEBC as a translational model of declarative memory.

Poster 4-064
NEUROFEEDBACK OF BETA BAND COMPONENTS: FREQUENCY SPECIFIC EFFECTS ON ATTENTION AND REACTION TIME OF ATHLETES
Arash Minfar1, Andreas Keil2, Jürgen Beckmann1 & Felix Ehrlenspiel1
1Technical University of Munich, 2University of Florida

Descriptors: neurofeedback training, attention, reaction time
Previous research has established that high compared to low-frequency EEG oscillatory activity is related to better performance on attention and reaction time (RT) tasks. In the same vein, learning to enhance the power of the high frequency, i.e. Beta band, or inhibit the low frequency, i.e. Theta, or reducing the ratio of low to high frequency, called Theta/Beta ratio (TBR), by means of neurofeedback (NF) has been reported to improve the performance of attention and RT. The aim of this study was to explore the frequency-specific effects on different aspects of attention and RT performance: stimulus detection, attentional processing, and motor execution. To this end, NF training (NFT) of TBR (Theta: 4–7 Hz, mid Beta: 15–18 Hz) and low Beta (or sensory motor rhythm [SMR], 12–15 Hz) was compared. Participants (n=38, soccer players), following 2 baseline measurements, were randomly allocated to train 10 sessions with either TBR, or SMR, or 1 session with sham protocols. The effect of the training was measured by simple RT (SRT), in which participants responded to the onset of one stimulus, and choice RT (CRT), in which participants responded differently to target among non-target stimuli. The TBR group showed a reduced TBR following NFT, whereas the SMR group showed no change in their trained frequency. Further, only the TBR group performed faster on the CRT task, supporting a protocol specific effect. A lack of change in SRT could be due to a floor effect in our sample of athletes. These findings suggest a role for NFT in optimizing some aspects of the athlete’s performance.
Poster 4-065
REWARD POSITIVITY CONFORMS TO AN AXIOMATIC PREDICTION ERROR: EVIDENCE FOR DIFFERENT TYPES OF REWARD
Darin Brown & James Cavanagh
University of New Mexico
Descriptors: reward positivity, reward prediction error, emotion
Increasing evidence suggests that the reward positivity conforms to an axiomatic reward prediction error – that is, it closely follows the rule-like encoding of surprising reinforcers. In the current suite of studies we challenged this axiomatic explanation by leveraging incentive vs. hedonic aspects of reinforcement. Over a series of three experiments, participants were able to choose idiosyncratically preferred pictures as rewards. During the first two experiments, participants were rewarded with either high or low points or high or low preferred pictures. The reward positivity was modulated by high vs. low points, not but not by pictures (regardless of preference). In a third study that paired high/low points and preferred/non-preferred pictures, both performance and the reward positivity were modulated only by high vs. low points. While these findings support an axiomatic explanation of the reward positivity, this theory also suggests that the earliest predictor of future (hedonic) reward should be modulated. This finding was also supported: in all three studies, the reward positivity amplitude to the pre-task cue indicating the type of upcoming reward was larger for pictures vs. points. Together, these findings suggest that the reward positivity conforms to an axiomatic reward prediction error, and that the evalative features for different types of rewards are expressed at different time points.

Poster 4-066
DYNAMICS OF ERROR EVALUATION WHILE LEARNING IN DETERMINISTIC ENVIRONMENT
Magda Gawlowska, Aleksandra Domagalka, Ewa Beldzik, Tadeusz Marek & Justyna Mosja-Kaja
Jagiellonian University
Descriptors: error-monitoring, deterministic feedback, learning dynamics
Studies upon probabilistic learning point at the close relationship between the error-monitoring system and the progress in learning, showing a distinct dynamic of amplitude change in two error-related ERP components – an increase of error-related negativity (ERN) and a decrease of feedback-related negativity (FN). Based on these findings, we implemented a newly designed deterministic learning task to investigate whether this pattern of amplitude change holds in a fully predictable environment. We run EEG (N=34) and fMRI (N=24) experiments, in which participants completed Paired Associate Deterministic Learning task (PADL), where they were asked to learn if a presented pair of pictures is correct, based on either positive or negative deterministic feedback. The analysis of EEG data across 4 learning time-points showed statistically significant increase in amplitude for both, the ERN (p < .001) and the FN (p < .001). Consistently, the analysis of fMRI data revealed statistically significant increase in the response-related (p < .05) and the feedback-related (p < .02) activity of ACC for erroneous trials. Together, these findings show that response-related error processing across the deterministic learning process is like the one observed in probabilistic settings. On the contrary, the activity related to negative feedback evaluation reveals a distinct pattern of change during deterministic learning, what suggests divergent perception of feedback information in predictable, compared to not fully predictable environment.

Poster 4-067
FEAR ACQUISITION AND SAFETY LEARNING ARE MODULATED BY INDIVIDUAL STIMULUS FEAR-RELEVANCE
Jörg Neubert, Julia Wendt & Alfons Hamm
University of Greifswald
Descriptors: fear learning, conditioned inhibition, starrle blink response
The preparedness theory proposes an enhanced acquisition of fear towards fear-relevant compared to neutral stimuli. Likewise, the extinction of conditioned responses should be impaired when fear-relevant stimuli are involved. Although the resistance to extinction of fear-relevant CS was observed multiple times, evidence for effects on acquisition is scarce. In a series of experiments we applied the fear potentiated startle paradigm to the AX+/BX− discrimination learning task and studied the effects of stimulus fear-relevance on the acquisition and conditioned inhibition of fear responses. Pictures of fear-relevant (spider, snake) and fear-irrelevant (butterfly) stimuli served as excitors or inhibitors. During acquisition we found an interaction between fear responses differing between conditions (AX+ vs. BX−), stimulus fear-relevance, and the participant's individual stimulus specific fear. An advantageous effect of fear-relevant stimuli was observed for participants with elevated stimulus specific fear, when a fear relevant stimulus acted as excitor (A). Conditioned inhibition was assessed in a summation test, where the responses to the compound presentation of the excitor and the inhibitor (AB) were compared to conditioned responses towards AX+. Effects of conditioned inhibition were impaired in participants with a higher stimulus specific fear, when the fear-relevant stimulus was the conditioned safety signal (B). In contrast to a general preparedness our data point to specific effects on the acquisition and inhibition of fear for individually-fear relevant stimuli.

Poster 4-068
IMPLICIT PREDICTION ERROR AND LEARNING: P300 AND FEEDBACK FREE LEARNING
Stephen Luehr, Francisco Colino & Olav Krigolson
University of Victoria
Descriptors: learning, decision making, implicit error
Evidence suggests that structures within the medial-frontal cortex are part of a reinforcement learning system responsible for the optimization of behaviour. However, we also learn without reinforcement and it is less clear what neural substrates are recruited in these instances. Here, we sought to elaborate the role of the P3 event-related brain potential (ERP) component in implicit learning of stimulus frequencies without feedback. We hypothesised that the amplitude of the P3 reflected an implicit prediction error – the difference between the expected frequency of a given stimulus and its actual frequency. Participants completed a variant of the standard oddball task while electroencephalographic (EEG) data were recorded. The task required participants to classify and learn stimulus frequencies without feedback. Participants responded by keypress whether the stimulus was frequent or infrequent as they were randomly presented. Trial-by-trial analysis revealed that the first trial in each block for the stimuli produced extremely similar P3 amplitude for both frequent and infrequent stimuli before scaling to probability over many trials. The P3 is suggested to be related to expectancies of a particular stimulus, with amplitude reflecting an expectancy driven prediction error. Specifically, a reinforcement learning process is taking place based on implicit violations of frequency, not feedback. Source localization supports the idea that the posterior parietal cortex may play a role in prediction error driven implicit learning mechanisms in the absence of feedback.

Poster 4-069
AUTONOMOUS DYSFUNCTIONS IN MULTIPLE SCLEROSIS: RELATION TO COGNITIVE PARAMETERS
Sascha Hansen, Philipp Keune, Jana Münsinger, Roy Müller, Franziska Zapf & Patrick Osschmann
Klinikum Bayreuth GmbH
Descriptors: multiple sclerosis, PASAT, orthostatism
Both cognitive deficits and autonomous dysfunction are common in multiple sclerosis (MS). A previous study also showed that there may be a moderate effect of the response to an orthostatic challenge and fatigue parameters in MS-patients. Finally, in several studies including patients with chronic fatigue syndrome (CFS), a possible connection between autonomous dysfunction and cognitive deficits has been demonstrated. Therefore, a connection between autonomous dysfunction and cognitive deficits in MS seems also possible, but has not been sufficiently explored in previous research. The objective of the current study was to establish whether an orthostatic challenge induced by means of a tilt table test which simulates the movement from a horizontal to a standing position has an impact on cognitive performance in MS-patients. Based on previous work, we assumed that particularly cognitive fatigue may be increased by the orthostatic challenge. To test these hypotheses, 28 MS patients were examined with several orthostatic tests, including the tilting table. Also, they underwent standardized neuropsychological tests including the PASAT both before and after the orthostatic challenge. Results indicated that overall performance on the neuropsychological tests were relatively stable before and after the orthostatic challenge. However, sustained attention declined significantly in the post-challenge condition of the PASAT. These findings suggest that an orthostatic challenge specifically enhances cognitive fatigue symptoms in MS-patients.
Poster 4-070
EXPLORING THE RESTING-STATE EEG THETA/BETA RATIO AS A MONITORING PARAMETER OF ATTENTION PERFORMANCE IN MULTIPLE SCLEROSIS
Philipp Keune, Sascha Hansen & Patrick Oschmann
Klinikum Bayreuth GmbH

Descriptors: Multiple Sclerosis (MS), resting-state electroencephalogram (EEG), theta/beta ratio

Multiple Sclerosis (MS) patients are frequently characterized by cognitive deficits, due to a pathological autoimmune-response that corrupts myelin sheaths and leads to axonal damage in the central nervous system. In the routine clinical process, continuous monitoring of cognitive performance by means of neuropsychological examinations is a standard procedure. To date, information as to whether resting-state electroencephalographic (EEG) parameters relevant for attention could be utilized to support the monitoring process is limited. A potential candidate might be the EEG theta/beta ratio, which has been shown to be associated with attentional control processes in healthy individuals and in psychiatric groups (e.g. ADHD). In the current study, a sample of 25 MS patients participated in a neuropsychological assessment involving a divided attention task. Additionally, patients completed two resting-state EEG recordings, two weeks apart. Results revealed that patients who showed a clinically relevant impairment on the divided attention task, also displayed a significantly increased frontal (θ) theta/beta ratio, indicative of cortical slowing, relative to patients without comparable cognitive deficits. Moreover, the theta/beta ratio was shown to display good test-retest reliability across assessments. In sum, the current findings suggest that the frontal theta/beta ratio represents a reliable marker of attention performance in MS. It might hence be used as a monitoring parameter in future interventional studies involving immune-modulating medication.

Poster 4-071
PSYCHOPHYSIOLOGICAL MODELLING - SOLVING THE INVERSE PROBLEM IN PSYCHOPHYSIOLOGY
Dominik Bach
University of Zurich, Switzerland, and University College London, United Kingdom

Descriptors: peripheral psychophysiology, methods development, statistical methods

Psychophysiology is often concerned with how processes in the mind influence the body. However, in standard use of psychophysiological measurements, many psychologists ask an inverse question: what is the current status of a certain mind process (e.g. learning, memory, arousal, etc.) given measurements of the body. This inverse question is usually answered via operationalisation - certain data features are loosely equated with the mind process under study. As an alternative, we hereby present a generic Psychophysiological Modelling (PpPM) framework for solving this inverse problem. The forward relationship from mind to body is described in mathematical terms, and this formalisation used to yield maximum likelihood estimates of assumed mind processes, given measured data. We present models for skin conductance, heart period, respiration amplitude, pupil size, and startle eye blink responses. We formally verify some of the assumptions of these models. Under test conditions where the status of the mind process is known, the PpPM approach yields more sensitive and more robust estimates than standard operational methods, including some modern computerised approaches. We conclude that PpPM may offer a principled way of solving the inverse problem in psychophysiology in suitable experimental procedures.

Poster 4-072
REGIONALLY SPECIFIC CHANGES IN FACIAL SKIN TEMPERATURE UNDER STRESS
Dagmar Rebeck1, Petra Bachmann1, Xinwei Zhang1, Mauro Larra1, Johannes Finke1, Daniel Best1, Klaus Koch2 & Hartmut Schächinger1
1University of Trier, 2University of Applied Sciences - Trier

Descriptors: infrared-thermography, cold pressor test, region-specific blood perfusion

Infrared Thermography and image analysis are powerful tools to detect regionally specific changes in facial skin temperature linked to metabolic challenges and disruption of homeostasis during stress. The non-invasive and non-contact recording can be performed simultaneously to other stress-related measurements without being noticed by the participant. For stress induction, we used a bilateral feet Cold Pressor Test in a specialized, fully automated lab environment. Data from two related studies are presented. In experiment A (N=15, male) all participants underwent both a stressful and a control condition, whereas experiment B (N=20, male) employed a between-subjects design. As indexed by significant increases in blood pressure, cortisol level and heart rate, stress induction was successful. Thermal data were recorded by IRBIS head 640 thermography camera and analysed by means of custom-made MATLAB scripts, using the eigenvectors of threshold-selected datasets in order to rotate and translate face-shape information. Prior to performing regions of interest analyses, data were fitted to a uniform shape. During stress (relative to control), a significant drop in overall facial skin temperature was found, which was mainly driven by changes in the cheek region, whereas other areas showed a different pattern. The results a discussed with respect to effects of cardiovascular and blood perfusion changes following stress.

In conclusion, the present study shows that thermography is a promising approach to the analysis of stress-induced physiological processes.

Poster 4-073
TEST-RETEST REPRODUCIBILITY OF A COMBINED PHYSICAL AND COGNITIVE STRESSOR
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1University of Trier, 2University of Applied Sciences - Trier

Descriptors: cold pressor test, PASAT, test-retest reproducibility

Stress is an important topic in human psychobiology. Recently, we have validated a new version of a combined physical and cognitive stressor: bilateral feet Cold Pressor Test (CPT) with simultaneous administration of the Paced Auditory Serial Addition Task (PASAT). Since habituation and/or sensitization effects play a role in stress testing our study examined test-retest reproducibility of this new lab stressor. Thirty-two males aged 19–31 years were subjected twice to the stressor, under exactly identical conditions, one week apart. Cardiovascular (blood pressure and heart rate), neuroendocrine (salivary cortisol) and subjective stress responses were assessed. During test and retest, significant stress responses were found for all parameters. Test-retest correlations of cardiovascular and subjective responses ranged from r=−.50 to r=−.83, and r=−.30 to r=−.68, respectively. The test-retest correlation of cortisol reactivity (AUCG) was r=−.70. There was no significant trend between test and retest detectable for cardiovascular reactions. In contrast, increases in cortisol responses were lower during retest (p<.01). A similar finding was present in subjective ratings of stress, arousal, anxiety and pain (all p<.05). In summary, our results demonstrate that the new combination of CPT and PASAT provokes distinct stress responses during novel and repeated exposure. Test-retest reproducibility is comparable to other well validated stress protocols. Sensitization was not found. However, reduced cortisol and subjective responses during retest suggest presence of habituation effects.

Poster 4-074
HUMAN FREEZE AND ITS ROLE IN DEFENSIVE ACTION PREPARATION
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Descriptors: freezing, bodily immobility, threat

The detection of distal threat facilitates a parasympathetic state of freezing, a defensive response reflected by bodily immobility and bradycardia. Although theoretical accounts describe freezing as active preparatory state in which processing is biased to threat-related information, human freezing has been mostly studied in passive paradigms excluding active responding. To investigate the association between freezing and threat-related actions, we applied an active shooting task under threat of shock while measuring participants body sway on a stabilometric force platform, as index of freezing. Preliminary results of 427 participants show increased phasic bodily immobility during the anticipation of threat of shock (vs. safety), indicative of human freezing. This demonstrates for the first time threat-related human bodily immobility while preparing for action which is in line with theoretical accounts indicating that freezing is not a purely passive defensive state and may benefit the organism by facilitating preparation for defensive action. Ongoing analyses aim to further test this theory by elucidating whether interindividual differences in freezing are associated with shooting speed and accuracy.
**Poster 4-076**

**EFFECTS OF TRANSCRANIAL DIRECT CURRENT STIMULATION ON POSTURAL SWAY IN YOUNG ADULTS**

Abinand Rejimon, Alexandra Moussa-Tools, Nancy Lundin, Jessica Mitroi, Leah Burroughs, Shahin Saberi, Amanda Bolbecker, Brian O’Donnell & William Hetrick

Indiana University - Bloomington

**Descriptors:** transcranial direct current stimulation, postural sway

It has been suggested that the cerebellum may contribute to both cognitive and motor function, and that cerebellar deficits may account for both motor and cognitive dysfunction in schizophrenia. Postural stability is a task that tests the cerebellar node of the entire network involved in balance. While postural sway is influenced by various systems within the brain, the cerebellar node is one of the most important. Postural sway was measured in healthy controls under four different conditions with different amounts of visual and spatial feedback while minor electrical stimulation was applied to their cerebellum in the form of transcranial direct current stimulation (tDCS). tDCS utilizes low levels of electricity (1–2 mA) in target brain regions to depolarize (using anodal stimulation) or hyperpolarize (using cathodal stimulation) neuronal resting membrane potentials, allowing for an increase or decrease, respectively, in neural firing. Postural sway was measured in three times for each subject. After initial baseline measurements, postural sway was measured twice during a 30 minute period of active stimulation at 1.5 mA (anodal or cathodal). Cathodal stimulation was shown to increase sway while anodal stimulation decreased sway with less than 10 minutes of stimulation. Analysis of path length revealed a main effect of group, with mean path length larger in participants who received anodal stimulation compared to those who received cathodal stimulation (t (11) = 10.86, p < 0.05).

**Poster 4-077**

**DEFENSIVE RESPONSE MOBILIZATION DURING REPEATED TERMINATIONS OF EXPOSURE TO INCREASING INTEROCEPTIVE THREAT**

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**Descriptors:** avoidance, escape, habit

Resistant avoidance behaviors play a crucial role in the maintenance of anxiety disorders. In the present study avoidance behavior was investigated in 24 healthy participants who repeatedly prematurely terminated the exposure to increasing interoceptive threat and a matched control group (N=24) who completed the exposure. Increasing interoceptive threat was established by evoking the feeling of dyspnea applying increasing inspiratory resistive loads that were followed by the ultimate threat, a short breathing occlusion. Initially, participants terminated the exposure during ultimate threat. This first termination was preceded by a strong surge in autonomic arousal and reported anxiety. Startle reflex and the P3 component of event-related brain potentials to startle probes were strongly inhibited, indicating preparation for defensive action. With repetitive terminations, individuals successively terminated earlier, thus avoiding exposure to the occlusion. This avoidant behavior was accompanied by alleviated autonomic arousal. In addition, no indication of response preparation was found implying that the avoidance behavior was performed in a rather habitual way. Matched controls did not show any indication of a defensive response surge in the matched intervals. In matched controls, no changes in physiological response patterns were detected while anxiety levels increased with repetitions. The present results will be discussed with reference to etiological models and therapeutic strategies in treating anxiety disorders.

**Poster 4-078**

**THE INFLUENCE OF PACED BREATHING AT 0.1 HZ AND 0.28 HZ FREQUENCIES ON THE CARDIOVASCULAR SYSTEM AND CORE AFFECT**

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University of Warsaw

**Descriptors:** respiratory rate, cardiovascular system, core affect

In this study, we investigated the influence of paced breathing on core affect and the cardiovascular system. 84 participants were assigned to one of the three conditions with 5 minutes paced breathing at 0.1 Hz (6 breaths/min) with deceptive instruction, 0.1 Hz without deceptive instruction, and 0.28 Hz (16.6 breaths/min) with deceptive instruction. An 8 minute resting measurement was followed by a questionnaire measure of core affect (Chinese Circumplex Model of Affect), paced breathing, and, again, a core affect measure. During paced breathing, heart rate (HR) decreased compared in all conditions. Respiratory sinus arrhythmia was higher in conditions with a 0.1 Hz frequency, presumably as a result of increased baroreflex and enhanced parasympathetic control. The pre-ejection period did not differ between baseline and the paced breathing task in any conditions. End-tidal CO² (EtCO²) decreased in all conditions, despite anti-hyperventilation instruction. The decrease in EtCO² was negatively related with the decrease in HR. This finding emphasizes the importance of avoiding hyperventilation during paced breathing, both in scientific and applied contexts, because it may counteract the anti-arousal effects of slow breathing on the cardiovascular system. Paced breathing caused a comparable decrease in subjective arousal in all conditions. This finding suggests that during situations of low affective arousal, paced breathing at 0.1 Hz doesn’t produce, through interoceptive pathways, discernible changes in affective state, despite an increase in parasympathetic heart control.

**Poster 4-079**

**RELATIONSHIP BETWEEN HEART RATE REACTIVITY AND IN-VIVO AGGRESSION DURING PROVOCATION**

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Temple University

**Descriptors:** heart rate reactivity, aggression, Taylor Aggression Paradigm (TAP)

Previous studies have shown that heart rate reactivity (HRR) is negatively associated with aggression when experiencing provocation. The current study examined the relationship between HRR and in-vivo aggression during different levels of provocation. 51 participants completed 32 reaction-time trials (8 4-trial blocks) that allowed them to administer electric shocks to a fictitious opponent who shocked them as well. This was designed to mimic real-life provocation (i.e. going from pre-provocation, to quickly increasing to peak provocation, and then quickly returning to post-provocation). Aggression was defined as the average intensity of electric shocks set within each block, with greater shock intensity indicating greater aggression. HRR scores were operationally defined as peak provocation HR minus pre-provocation HR (ascending reactivity) and peak provocation HR minus post-provocation HR (descending reactivity). We examined (1) how HR changed over the task, and (2) how HRR was associated with mean aggression during the entire task and aggression during peak provocation. A repeated measures ANOVA showed a main effect of provocation [F(7,315) = 8.69, p < .001], with all participants increasing in HR when provocation decreased. Ascending HRR was negatively associated with mean aggression (R = −.38) and peak aggression (R = −.34). Descending HRR was not associated with any aggression variables (p > .12). Thus, HRR due to provocation is negatively associated with in-vivo aggression regardless of level of provocation.
Poster 4-079

REDUCED ELECTRODERMAL RESPONSE TO AVERSIVE PICTURE STIMULI AS AN INDICATOR OF DISPOSITIONAL THREAT SENSITIVITY

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Descriptors: threat, skin conductance, fear

Skin conductance response (SCR) has long been utilized as a physiological measure of emotional arousal in clinical and personality research. Prior studies have demonstrated that SCR magnitude is enhanced during viewing of affective picture stimuli compared to neutral pictures. Other work has shown that individuals with anxiety disorders exhibit increased SCR to unpleasant pictures relative to control participants, whereas individuals high in affective-interpersonal features of psychopathy or fearless-trait traits show reduced SCR to such stimuli. A plausible hypothesis based on recent research is that a common dispositional dimension, fear/fearlessness or threat sensitivity (THT), may account for these different results. The current study used data from a sample of 204 adult community members (M age = 20.6) to investigate associations among fear psychopathy, dispositional THT, and SCR during viewing of affective pictures. Results indicated enhanced SCR to unpleasant pictures in participants exhibiting symptoms of fear psychopathy, and for individuals scoring high on a scale measure of dispositional THT (Yancey et al., 2016). Further, a mediational analysis indicated that the observed relationship between fear psychopathy and augmented SCR was accounted for by elevations in dispositional THT. These results suggest that modulation of electrodermal response to aversive visual stimuli may operate as a physiological indicator of dispositional THT, a trait construct with referents in both neurophysiology and behavior.

Poster 4-080

GENERALIZATION OF TASK-RELATED PREFRONTAL-ORBITOFRONTAL DYSCONNECTIVITY TO PERSECUATORY ANTICIPATION OF THREAT IN PSYCHOSIS PATIENTS

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Descriptors: decision-making, persecution, functional connectivity

One model of delusions stipulates two hits where an aberrant percept interacts with a failure to dismiss the aberration. We studied persecution as a model system using the Minnesota Trust Game (MTG). In the critical suspiciousness condition of MTG the participant chose between a certain payoff ($10 each for the participant and an anonymous partner) or trusting the partner to decide the final payoff. If selected, the partner chose between a mutually beneficial payoff ($20 each for the participant and the partner) or a spiteful payoff (a varying amount, e.g. $0, for the participant and $15 for the partner). METHOD: Two studies of 38 psychosis patients and 46 monozygotic twins performed MTG during fMRI. Participants completed an interview reporting on life events and others’ intentions. Analyses focused on connectivity-related metrics when making trusting vs. certain payoff choices. RESULTS & DISCUSSION: Patients and twins showed valid performance profiles during the suspiciousness condition with the extent to which participants trusting a partner correlating with interview and self-reports of suspiciousness. Coherence in the dorsolateral prefrontal (dPFC) and orbitofrontal cortices (OFC) correlated with trust vs. certain payoff decisions, whereas decreased connectivity dPFC-OFC connectivity correlated with spite sensitivity. MZ discordance in connectivity corresponded to discordance in suspiciousness. We also examine relationships to anticipation of others’ threatening intentions. These results suggest specific regions subject to two hits.
Poster 4-083

TRANSCALLOSAL AUDITORY CONNECTIVITY IN FIRST EPISODE SCHIZOPHRENIA

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Descriptors: schizophrenia, white matter tractography, DSI

Auditory verbal hallucinations (AVH) are common in schizophrenia and may relate to abnormal connectivity between auditory cortices. We examined transcallosal auditory cortex tracts in first-episode schizophrenia patients (FESz) with and without AVH. Diffusion spectrum imaging (DSI) data were obtained from 23 healthy controls (HCs) and 29 FESz, 14 of which were AVH+. A comparison of the first 2 months of follow-up. Participants who received anodal stimulation over the right DLPFC in the first place, AE during adolescence may cause regionally-selective and lastingly altered brain connectivity that may underlie AVH, even in the absence of deficits. The current study examined whether frontal hemispheric asymmetry during emotional disorders is related to trait anxiety, a history of depressive episodes, and the interaction of these two emotional disorders. Participants (n=77) from a larger longitudinal study had hemispheric asymmetry measured during cueing of potential gains and losses (conditions) during a monetary incentive delay task (MID) using functional magnetic resonance imaging (fMRI). Multiple regions of the prefrontal cortex (ROIs) associated with depression and anxiety were examined. These were the dorsal anterior cingulate cortex (dACC), dorsolateral prefrontal cortex (dlPFC), and the ventromedial prefrontal cortex (vmPFC). Participants also completed trait anxiety and depression measures. A significant trait anxiety x ROI x condition interaction revealed that trait anxiety predicted different asymmetry responses to gain and loss cues, and that these responses were the opposite in the dACC and dlPFC. A significant trait anxiety x depressive episode history x ROI interaction showed that participants with a greater number of previous depressive episodes demonstrated patterns of trait anxiety and asymmetry in the dACC and dlPFC that were commensurate with loss processing patterns at each respective ROI, regardless of whether the cues were for gain or loss. This indicates that among participants with a history of depressive episodes, trait anxiety level was a determinant of frontal asymmetry in response to emotional cues, but the positivity or negativity of the cue was not.
Posterior 4-087

HAIR CORTISOL CONCENTRATION IN THE STUDY OF ANXIETY AND DEPRESSION

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Descriptors: hair cortisol, anxiety, depression

Long-lasting stress is an established risk factor for the development of mental illness and psychopathology. A relatively new and reliable measure of chronic stress levels has been found in the extraction of cortisol concentrations from hair samples, which provides a retrospective index over several months. Whereas cortisol specimens from serum, saliva, or urine primarily reflect momentary cortisol circulation, hair cortisol represents a trait marker relatively robust to acute daily stressors, state-related factors, and circadian rhythms. However, hair cortisol levels are also influenced by major life events and therefore reflect variability in the human stress response. Combining hair cortisol concentration as a stable marker of chronic stress with individual psychometric indexes of psychopathology is an important step in understanding the dimensions of mental illness. In this study we collected hair samples from the posterior vertex of the scalp together with psychometric and psychophysiological data from 87 participants with current anxiety and/or depressive diagnoses as well as healthy controls. Monthly averages of hair cortisol concentrations were acquired for up to 4 months into the past and showed strong reliability across the timespan. Correlational analyses with psychometric data show higher cortisol levels associated with higher BDI and Anhedonic Depression scores. Using a factor analytic approach across a variety of psychometric measures, hair cortisol levels were positively correlated with negative affectivity.

Posterior 4-088

AGE OF ALCOHOL INITIATION AND REWARD PROCESSES IN A CURRENT ALCOHOL DRINKING SAMPLE

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Descriptors: early alcohol initiation, reward sensitivity, EEG

Earlier ages of alcohol initiation have been associated with an increased vulnerability for Alcohol Use Disorder and general risk taking behaviors beyond genetic influence. Reward processes, including reward anticipation (pleasure before receiving alcohol/general reward), learning (how quickly one pairs a stimulus with alcohol/general reward), and consummation (pleasure when receiving alcohol/general reward), have been implicated as potential mechanisms accounting for this vulnerability. However, no human research has been conducted on the effect of age of alcohol initiation on general and alcohol-related reward processes. Using Event Related Potentials (ERPs), the current study addressed this gap in a sample of 123 current alcohol drinkers. The Monetary Incentive Delay-General task and Monetary Incentive Delay-Alcohol task were administered to participants, and Electroencephalography was used to collect ERPs that index reward anticipation (P3) and reward consummation (P3 and Late Positive Potential) during these tasks. Earlier ages of alcohol initiation were associated with increased alcohol-related reward learning ($b = -.29; p < .05$) and decreased alcohol-related reward consummation ($b = .30; p < .05$; P3 and Late Positive Potential) beyond genetic and environmental covariates. There were no other significant relationships. These findings support and extend alcohol theories by showing that the impact of alcohol on reward deficits may vary based on the developmental time period and may be specific to alcohol, rather than general reward processes.

Posterior 4-089

KEEPING THE BEAT: HEART RATE VARIABILITY AND RHYTHM MAINTENANCE IN TRAUMA EXPOSED INDIVIDUALS

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Descriptors: trauma, rhythm, HRV

The ability to maintain rhythm has been associated with regulating arousal and decreasing stress response. Individuals who are able to effectively maintain rhythm in tapping paradigms have been shown to have greater Heart Rate Variability, a marker of response flexibility and regulatory skills (Thaut et al., 2015). In turn, engaging in rhythmic tapping exercises may effectively correct low HRV. The association between HRV and rhythm may be particularly strong in populations with exposure to childhood trauma, as these individuals tend to have lower HRV and greater difficulty regulating. The current study examined the relationship between HRV, trauma, and tapping task performance. Participants were asked to perform a motor task in which they tapped a long with a tone for 30 seconds and then continued to maintain the beat without the tone for an additional 30 seconds. For individuals who did not meet criteria for childhood trauma there was no significant relationship between HRV and tapping accuracy. However, for individuals who had experienced childhood trauma greater HRV was negatively correlated with change scores in paced and un-paced tapping in both trial 1 and 2, when the beats were presented at 1.5 beats per second, $p = .046$, $r = -.403$, and 2 beats per second respectively, $p = .035$, $r = -.424$, suggesting that for individuals who have experienced trauma, those with higher HRV were able to more accurately regulate and maintain the beat. This data suggests that the relationship between HRV and rhythm maintenance may be particularly salient in trauma-exposed individuals.

Posterior 4-090

BINAURAL BEATS AT 34 HZ ENHANCE EEG BRAINWAVES AT THE SAME FREQUENCY RANGE

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Descriptors: binaural beats, acoustic beats, enhancement within EEG gamma band

When two pure tones of slightly different frequencies are presented simultaneously to the two ears, they generate a beat whose frequency corresponds to the frequency difference between them, known as acoustic beat. If these two tones are presented one to each ear, they still produce the sensation of the same beat, although no physical combination of them occurs outside the auditory system. This phenomenon is called binaural beat. In the present study, we aimed to disentangle the potential role of binaural beats over that of acoustic beats, for the enhancement of distinct brain oscillatory frequencies: 4.53 Hz, 8.97 Hz, 17.93 Hz, 34.49 Hz and 57.3 Hz, within the classical electroencephalogram (EEG) theta, alpha, beta, gamma and upper gamma bands, respectively. In addition, we analyzed the effects of binaural-beat stimulation on two psychophysiological measures related to emotional arousal: heart rate and skin conductance. We recorded the EEG, the electrocardiogram and the skin conductance response of fourteen healthy participants, while they were passively listening to binaural or acoustic beats. Beats were presented for periods of 3 minutes, preceded and followed by pink noise periods of 90 seconds. Results revealed a significant enhancement of gamma-band power only after stimulation with binaural gamma-beat, with a different mechanism of action of binaural and acoustic beats in the modulation of EEG gamma activity. These results suggest binaural-beat stimulation in the gamma frequency range may constitute a potential tool for the enhancement of EEG gamma band.
**Poster 4-091**

EFFECTS OF EMOTIONAL CONTENT AND MOTIVATIONAL CONTEXT ON CONTRAST RESPONSE FUNCTIONS OF NATURALISTIC STIMULI

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Descriptors: electroencephalography, ssVEP, threat

Visual scene processing is modulated by semantic and motivational/ emotional factors, in addition to physical scene statistics. A metric of lower-level visual processing is the contrast-response function (CRF), representing the change in neural or psychophysical gain with increasing stimulus contrast. The CRF can be modulated in two main ways: Contrast gain involves a selective increase in the intermediate contrast range of the CRF, whereas response gain involves a multiplicative increase of the CRF with maximum modulation in the high-contrast range. Here we aimed to examine the effects of motivational context (expectancy of threat vs. safety, implemented as a noxious noise) and emotional content (pleasant, neutral, unpleasant) on CRFs elicited by naturalistic stimuli, including faces and complex scenes (humans, animals). CRFs were measured in 16 participants by means of sweep steady-state visual evoked potentials (ssVEPs), implemented by gradually enhancing each stimulus’ Michelson contrast in 40 logarithmic steps. Each contrast level was shown for 41.7 ms followed by 41.7 ms of blank screen, resulting in a periodic (12 Hz) on-off stimulation (3.33 sec). The envelope of the evoked sweep-ssVEPs was used to represent neutral mass CRFs for each condition. Results show (1) differences in sweep-ssVEP topography and amplitude between CRFs elicited by faces and complex scenes (2) response gain, but not contrast gain for motivationally and emotionally relevant, compared to neutral scenes. Ongoing analyses focus on interaction effects between threat expectancy and content processing.

**Poster 4-092**

DISTINCT N1 AND P2 AUDITORY ERP COMPONENT RESPONSES TO IMPERCEPTIBLE VARIATIONS IN SOUND INTENSITY: TEMPORAL AND TIME-FREQUENCY EVIDENCE

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Descriptors: EEG, N1 and P2 components, Intensity dependence

Introduction: We previously have shown that the independent manipulation of stimulus intensity produces similar linear modulations on auditory N1 and P2 ERP components at averaged and single-trial levels, which contrasts with reports of distinct modulations for both components. To properly address the functional significance of the auditory P2 component, it is relevant to understand in which experimental conditions it dissociates from the N1, as they partially overlap in the time domain. Objective: We attempted to dissociate the N1 and P2 by sequentially varying the stimulus intensity in below the threshold of perceptual awareness. Methods: 27 healthy volunteers (9 male) with age of 22.6 ± 5.1 years were studied. Interceptive accuracy was measured by the Schandry heartbeat detection task. Electrocardiography and beat-to-beat blood pressure were recorded. RMSSD was assessed as a measure of vagally-mediated heart rate variability and the sequence method was used to measure spontaneous BRS. Results: Interceptive accuracy ranged from 0.26 to 0.91, was higher in males (0.62 ± 0.18 vs. 0.49 ± 0.12, p = 0.029), and was correlated with systolic blood pressure (SBP, r = 0.456, p = 0.017), systolic blood pressure (SBP, r = 0.444, p = 0.020), and was non-significantly with heart rate (HR, r = 0.18 vs. 0.452, p = 0.091). In separate General Linear Models controlling for gender, SBP, and HR, the association of BRS (F = 6.105, p = 0.022) and RMSSD (F = 5.827, p = 0.025) with interceptive accuracy remained significant. RMSSD and BRS were not included in the model at the same time due to high intercorrelation (r = 0.798). Conclusions: These data suggest that baroreceptors are involved in interoception. Future experiments will be aimed at localizing brain areas relevant to self-face recognition and their functional connections.

**Poster 4-093**

EVENT-RELATED POTENTIALS CORRELATES OF SELF-FACE RECOGNITION

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Descriptors: self-face recognition, ERPs, familiarity

Self-face recognition is a particular form of face processing. It differs from recognition of other faces, even when these are familiar, as shown by brain imaging studies. However, little is known about the temporal dynamics of self-face recognition, and existing ERPs studies disagree on the timing of the effect. Specifically, the present study aimed to investigate whether differences between the self-face recognition and recognition of other faces emerge in early or subsequent stages of facial perception. To test this, 25 healthy participants performed a face recognition task while EEG activity was recorded. They were asked to identify their own face, a familiar or an unfamiliar face. No significant differences were found in N170 between conditions. However, statistical differences in P200 amplitude over posterior electrodes were found for self-face compared to the familiar and unfamiliar faces. Additionally, the posterior N250 amplitude was differentially modulated across the three conditions. These effects were accompanied by a frontocentral inverted polarity in the same latency range. Our findings suggest that differences in self-face recognition emerge not earlier than at 200 ms. Furthermore, the later component, N250, which has consistently emerged as a neurophysiological correlate of face recognition, may be indicative of a gradient of familiarity. Future experiments will be aimed at localizing brain areas relevant to self-face recognition and their functional connections.

**Poster 4-094**

BARORECEPTORS AS INTERCEPTORS: ASSOCIATION BETWEEN BARORECEPTOR SENSITIVITY AND INTERCEPTIVE ACCURACY

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Descriptors: Interoception, Interoceptive accuracy, Baroreceptors

Background: Baroreceptors are assumed to be involved in interoception, but neurophysiological evidence to support this is limited. Here, we present data on the association between baroreceptor sensitivity (BRS) and interoceptive accuracy. Methods: 27 healthy volunteers (9 male) with age of 22.6 ± 5.1 years were studied. Interceptive accuracy was measured by the Schandry heartbeat detection task. Electrocardiography and beat-to-beat blood pressure were recorded. RMSSD was assessed as a measure of vagally-mediated heart rate variability and the sequence method was used to measure spontaneous BRS. Results: Interoceptive accuracy ranged from 0.26 to 0.91, was higher in males (0.62 ± 0.18 vs. 0.49 ± 0.12, p = 0.029), and was correlated with systolic blood pressure (SBP, r = 0.456, p = 0.017), systolic blood pressure (SBP, r = 0.444, p = 0.020), and was non-significantly with heart rate (HR, r = 0.18 vs. 0.452, p = 0.091). In separate General Linear Models controlling for gender, SBP, and HR, the association of BRS (F = 6.105, p = 0.022) and RMSSD (F = 5.827, p = 0.025) with interceptive accuracy remained significant. RMSSD and BRS were not included in the model at the same time due to high intercorrelation (r = 0.798). Conclusions: These data suggest that baroreceptors are involved in interoception. Future experiments will be aimed at localizing brain areas relevant to interoceptive ability. As such, BRS is a potential treatment target for improving interoceptive accuracy.
Poster 4-095

BITTER AFTERTASTE INFLUENCES THE PROCESSING OF VISUAL FOOD CUES: A COMBINED ERP AND SLORETA STUDY

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Descriptors: ERP, bitter aftertaste, food cue processing

The perception of intense bitterness is associated with disgust and food rejection. The present cross-modal study investigated whether a bitter taste is able to influence affective ratings and the neuronal processing of visual food cues. Images depicting high-caloric meat dishes, high-caloric sweets, and low-caloric vegetables were presented to 39 healthy normal-weight women (mean age: 22.5 years) after they had either rinsed their mouth with wormwood tea (bitter group; n = 20) or water (control group; n = 19) for 30s. Images of high caloric food elicited higher fronto-central LPPs than vegetables only in the water group. This differentiation was absent in participants of the bitter group, who also gave lower arousal ratings for the high-caloric food. The bitter aftertaste seemed to reduce the palatability of high-caloric food. In addition, source localization analysis revealed higher current density in the somatosensory cortex for high caloric food pictures in the bitter group indicating altered multisensory processing of pleasant food cues during the perception of an intensive bitter aftertaste. The current study showed that rinsing the mouth with a bitter fluid challenged the multisensory integration of visual and gustatory cues, which in turn led to changes in the perceived palatability of food cues.

Poster 4-096

PREDICTING SOUNDS AND SILENCES: DISENTANGLING MATCH AND MISMATCH EFFECTS ON AUDITORY ERPS

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Descriptors: audition, event-related potential (ERP), predictive coding

Auditory event-related potentials (aERPs) are modulated by internal expectations. Several studies report modulations of exogenous aERPs, such as attenuated auditory N1 and P2 components for predictable sounds. Additionally, endogenous aERPs, such as the mismatch negativity (MMN) and repetition positivity (RP) are believed to index specific mismatch- and match-related processes, respectively. We aimed to clarify the relationship between these prediction-related modulations and components. We recorded ERPs while participants performed button presses that were associated with either sounds or silences, and occasionally violated these associations. Expected sounds, unexpected sounds, expected silences and unexpected silences, were compared to the corresponding event recorded in an unpredictable control condition, allowing to isolate match and mismatch effects on sound-evoked responses and on purely endogenous (silence-evoked) signals. Match and mismatch effects on sound-evoked responses followed similar time-courses, albeit with maxima of opposing polarities. The effects were also apparent but of a much smaller magnitude on the endogenous signals. Unexpected events elicited a fronto-central negativity in the typical MMN time-course, followed by a P3. These effects were mirrored for expected events, which elicited a similarly distributed positivity, followed by a negativity. The results suggest that the modulations of the exogenous aERPs, may be due to overlapping match- and mismatch-related effects that reflect opposing manifestations of the same underlying predictive process.

Poster 4-097

BELIEVING IN CONTROL OVER ONE'S LIFE YIELDS ENHANCED FEEDBACK SALIENCY SIGNALS IN A SOCIAL COMPARISON CONTEXT

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Descriptors: FRN, internal control beliefs, social comparison

Reference frames during performance monitoring shape the interpretation of our behaviour. For example, criterion-based reference frames capture individual performance in relation to a pre-defined criterion, while social reference frames allow direct comparison with our fellow humans. However, little is known regarding the interplay of reference frames and dispositional attribution styles such as generalized internality beliefs, which constitute beliefs about generalized control over one’s own life and environment. This study investigated event-related potentials during performance monitoring – in particular the Feedback-Related Negativity (FRN) - in both reference frames in relation to generalized internality beliefs. 70 volunteers (36 women) performed a time estimation task while EEG was measured. Feedback was either delivered relative to their own performance (self-reference) or relative to the performance of a social reference group constituting of previous participants (social reference). Afterwards, attribution style was assessed with a questionnaire. FRN amplitudes after negative feedback were positively correlated with generalized internality beliefs solely during social reference, but not during self-reference or positive feedback trials. Thus, enhanced scores of controllability of one’s own life were associated with more pronounced feedback saliency signals in a social comparison context only. Our findings suggest that a social reference frame possibly challenges internal control beliefs and initiates consequently enhanced performance monitoring.

Poster 4-098

YOU SEE WHAT YOU SMELL: BODY SHAPE PERCEPTION IS AFFECTED BY CHEMOSENSORY CUES OF THE METABOLIC STATE

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Descriptors: chemosensory communication, ERP

The metabolic system is considered to affect human body odor expression. Here, we investigate whether chemosensory cues from short-term fasting vs. satiated individuals affect the processing of human body shapes. Pictures of overweight (body mass index, BMI = 35) and underweight (BMI = 15) avatars (stimulus duration: 1000 ms) were presented to 20 participants, in the context of chemical stimuli (constant flow olfactometer presentation for 3000 ms, starting 2000 ms before picture onset) derived from auxillary sweat (sampled on cotton pads) obtained from either fasting or satiated people (N = 10, fasting for 12 hours vs. after finishing a 600 kcal carbohydrate-rich meal). Pure cotton pads served as control context. The EEG was recorded from 64 electrodes and stimulus-locked averaged. Integrals were calculated for the latency windows of the N1 (90–170 ms), P2 (160–240 ms), P3a (200–280 ms) and P3b (280–380 ms) peaks. Only 10 % of the participants could discriminate the odor of fasting and satiated people from room air, and stimulus ratings (intensity, pleasantness, familiarity) between body odors and cotton pad control did not differ. Integrals were larger for overweight avatars (main effect picture; P2, p = 0.025) and for avatars presented in the context of sweat cues from satiated people (main effect chemosensory cue; P2, p = 0.012; P3a, p = 0.034; P3b, p = 0.012). It is concluded, that human chemosensory cues of satiation might contain more information than cues of fasting, and capture a higher amount of attentional resources during the perception of human bodies.

Poster 4-099

WHY THINKING “I TOLD YOU SO” IS REWARDING: A FMRI STUDY ON BEING RIGHT IN A SOCIAL CONTEXT

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Descriptors: social reward

Many decisions you make are joint decisions made together with someone else. Often situations occur in which you disagree with each other. Even though you are convinced that you are right, you may have to go along with the other’s decision. In such a situation negative consequences of the decision may go together with a feeling of satisfaction and an impulse to say “I told you so”. The current FMRI study aimed at investigating whether striatal activation is enhanced in such a situation because of the rewarding effect of being right despite the loss of monetary reward. Nineteen participants performed a joint visual search task with a confederate. The participant could give his or her advice followed by the confederate making the final decision. The current task enabled us to disentangle correctness of the participant’s advice from financial outcome. A correctness x outcome ANOVA revealed more stratum activation for correct compared to incorrect advice and more stratum activation for gains versus losses. Importantly, ROI analysis showed enhanced stratum activation for correct compared to incorrect advice also when the outcome resulted in a monetary loss. The current study therefore shows that the stratum is sensitive to being right and explains why being able to say “I told you so” simply feels so good. We hypothesize that these activations may serve the function of boosting self-esteem and reputation in a social context.
Poster 4-100

SOURCE LOCALIZATION OF BRAIN ELECTRICAL ACTIVITY DURING VISUALIZATION OF A WORD:
COMPARISON OF HIGH AND LOW IMAGERY WORDS

Yuya Ogawa & Hiroshi Nittomo
Osaka University

Descriptors: word imageability, event-related potentials, sLORETA

Word imageability means the extent to which a word evokes sensory mental images. The processing differences between high and low imagery words have been examined in semantic processing tasks. However, few studies directly focus on imagery processing. In this study, we recorded event-related potentials (ERPs) to examine the effect of word imageability in an imagery task. Participants (N = 39) performed an imageability rating task in which participants were asked to rate the ease of imaging a stimulus word’s referent on a five-point scale. Forty-five high imagery words and 45 low imagery words, consisting of two Chinese characters, were presented in random order. All participants rated high imagery words as easier to image than low imagery words. High imagery words elicited a larger N400 than did low imagery words. Low imagery words elicited a larger late positive component (LPC) than did high imagery words. Source analysis using sLORETA was applied to the N400 and LPC. The nonparametric statistical mapping results showed no significant differences between high and low imagery words in the N400 latency range. In contrast, current densities in the LPC latency range were significantly higher for low imagery words than for high imagery words in the occipital cortex including cuneus. No regions showed higher levels of activity for high imagery words than for low imagery words. Given that low imagery words are more difficult to visualize, activation in the visual cortex may reflect the amount of effort necessary to produce a mental image of a word for the imagery task.

Poster 4-103

CONTEXTUAL SEMANTIC COMPREHENSION OF A WORD WRITTEN WITH DIFFERENT JAPANESE ORTHOGRAPHY

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Kwansei Gakuin University

Descriptors: Japanese character, words in a sentence, event related potential

Japanese sentence is composed of the different orthography; kanji (ideogram), hiragana and katakana (phonograms). When recognizing a phonogram, we would need the process of word’s sound in addition to that of its form. We examined the semantic comprehension of a word written with the different Japanese orthography during reading sentences. Reading words semantically mismatched with the sentence, the N400 component of the event related potential would appear. We predicted the peak latencies of the N400 component to hiragana and katakana words semantically mismatched would be longer than kanji. During recording electroencephalogram, sentences were presented word by word on a display. The sentences ended with a semantically matched or mismatched word (critical word). A half of the mismatched words violated world knowledge, meaning the knowledge we already have commonly. The other violated semantic knowledge, meaning the knowledge to identify the contextual validities of each word. The critical words were presented with the three orthographic conditions. As a result, the mean of the N400 amplitudes to mismatched words was larger than matched words in the kanji and hiragana conditions. However, there is no significant difference of the peak latency between the two conditions. As for reading the matched words, the mean amplitudes to the three conditions differed. In the stimulus series of the task, the words were presented with kanji more frequently than hiragana and katakana. The presenting frequency of the orthography would be related to the occurrence of the N400 component.

Poster 4-101

AN INVESTIGATION OF AUTOMATICITY IN TRANSLATION IN BILINGUALS: AN ERP STUDY

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¹Sichuan Normal University, ²University of South Florida

Descriptors: automaticity, translation, ERP

In our previous TAPs (Think-Aloud Protocols) study, we found that the proficient bilinguals used an automatic strategy in translation, which marked by faster response and similar cognitive efforts in forward translation (language 1 to language 2) and backward translation (language 2 to language 1). In the present study, we used a translation recognition task to examine the automaticity indexed by ERPs in the proficient and intermediate bilinguals. Apart from some results consistent with translation priming effect and the Revised Hierarchical Model, we found (1) Proficient group responded faster and had a higher accuracy compared to the intermediate group; (2) Translation direction did not impact the performance of the proficient group, but did affect the Intermediate group (their performance of the proficient group, but did affect the Intermediate group (their performance of the proficient group, but did affect the Intermediate group (their performance of the proficient group, but did affect the Intermediate group (their performance of the proficient group, but did affect the Intermediate group (their performance of the proficient group, but did affect the Intermediate group (their). Apart from some results consistent with translation priming effect and the Revised Hierarchical Model, we found (1) Proficient group responded faster and had a higher accuracy compared to the intermediate group; (2) Translation direction did not impact the performance of the proficient group, but did affect the Intermediate group; (3) Translation priming effect was more pronounced in the proficient group than in the intermediate group. We found that proficient bilinguals used an automatic strategy in translation, which marked by faster response and similar cognitive efforts in forward translation (language 1 to language 2) and backward translation (language 2 to language 1). In the present study, we used a translation recognition task to examine the automaticity indexed by ERPs in the proficient and intermediate bilinguals. Apart from some results consistent with translation priming effect and the Revised Hierarchical Model, we found (1) Proficient group responded faster and had a higher accuracy compared to the intermediate group; (2) Translation direction did not impact the performance of the proficient group, but did affect the Intermediate group; (3) Translation priming effect was more pronounced in the proficient group than in the intermediate group.

Poster 4-104

RAPID ACQUISITION OF ACTION WORLD MEANING THROUGH AUDITORY-MOTOR ASSOCIATIONS: A MAGNETOENCEPHALOGRAPHIC STUDY

Anastasia Nikolaeva¹, Boris Chernyshev², Alena Zhukova¹, Andrey Prokofyev¹, Platon Pronko², Anna Butornina¹ & Tatiana Stroganova¹
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Descriptors: speech embodiment, embodied cognition, action words

The theory of embodied cognition suggests that word meaning resides on the motor and sensory body experience. In order to understand the nature of human language, it is important to decipher how the brain links word meaning with sensory-motor experience. We developed an experimental procedure that allowed investigating acquisition of word meaning by way of rapid associative trial-and-error learning. Eight pseudowords were presented to the participants; four of them were assigned to left and right hand and foot movements, while the other pseudowords did not require actions and were used as controls. Participants were instructed to learn the relations between the pseudowords and actions through a trial-and-error motor learning procedure. Auditory feedback was delivered on each trial informing whether response was correct or erroneous. Magnetoencephalogram was recorded during passive listening of the pseudowords before and after learning. The cortical sources of the magnetic evoked responses were reconstructed using distributed source modeling (MNE software). Neural responses to newly learnt words compared to control pseudowords were significantly enhanced in temporal and frontal cortical regions surrounding the Sylvan fissure of the left hemisphere. This activation was inversely related to the number of trials needed for participants to reach the learning threshold. Thus, our findings revealed a neural signature of rapid associative learning of word meaning and highlighted the role of sensory-motor transformation for association-grounded word semantics.
**Poster 4-105**

**GRATITUDE INCREASES EARLY ATTENTION TO EMOTIONAL PICTURES BUT DOES NOT AFFECT LATER EMOTIONAL PROCESSING: EVIDENCE FROM EVENT-RELATED POTENTIALS**

John Williams, Stacy Eltiti, Frank Giordano & Lauren Dacorso
Biola University

Descriptors: gratitude, attention, emotion

The practice of gratitude has been associated with numerous psychological, emotional, and physical benefits (for a review see Emmons, 2016). While most of the research on gratitude has been conducted using self-report techniques and is correlational in nature, very few studies have included gratitude manipulations, and fewer still have looked at the neurophysiological effects of gratitude. The present study was exploratory in nature and examined both early and late ERP components in response to viewing positive, negative, and neutral pictures following a letter-writing exercise. A total of 53 participants were randomly assigned to write a letter in one of three conditions: Either a letter of gratitude to someone to whom they were thankful (gratitude condition), a letter to someone describing a negative event in their life (negative condition), or a letter recounting the events of the previous day (control condition). In response to categorizing IAPS images as positive, negative, or neutral, results indicated no effect of the letter-writing condition on LPP amplitudes, contrary to the researchers’ hypotheses. Significant effects were found, however, on P2 and N2 amplitudes, revealing that gratitude led to increased early attention to positive and negative pictures (P2 increases), and led to attenuated response conflict (N2 decreases) when categorizing positive and negative pictures. These results suggest that while gratitude may not have had an effect on later emotional processing of the pictures, it did influence early attentional processing of the emotional stimuli.

**Poster 4-106**

**ELECTROPHYSIOLOGICAL CORRELATES OF COGNITIVE CONTROL AND EMOTION REGULATION IN SUBJECTS WITH PSYCHOPATHIC TRAITS**

Malte Guth, José García Alanis & Martin Peper
University of Marburg

Descriptors: event-related potentials, personality, individual differences

Objective: Successfully performing emotional and cognitive control improves goal-oriented behaviour in stressful situations. However, if simultaneously demanded, the maintenance of context information in working memory and inhibition of emotional impulses are prone to fail. In contrast, subjects with primary psychopathic traits (i.e. fearlessness) exhibit reduced sensitivity to emotional arousal and enhanced goal-directed behaviour. Thus, we expect subjects with high psychopathy to use cognitive control more efficiently than subjects with low psychopathic traits under intensified emotional interference. Methods: Participants with extreme values in psychopathy (high vs. low) were recruited. Event-Related Potentials related to maintenance and updating functions of working memory (e.g. P3) were recorded during a Continuous Performance Task. Later in the experiment emotional load was added by inducing pain and instructing participants to cognitive reappraisal. Results: Results yielded a shift towards diminished context maintenance and stronger reliance on late correction during cognitive reappraisal. Significant brain activation patterns suggested different cognitive control modes for the psychopathy groups and the experimental conditions (baseline vs. reappraisal). Discussion: Results indicate that psychopathic traits promote resistance to emotional interferences during recruitment of working memory resources. More efficient self-regulatory abilities might prime subjects with psychopathic traits towards enhanced goal-directed regulation of emotional interference.

**Poster 4-107**

**BRAIN ACTIVITIES AND FACIAL SKIN BLOOD FLOW RESPONSE DURING MOTOR IMAGERY OF THE VOLLEYBALL SERVE**

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Descriptors: motor imagery, EEG, facial skin blood flow

Because motor imagery can activate the motor system without any actual motor movement, athletes have used it as a training tool. However, how motor imagery can be evaluated is still under debate due to a lack of objective physiological indicators. We examined if motor imagery can be evaluated by both electroencephalograms (EEG) and facial skin blood flow responses. Volleyball players (N = 16) imaged serving in four conditions consisting of two types of serve (float/underhand serve) and two perspectives (1°/3°-person). In each condition, both vividness and feeling of control of motor imagery were evaluated with a visual analogue scale (VAS). We recorded EEGs and SkBF responses during both the resting and imagery period. The VAS score on the control of motor imagery suggested that participants could control the movements during imagery with the actual serve for the float/serve better than for the under serve. Alpha band power was slightly attenuated over the left central regions (p = .062) when players imaged the float/serve as compared with the under serve. In addition, SkBF increase responses in both eyelids were significantly greater during the float/serve imagery than during the under serve imagery with the 1°-person perspective (p < .05). Our results suggest that high controllability of motor imagery may suppress alpha band power over the left central regions and increase the SkBF responses in the eyelid.

**Poster 4-108**

**PRO-ACTIVE VS. RE-ACTIVE DRIVING SCENARIOS AND THEIR EFFECT ON DRIVING PERFORMANCE AND OSCILLATORY EEG ACTIVITY**

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Leibniz Research Centre for Working Environment and Human Factors (IfADo)

Descriptors: driving

Background: Human behavior can be “re-active” as an answer to an outer stimulus or generated by an inner source as an intentional act (“pro-active”). Pro-active driving behavior is characterized by increased preparatory activity processed by the posterior medial frontal cortex and associated with lower crash risk. In the present study we investigate the effect of pro-active vs. re-active driving scenarios on driving performance and oscillatory EEG activity that is associated with cognitive functions like attention and cognitive control. Methods: 16 young car drivers either drove along a straight road with varying crosswind (re-active task) or drove along a winded road (pro-active task) in a driving simulator. During driving behavioral data and EEG data were recorded. Results: Time off track was comparable across tasks, but steering variability was larger for re-active driving and higher task load. With time on task there was a decrease of steering variability in re-active driving, but rather an increase in pro-active driving. Midline theta and alpha power did not vary with the task, but there was a stronger decrease of frontal theta power in the pro-active task compared to the re-active task. Moreover, alpha power was more strongly modulated by task load when participants drove pro-active compared to re-active driving. Discussion: Oscillatory EEG parameters varied with all factors involved in the task. Thus, it can be assumed that they reflect a situative mental state rather than uni-dimensionally either type of the task or mental fatigue.
Poster 4-109
APPLICATION OF ADAPTIVE MULTI-SESSION ATTENTIONAL BIAS MODIFICATION TRAINING TO REDUCE ERROR-RELATED NEGATIVITY
Julia Klavohn1, Nader Amir2, Brady Nelson3, Felicia Jackson3, Norbert Kuthmann4, & Greg Hajac4
1Humboldt-University Berlin, 2San Diego State University, 3Stony Brook University, 4Florida State University

Descriptors: error monitoring, attentional training, eeg

Cumulating evidence from psychophysiological research indicates the error-related negativity (ERN) represents a neurocognitive biomarker of anxiety disorders. An important question is whether reducing the ERN might lead to reduction in symptoms of, or risk for, anxiety. Attentional bias modification training (ABM) appears to modulate both symptoms of anxiety and the ERN; however, specific mechanisms are not clear. In the current study, 35 healthy participants completed an adaptive multi-session training paradigm with idiographic emotional words, including a pre- and post-training flankers task EEG assessment and six sessions of ABM training, four of which were to be completed at home. A similar comparison group completed an active control condition in which procedures were identical but training was directed towards colors of stimuli instead of emotional words. Results indicated a highly significant intra-individual reduction of ERN amplitudes from pre- to post-training with the active ABM condition. Further, correlational analyses indicated stronger ERN reduction in those participants with smaller negative bias scores after the training (i.e. a better ability to disengage from negative stimuli). In conclusion, the current study was able to demonstrate that attentional bias modification training is an effective intervention to decrease ERN amplitudes and further showed an association between a measure of negative bias and the ERN reduction after the training intervention.

Poster 4-110
THE REACTIVE AND ANTICIPATORY NATURE OF DACC AND RACC: AN FMRI STUDY ON TRAIT-BIS AND REASONING ABILITY
Anja Leue1, Tobias Oerther2, Bernd Weber3, Christian Elger1, Peter Trautner1 & Andre Beauducel1
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Descriptors: cognitive control, cognitive demand, reasoning

Based on the dual-mechanism of cognitive control and recent findings for the differentiation of the functioning of the dorsal and rostral Anterior Cingulate Cortex (dACC, rACC), we investigated individual differences (Trait-BIS, reasoning ability) of cognitive control depending on cognitive demand and error feedback. A sample of N = 38 participants (n = 22 male) performed an adapted go/no-go task with four combined levels of cognitive demand (low vs. high) and error feedback (less vs. more intense) while functional Magnetic Resonance Imaging (1.5-T Avanto Scanner Siemens, Erlangen, Germany; TR = 2.5s, TE = 45 ms, flip angle = 90°) was recorded. We observed more intense neural activity representing cognitive control to nogo stimuli in rACC. Cognitive control depending on cognitive demand in rACC was modulated by Trait-BIS differences. The dACC was more activated in conditions with less intense error feedback. Individuals with higher reasoning scores showed more intense cognitive control to nogo than go stimuli in dACC when cognitive demand was low. This finding suggests that individuals with higher reasoning scores invest cognitive control in an anticipatory manner for the inhibition of behavior to prevent errors. We observed response adaptation in terms of response times slowing in high demand conditions when the recruitment of cognitive control is no longer sufficient. Overall, our data illustrate that the dACC activates cognitive control in an anticipatory manner whereas the rACC intensifies cognitive control in a reactive manner.

Poster 4-111
MODERATE EXERCISE INCREASES NEURAL MARKER OF INHIBITORY CONTROL
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1Institute of Psychology, 2University of Physical Education, Kraków, 3Jagiellonian University in Krakow

Descriptors: acute exercise, flanker task, erp

Previous studies indicate that a session of aerobic exercise promotes executive function. However, it still unknown if all forms of aerobic exercise benefit executive function to the same extent. The aim of the present study was to examine how two different types of aerobic physical exercise influence behavioral and neural markers of executive function in a flanker task. Twenty healthy male participants completed three session on cycle ergometer (one session per week; each lasting 24 minutes): 1) a moderate-intensity continuous exercise (intensity below the second ventilatory threshold), 2) high-intensity interval exercise (3 mins of intensity at first ventilatory threshold interspersed with 3 mins at intensity above second ventilatory threshold) and 3) a no-exercise seated control (without pedaling). The order of the sessions was randomized and counterbalanced across participants. Approximately 10 mins after each session, participants performed a flanker task during which continuous EEG data were collected. Behavioral results revealed that participants performed the task more accurately after the moderate-intensity exercise session, relative to the two other sessions. Similarly, ERP data revealed more prominent N2 component after a moderate-intensity exercise session, relative to the other sessions. Both findings consistently suggest that a moderate continuous, but not the high-intensity interval, exercise increases effectiveness of executive function in the flanker task. Overall, results suggest that not all kinds of aerobic exercises boost the executive function equally.

Poster 4-112
RELATIONSHIP BETWEEN THE ERROR-RELATED NEGATIVITY (ERN) AND SOCIAL INTERACTION IN TYPICALLY DEVELOPING CHILDREN
Mei-Heng Lin, Patricia Davies & William Gavin
Colorado State University

Descriptors: error-related negativity (ERN), social interactions, latency jitter

Studies have linked the error-related negativity (ERN) with social-emotional and social-cognitive functioning. However, few studies examine whether the ERN relates to social interactions assessed in real-life contexts in children. Moreover, when measuring the ERN, most researchers do not adjust for a confounding factor, the within-subject variation in the ERN latency (i.e. latency jitter), that may lead to inaccurate interpretation of the true ERN amplitudes. This study examines the relationship between social interactions in everyday contexts and the ERN amplitudes during a flanker task before and after jitter adjustment in 21 children (ages 8–12 yrs; M = 9.97; 5 males). To adjust for latency jitter, data were processed via the Woody filter technique. The quality of social interaction was measured by an observation-based tool - the Evaluation of Social Interactions (ESI). Two regression analyses showed that after controlling for age and gender, ERN amplitudes did not significantly predict ESI scores before jitter adjustment, however, after jitter adjustment, ERN amplitudes significantly predicted ESI scores (Beta = .54, p = .01), indicating that children with larger ERN amplitudes had poorer quality of social interactions. The full model explained 42% of the variance in ESI scores (F(3, 17) = 5.78, p = .007). Our results show that hyperactive response monitoring impacts the quality of social interactions in children and may help explain the underlying mechanisms of behavioral manifestations in children with anxiety or obsessive-compulsive disorder.
The time course of distractor-based response activation with unpredictable target onset

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1Helmut-Schmidt-University/University of the Federal Armed Forces Hamburg, 2Medical School Hamburg, 3Brandenburg Medical School

Descriptive: lateralized readiness potential (LRP), cognitive control, distractor processing

Nominally task-irrelevant stimuli (distractors) often interfere with performance by speeding up responses in case of a match with certain aspects of the relevant stimulus (congruent condition) and/or slowing down responses in case of a mismatch (incongruent condition). This congruency effect is usually attributed to distractor-based response activation. We investigate to what degree the processing of irrelevant information can be dynamically adjusted to contextual factors such as the overall distractor utility and the temporal requirements of the task. The distractor was presented in advance to the target (unpredictable SOA of either 350 or 1000 ms) and lateralized readiness potentials (LRPs) were used to examine pure distractor-related response activation (n=26). A distractor-based LRP occurred early with short and long SOA. However, when the SOA was long, the initial rise of the LRP was followed by a marked decrease and a subsequent second rise, reaching a high level when the target occurred. The LRP was generally larger when the overall utility of the distractor was increased (i.e., 75% congruent trials). These findings suggest that strategic usage of distractor information under conditions of unpredictable target onset (at the time of distractor processing) is enabled by an early rise of response activation to ensure an appropriate bias for responding when the target occurs early. In case this activation turn out to be premature, response activation is temporarily inhibited and regained in a usefully timed way (rather than being maintained until target occurrence).

Error positivity and error-related negativity reflect dissociable mechanisms of error monitoring

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1Catholic University of Eichstätt-Ingolstadt, 2Ospedale Maggiore Carlo Alberto Pizzardi di Bologna

Descriptive: error monitoring, event-related potentials

The error-related negativity (ERN) and the error positivity (Pe) are electrophysiological markers of early unconscious and later conscious error monitoring processes. Although both components follow each other in close succession, it is unknown whether the earlier ERN is necessary for the emergence of the later Pe. Here, we tested this directly by eliminating the ERN in a condition where conscious error detection is nevertheless possible and aimed at detecting a Pe in the absence of an ERN. We used a three-choice flanker task, where participants had to classify central targets while ignoring lateral flankers. Targets and flankers always required different responses. Targets but not flankers were masked at varying intervals. Crucially, on some trials, the target was entirely replaced by the mask. Because the ERN requires a representation of the correct response, we predicted the ERN to be absent when errors were committed on these trials. However, because participants knew that the flankers required a different response than the target, they could nevertheless deduce that they had committed an error when the error involved responding to the flankers. The results showed no ERN but a sizeable Pe when participants had responded to the flankers on trials without target. Multivariate pattern classification revealed that comparable Pe activity distinguished errors from correct trials with and without ERN. Taken together, these results show that the Pe can emerge also in the absence of an ERN and thus speaks for independent neural mechanisms underlying these components.
Poster 4-118

DOES CONFLICT MONITORING INTENSITY HELP TO DIFFERENTIATE COLLABORATORS AND NON-COLLABORATORS?

Katharina Nieten, Vera Schreuble, André Beauducel & Anja Leue
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Descriptors: conflict-monitoring, N2, collaboration

Prior research showed that conflict monitoring is modulated by the intensity of aversive reinforcement. Monitoring processes in the anterior cingulate cortex are indicated by the N2 amplitude of the event-related potential. This study aimed at investigating the effects of conflict monitoring on avoidance-learning. A sample of 130 participants performed a go/no go discrimination task. To activate a real-life context, participants listened to a scenario that described a business situation. Subsequently, 32 face pictures were presented, 16 faces representing collaborators and 16 faces representing non-collaborators. The participants had to learn which of the faces present potential collaborators (requiring go responses) or non-collaborators (requiring withholding responses). Half of the participants performed the discrimination task under social observation of a related person to intensify conflict monitoring, the other participants were not observed. We observed a main effect of frontality with the N2 amplitude being more negative at frontal positions. Collaboration vs. non-collaboration revealed a main effect meaning that withholding responses to non-collaborators showed more intense conflict monitoring (more negative N2). Additionally, we observed an interaction collaboration vs. non-collaboration and the observation situation with a more negative N2 for withholding responses under social observation. Participants with higher vs. lower trait-BIS scores showed more intense conflict monitoring (more negative N2).

Poster 4-119

PAIN EFFECTS ON PERFORMANCE MONITORING AND AUTONOMIC RESPONSES

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Descriptors: pain, negative affect, performance monitoring

It has been suggested that neural implementations of performance monitoring functions, negative affect and pain perception overlap in anterior portions of medial frontal cortex. To further investigate this matter, we combined a classic flanker task with interleaved blocks of electrical shocks. Before the experiment participants rated single electric stimuli to determine individual detection thresholds as well subjective stimulation maxima. Via this threshold range either painful or subtle stimulation trains were applied between flanker blocks. To quantify the physiological and psychological effects of the pain stimulation, we recorded galvanic skin responses (GSR) as well as heart rate (HR), corrugator activity (CA) and subjective mood ratings. Effects on performance monitoring functions were assessed via behavioral data and the error-related negativity (ERN). Direct pain stimulation led to significant changes in the affect-sensitive measurements, resulting in accelerated HR, increased GSR amplitudes as well as heightened CA. Mood ratings indicated that pain stimulation also enhanced subjective negative affect. Regarding the flanker task, main effects for congruency as well as for pain stimulation were observed, yielding generally faster reaction times after pain stimulation. ERN amplitudes were decreased after pain blocks but differences did not reach significance level, while N1 amplitudes were reduced after pain stimulation. The results demonstrate that even performance-non-contingent pain leads to alterations in cognitive control and triggers behavioral adaptations.

Poster 4-120

FINDING A MUSE: VALIDATION OF A LOW-COST, PORTABLE SYSTEM FOR EEG RESEARCH

Angela Norton, Francisco Colino, Chad Williams, Cameron Hassall & Olav Krigolson
University of Victoria

Descriptors: EEG, cognitive science, portable electronics

Over the past few years, there have been a number of new portable and affordable electroencephalographic (EEG) systems made available to researchers. Validation of these systems has, to date, been focused on either continuous EEG recording, or on replication of research previously conducted on large EEG setups reliant on event markers, or both. In this presentation, we show that event-related brain potential (ERP) research can be conducted using a portable MUSE EEG system paired with a single laptop computer. Specifically, we report the results of two experiments conducted with the MUSE system: a well-known visual oddball paradigm, and a standard reward-learning task. Our results demonstrate that we could observe and quantify the N200 and P300 ERP components in the oddball task, and the reward positivity in the reward learning task. Indeed, single-sample t-tests of component existence (all p's < 0.05), computation of Bayesian credible intervals, as well as 95% confidence intervals all statistically verified the presence of the N200, P300, and reward positivity in all analyses. We freely provide code, instructions, and methods on our website to allow other researchers to replicate our findings and use the MUSE system in their own research. Most importantly, this work highlights that ERP research can be done with ease using a single computer paired with the portable MUSE EEG system, thus greatly increasing the range of situations in which ERP methodology can be applied.

Poster 4-121

EFFECTS OF COOPERATION ON A MOTOR INHIBITION TASK IN ADOLESCENTS: SEX DIFFERENCES

Almitra Vazquez-Moreno, Andres Gonzalez-Garrido & Julia Ramo-Loyo
University of Guadalajara

Descriptors: social influence, adolescence, sex differences

Adolescence is a period that can be related to poor behavioral control, especially in social situations. It has been reported that men get involved in risky behaviors more often than women. This could be related to failures in motor inhibition control. Our purpose was to assess sex differences in motor inhibition during different social situations. EEG activity was recorded in 30 adolescents (15 women) while performing a Go-NoGo task under 3 conditions: individual performance, while competing or cooperating with a peer. Event-related potentials were obtained. There were not differences in accuracy between sexes, but men showed shorter reaction times than women (p = 0.03). There was higher response accuracy in the cooperation than in the individual condition (p = .001). Higher P3Go amplitude was larger in the cooperation than in the individual condition at the Cz electrode (p = .01). In addition, women displayed longer P3NoGo latency than men in the fronto-central electrodes (p = .03). Our work indicates men show a faster processing than women. Cooperating with a peer require higher neural resources with a higher accuracy.
FRONTAL MIDLINE THETA REFLECTS COGNITIVE CONTROL IN AN A-X CONTINUOUS PERFORMANCE TASK AND IS RELATED TO INDIVIDUAL DIFFERENCES IN COGNITIVE CONTROL ABILITIES

Eric Rawls & Connie Lamm
University of Arkansas

Descriptors: cognitive control, individual differences, frontal theta

Response conflict occurs when one must inhibit a prepotent action and select an alternate response. Neural activity in theta frequency band (4-8 Hz), generated by medial frontal cortex and measured at frontal midline electrodes, provides a plausible neuropsychophysiologic mechanism underlying successful cognitive control during response conflict. If this is true, individual differences in cognitive control ability should be related to theta activation. To test whether this is the case, EEG was recorded while participants completed a task in which they either had to execute a prepotent motor response (no conflict) or change their response based on last-minute information (response conflict). Single-trial data were decomposed into a time-frequency representation by multiplying the EEG power spectrum by complex Morlet wavelets, then averaged to obtain the event-related spectral perturbation. As expected, trials containing response conflict elicited a robust increase in frontal midline theta, compared to trials without conflict. Moreover, external measures of individual differences in cognitive control predicted theta activation during the presence of response conflict. This effect was specific to trials containing response conflict; frontal theta elicited by trials requiring execution of a prepotent response was not related to individual differences in cognitive control. We provide further evidence that theta activity reflects the need for cognitive control, and extend previous findings by showing that conflict-related theta is related to trait-like cognitive control abilities.

THE ROLE OF PSYCHOPHYSIOLOGICAL MEASURES IN THE REHABILITATION OF SPORT-RELATED BRAIN INJURIES

Robert Moore
University of South Carolina

Descriptors: sport-related brain injury assessment, sport-related brain injury management, sport-related brain injury rehabilitation

Psychophysiological measures have proven invaluable for advancing the precise identification and tracking of deficits resulting from sport-related brain injuries. However, with the increasing incidence and prevalence of chronic conditions associated with these injuries (second impact syndrome, post-concussion syndrome, chronic traumatic encephalopathy), additional rehabilitation paradigms are necessary. Accordingly, increased efforts are being made to utilize psychophysiological measures for aiding the rehabilitation of sport-related brain injuries. This discussion section will provide a current overview of the utility of various psychophysiological measures in brain injury rehabilitation. A variety of technologies and methods will be discussed including: transcranial magnetic stimulation, direct current stimulation, electrocardiography, quantitative electroencephalography and event-related brain potentials. These technologies will be discussed regarding their ability to both facilitate and gauge rehabilitative gains. Current limitations will be examined and future directions will be suggested. Ultimately, this discussion section will serve to educate, and further promote the use of psychophysiological measures in the care and management of sport-related brain injuries.

THE UTILITY OF MOTOR CONTROL ASSESSMENTS IN CONCUSSION MANAGEMENT

Steven Broglio
University of Michigan - Ann Arbor

Descriptors: sport-related brain injury assessment, sport-related brain injury management, sport-related brain injury rehabilitation

Concussion diagnosis remains a clinical decision supported by objective measures. Numerous domestic and international organizations recommend a three-pronged approach that includes assessments of athlete reported symptoms, neurocognitive functioning, and motor control. The earliest motor control assessments included implementation of the Rhomberg test, which was later modified by Shumway-Cook in an effort to evaluate the visual, vestibular and somatosensory components of the balance mechanism. Starting in the mid-1990’s, instrumented force platforms, capable of visual and foundational sway referencing identified the vestibular mechanism as the primary impairment following concussion. While sensitive to post-concussion changes, cost and lack of portability limited the implementation of these devices in the sports setting. Since that time, the Balance Error Scoring System (BESS) has been developed and broadly accepted among sports medicine professionals as the default motor control assessment. Most recently, evaluations of single and dual-task gait models, with and without sensor technology (e.g. inertial measurement units) starting to show promise in the clinical and research settings. This discussion panel will present the value added and limitations of motor control assessments in concussion management.

THE CLINICAL RELEVANCE OF QUANTITATIVE EEG MEASURES IN CONCUSSION ASSESSMENT

Semyon Sobounov
The Pennsylvania State University

Descriptors: sport-related brain injury assessment, sport-related brain injury management, sport-related brain injury rehabilitation

EEG measures have been traditionally employed to “directly” assess the pathophysiology of concussion. Early EEG research demonstrated the slowing of major frequency bands and focal abnormalities within 48 hours post-injury (Greets, 1985). A shift in the mean frequency in the alpha band toward lower power and an overall decrease of beta power in patients suffering from concussion was observed by Tebano (1988). The most comprehensive EEG study using a database of more than 608 concussed subjects revealed: (a) increased coherence in frontal-temporal regions; (b) decreased power differences between anterior and posterior cortical regions; and (c) reduced alpha power in the posterior cortical region (Thatcher, 1989). In this discussion, we will present our ongoing research indicating incremental utility of EEG measures both in time (MRCP) and frequency domains (FFT) in the course of athletes’ recovery from concussion. We will present conceptual framework for examining how behavioral (postural balance) and neuropsychological (memory, information processing, attention and underlying neural mechanisms (EEG) are interactively affected by single or multiple concussions. A set of tools complementary to existing traditional assessment of concussion will be discussed based on virtual reality (VR) technologies incorporated with and brain imaging (EEG). Overall, our research using student-athletes prior to and after concussion has provided strong evidence for the feasibility of our research methodology and proposed technologies in clinical assessment of single and multiple concussions.
Poster 4-126

EFFECTS OF BODY POSITION ON RESTING STATE CORTICAL ACTIVITY: EVIDENCE FROM HIGH-BETA AND GAMMA EEG BANDS
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Descriptors: body posture, beta gamma EEG, hemispheric asymmetry
Recent literature showed how horizontal body position, and similar ones with head down, are associated to reduced plasticity and impaired responses to pain and emotions. The present study aimed at understanding the effects of resting state supine position specifically on high frequency EEG bands typically associated with high level cognitive activation. To this end, two samples of 16 female students were randomly assigned to either Sitting Control (SC) or 2 h Bed Rest (BR) group while EEG was recorded from 38 scalp sites. Results evidenced a Group by Phase by Region by Laterality interaction (F_{3,90} = 3.35, P < 0.05); the BR group showed, during supine phase compared to its own sitting baseline phase and to SC group, a reduced High Beta and Gamma EEG band amplitudes throughout the 2 h of bed rest. After 2 h, the BR group regained the sitting position and the cortical activation returned to the level preceding the supine phase. In addition, the frontal left hemispheric dominance of the two EEG bands observed in the SC group and in BR’s sitting baseline, during the supine phase of the BR group was abolished and returned only after the group recovered the sitting position. Analysis of the source in the group comparison SC vs BR (supine phase) located a greater activity in SC group in the left inferior frontal gyrus and insula. Results are interpreted both in relation to the linguistic networks engaged at rest and involving the DMN and to the implications for the studies carried out with fMRI in which participants are typically held in supine position.

Poster 4-127

REINVESTMENT THEORY: ASSEMBLING THE PUZZLE, MOTOR CHUNKS, CONSCIOUS PROCESSING, AND EEG ACTIVITY DURING SEQUENCE ACQUISITION AND PERFORMANCE UNDER PRESSURE
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Descriptors: conscious processing, performance under pressure, chunking
The present series of experiments are the first to combine measures of chunking, conscious processing, and EEG activity during visuomotor sequence acquisition and performance under pressure to provide a thorough examination of reinvestment theory (Masters & Maxwell, 2008). When acquisition was explicit (Experiment 1, N = 31), we observed a progressive decrease in conscious processing and a refinement in cortical activity (increased frontal, parietal and right-temporal high-alpha power; ps < .08, partial eta squared > .26) alongside a reduction in performance errors (p < .001, partial eta squared > .6). No such changes were observed when acquisition was implicit (Experiment 2, N = 29). Upon transfer to the high-pressure condition, we observed performance improvements (i.e., chunking; p < .001, partial eta squared = .92), and a selective increase in conscious processing (p < .001, partial eta squared = .42) and T7-Fz connectivity (p < .05, partial eta squared = .29) that occurred after explicit but not implicit acquisition. In line with reinvestment theory, our results endorse implicit modes of skill acquisition as a means of promoting chunking while limiting conscious processing and supporting robust motor performance under pressure.

Poster 4-128

CONNECTIVITY ANALYSIS IN REST AND IN HYPNOSIS: AN ELECTROPHYSIOLOGICAL COMPARISON STUDY
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Descriptors: hypnosis, EEG, cognitive neuroscience
There is no generally accepted theory to explain the mechanism of hypnosis and no objective instrument exists to measure the depthness of hypnosis. A very consistent finding for high suggestible subjects is the increase of theta activity under hypnosis compared to baseline measurements. Gamma activity is also repeatedly linked to hypnosis, but findings are much more inconsistent. A possible explanation could be that not gamma activity per se, but its coupling to theta is associated with hypnosis. The neuronal dissociation hypothesis states, that hypnosis is an altered state of consciousness caused by a dissociation (decoupling) between brain areas, normally being coupled. There is much support for this hypothesis in pain research. At the symposium, we will present three independent studies, in which the neuronal dissociation hypothesis is tested. The first study (20 high and 20 low suggestible subjects) examines subjects while hearing a hypnosis induction and the suggestion to sleep deeper. The paradigm is highly successful as subjects have significantly increased slow wave sleep. The second study (30 high and 30 low suggestible subjects) examines the blocking of visual perception in a three-stimulus oddball paradigm. The third study (24 subjects, distributed on the whole scale of suggestibility) tried to replicate and extend results of the reduction of conflict in hypnosis within the Stroop paradigm. Preliminary results show theta-gamma phase-amplitude coupling to be generally present, while being much weaker during hypnosis (decoupling) compared to the control condition.

Poster 4-129

INDEPENDENT COMPONENT ANALYSIS REVEALS THE GENERIC BRAIN AREAS INVOLVED IN THE MAINTENANCE OF CREATIVITY
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Descriptors: creative thinking, Independent Component Analysis (ICA), EEG
Creativity is a complex human behavior including ability to produce both novel and useful ideas. A large number of publications demonstrate the presence of relatively contradictory points of view on brain organization of creativity. The question is whether it is possible to reveal generic brain areas and processes involved in the brain’s maintenance of creativity irrespective of the type of experimental task, personality, cognitive strategy used and so on. The aim of this report is to summarize the results of our research of creative thinking in order to clarify the question mentioned above. There were 452 subjects who participated in various EEG studies. EEG was recorded from 19 sites (10,20 system in delta, alpha1, alpha2, beta1, beta2, gamma1, gamma2 and gamma3 frequency bands. We used different types of original verbal creative tasks with adequate control conditions, each type organizing creativity in its own way. ICA (Independent Component Analysis) which allows to reveal the common brain areas in relation to creative type of thinking in comparison to non-creative was applied for EEG power data. ICA revealed statistically significant differences in power spectra between creative and non-creative type of thinking, which manifested mainly in gamma2 and gamma3 bands in central and parietal areas. Our results stress the role of high-frequency bands in creativity, not only the low-frequency as often mentioned in literature. It seems that central and parietal areas are the most likely valuable candidates for constant brain areas maintaining the any type of creativity.
BIASED NEURAL PROCESSING OF MALE FACES IN CHILDHOOD SOCIAL ANXIETY DISORDER

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Descriptors: social anxiety disorder, autism spectrum disorder, event-related potentials

Cognitive models of social anxiety disorder (SAD) suggest that individuals with SAD may be characterized by a dysfunctional cognitive and neural processing of threatening social information such as angry faces. While previous studies on socially anxious adults were equivocal: i.e. evidence for both an enhanced and diminished neural processing of social cues exist, even less is known about the neural bases of face processing in socially anxious children. The late positive potential (LPP) is an event-related potential that is regarded as a neural indicator reflecting sustained attention towards motivationally salient information. In our study, the LPP was measured during an emotional face-identification task in children with SAD (10–13 years, n=32), in a clinical control group (n=30) with mixed anxiety disorders, and in healthy controls (n=33). Overall, there were no significant differences in LPP amplitudes to emotional faces between the three groups. However, children with SAD showed lower LPP amplitudes to male faces when compared to female faces, while the opposite pattern emerged in the two other groups. This pattern was underscored in correlations across all three groups: higher trait social went along with lower LPP amplitude to angry male faces. Our study suggests an important role of stimulus gender in the neural processing of social information in children with early onset SAD. From an evolutionary perspective, male faces may be associated with more social threat and are therefore avoided and processed less deeply in children with SAD.

HEART RATE VARIABILITY AND EMOTION REGULATION STRATEGIES IN HEALTHY POPULATION

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Descriptors: emotion regulation, heart rate variability, electrodermal activity

Emotion regulation has become a very relevant issue in psychopathology, being a useful transdiagnostic component in mood disorders therapy. In addition, Heart Rate Variability (HRV) has been considered a reliable biomarker of emotion regulation, with enhanced High-Frequency component (HF) being related to a greater emotional adjustment, wellbeing, and self-regulation. However, a small number of studies have focused on peripheral correlates of emotion regulation. This research aims to explore plausible differences in terms of HRV and reappraisal strategies by classifying the experimental sample into 2 groups (Low- and High-HF) based on the median-split. Forty-four undergraduate students completed an emotion regulation task using unpleasant (attacks, victims) and neutral (objects) pictures, in which a cue presented during 2 s signaled the strategy (Look, Increase, Decrease) to apply during the 8-s picture presentation. Tonic HRV was registered during 5 minutes before the experiment, whereas electrodermal activity was measured for each trial during the task. Results showed electrodermal activity differences between groups, being greater for Low-HF compared to High-HF regardless of the instruction. Moreover, only Low-HF group displayed an enhanced reactivity when they had to increase their negative emotions, compared to looking at pictures. These findings suggest that cardiac physiology may be related to how people reappraise their emotions. In order to explain this association, upcoming research should evaluate the impact of other psychological factors, such as catastrophism.
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