

PSYCHOPHYSIOLOGY

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Abstracts for the Fifty-Sixth Annual Meeting
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September 21-25, 2016
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Introduction and Speakers	S1
Invited Symposia and Session Abstracts	
<u>Friday, September 23, 2016</u>	
Invited Symposium I: Brain Computer Interaction	S3
Methods Q&A: NeuroModulation	S3
Invited Symposium II: Neuromodulation	S4
<u>Saturday, September 24, 2016</u>	
Psychophys Spectacular	S4
Symposia Abstracts	
<u>Thursday, September 22, 2016</u>	
Symposium 1.1: Laboratory to Life: Linking Brain Responses to Problems of Real World Functioning in Schizophrenia	S6
Symposium 1.2: Getting Past the Negativity: Building a Mechanistic Neural Model of Cognitive Control	S7
Symposium 1.3: Recent Advances in Transcutaneous Vagal Nerve Stimulation Research	S8
Symposium 2.1: The Present as the Past's Future: Early Career Award Winners, Where Are They Now?	S9
Symposium 2.2: Doing it Right: Neural Correlates of Action Preparation, Performance Monitoring, and Learning	S9
Symposium 2.3: Biomarkers of Anxiety Risk from Infancy to Adulthood	S10
Symposium 3.1: Psychometric Challenges for Psychophysiology in the Age of RDoC	S12
Symposium 3.2: Psychophysiological Evidence on the Significant and Interdependent Relationship Between Health Behaviors and Cognitive Functioning	S13
<u>Friday, September 23, 2016</u>	
Symposium 4.1: Leveraging Spontaneous and Task-Related Oscillatory Cortical Activity in the Study of Normal and Abnormal Brain Function Across the Lifespan	S14
Symposium 4.2: Externalizing Proneness and Substance Use: Theoretical Framework and Evidence from Psychophysiological and Neuroimaging Studies	S15
Symposium 4.3: Exploring Neuroeconomics and the Neural Bases of Decision-Making	S16
Poster Session Abstracts	S17
Index to Abstract Authors	S97
Index to Abstract Descriptors	S102

PSYCHOPHYSIOLOGY

THE INTERNATIONAL JOURNAL OF THE SOCIETY FOR PSYCHOPHYSIOLOGICAL RESEARCH

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Management Office: Society for Psychophysiological Research, 2424 American Lane, Madison, WI 53704, USA. Telephone: (608) 443-2472. Fax: (608) 443-2478. e-mail: spr@reesgroupinc.com. The Home Page of the Society for Psychophysiological Research can be found at www.sprweb.org.

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Fifty-Sixth Annual Meeting of the Society for Psychophysiological Research

Marriott City Center Hotel, Minneapolis, MN

September 21-25, 2016

Website: www.sprweb.org

Introduction

The 2016 Annual Meeting Program includes three Pre-Conference Workshops, four poster sessions, four invited symposia, a Flash Talk event, the Early Career Award Address, the SPR Presidential Address, and three Invited Keynote Addresses. 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.

The Program Committee thanks all contributors for sharing their research and the membership of SPR for making our Annual Meeting great!

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2016 Program Committee Chair

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Pre-Conference Workshops

Tuesday, September 20, 2016, 10:00 a.m. – 6:00 p.m.

Wednesday, September 21, 2016, 8:30 a.m. – 4:30 p.m.

Pre-Conference Workshop #1

ERP Mini-Boot Camp
Steven J. Luck

Wednesday, September 21, 2016

9:00 a.m. – 5:00 p.m.

Pre-Conference Workshop #2

Time-Frequency Decomposition: Methods and Challenges

Michael X. Cohen

9:00 a.m. – 5:00 p.m.

Pre-Conference Workshop #3

Multilevel Modeling

Jennifer Krull

Invited Addresses

Thursday, September 22, 2016

1:45 p.m. – 2:45 p.m.

Invited Address

Temporal Expectations in the Human Brain

Kia A. Nobre, FBA, MAE

Director, Oxford Centre for Human Brain Activity (OHBA); Chair, Translational Cognitive Neuroscience, Departments of Psychiatry and Experimental Psychology; Professorial Fellow, St. Catherine's College, University of Oxford; and Adjunct Professor, Northwestern University, Chicago, IL

Friday, September 23, 2016

9:00 a.m. – 10:00 a.m.

Invited Address

Rhythms for Cognition: Communication Through Coherence

Prof. Dr. Med. Pascal Fries

Director, Max Planck Institute for Neurobiology, Martinsried and Director, Ernst Strüngmann Institute, Max Planck Society, Frankfurt, Germany

Saturday, September 24, 2016

10:00 a.m. – 11:00 a.m.

Invited Address

Large-Scale Networks: Organization, Interactions, and Measurement in the Individual

Randy L. Buckner, PhD

Professor of Psychology and Neuroscience, Harvard University, Director, Psychiatric Neuroimaging Research Division, and Faculty, Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, Boston, MA

11:00 a.m.–11:30 a.m.

Early Career Award

The Study of Executive Function: Past, Present and Future Challenges

Sharma Jamadar, PhD

Olin Neuropsychiatric Research Center

11:30 a.m.–12:00 p.m.

Early Career Award

Cognitive Control After Surprising Events: A Universal Fronto-basal Ganglia Mechanism

Jan R. Wessel, PhD

University of Iowa

12:00 p.m.–1:00 p.m.

Presidential Address

Human Pavlovian Conditioning: New Tricks from an Old Dog

Ottmar V. Lipp, PhD, FASSA, FAPS

Professor of Psychology, School of Psychology and Speech Pathology, Curtin University, Perth, WA, Australia

INVITED SYMPOSIA AND SESSION ABSTRACTS

FRIDAY, SEPTEMBER 23, 2016

10:30 A.M.–12:00 noon

INVITED SYMPOSIUM I: BRAIN COMPUTER INTERACTION

Moderator: Maria Ruiz-Blondet
Binghamton University

DESIGNING BETTER SENSORS FOR BRAIN-MACHINE INTERFACE: SKIN-LIKE ELECTRONICS

Todd P. Coleman
University of California, San Diego

Capabilities for non-invasive measurement of neural signals are important because they support many critical biomedical applications, including brain-machine interface paradigms in mobile applications. Currently, recording neural signals in mobile environments is a challenge because conventional measurement devices have rigid or mildly flexible construction and bulky cables for signal conduction. Technologies of the future must address these drawbacks, through new ideas that provide ultrathin, conformal designs, with high fidelity and non-invasive measurement modes. Our research group, in conjunction with the research group of John Rogers at UIUC, is developing foldable, stretchable electrode arrays that can non-invasively measure neural signals (i.e. EEG) without the need for gel. The electrodes rely on layouts recently developed for silicon electronics that offer linear elastic responses to applied force, with the capacity to fold, twist and deform into various curved shapes. Stretchable electronics have the key advantage that they can wrap arbitrary, curvilinear surfaces and, at the same time, achieve mechanical properties that approach those of tissues of the human body (e.g. skin). These capabilities are especially significant for applications in skin-mounted devices for electroencephalography (EEG) in mobile environments.

VEP-BASED BRAIN INTERFACE DESIGN AND APPLICATIONS

Deniz Erdogmus
Northeastern University

In this presentation, we will discuss Bayesian contextual and physiological evidence fusion in the EEG-based brain interface setting. Brain interfaces will be viewed as communication channels through which operator intent is conveyed and these are converted to actions that drive task state dynamics in scenarios involving human-system collaboration. Especially focusing on visually-evoked potentials (VEP), we will illustrate use cases of concepts from active (machine) learning and information theoretic coding (for digital communication) can help solve practical problems in the design of brain interfaces. Theoretical concepts will be illustrated at work in several operational prototypes including RSVP Keyboard, Matrix Speller, and Shuffle Speller. Future directions will be discussed, including the control of dynamic systems by human operators through brain interfaces; these problems offer challenging and novel control theoretic problems to be solved under human intent inference uncertainty.

BRAIN COMPUTER INTERFACES FOR COMMUNICATION IN PARALYSIS AND MOVEMENT RESTORATION IN CHRONIC STROKE

Ujwal Chaudhary, Niels Birbaumer, and Andre Ramos-Murguialday
University of Tuebingen

BCI uses brain activity to control external devices, assisting severely motor disabled patients such as LIS, to interact with the environment. Distinct techniques have been explored to control a BCI in patient population especially electroencephalography (EEG) and more recently near-infrared spectroscopy (NIRS) because of their non-invasive nature and low cost. Previous studies demonstrated successful communication of patients with LIS using EEG-and invasive electrocorticography (ECoG)-BCI and intracortical recordings when patients still showed residual eye control, but not with patients with complete LIS (i.e., complete paralysis). Recently a NIRS-BCI and classical conditioning procedure was introduced, allowing communication in patients in the complete locked-in state (CLIS). In severe chronic stroke without residual hand function first results indi-

cate a possible superior motor rehabilitation to available treatment using BCI-training. Here we present an overview of the available studies and recent results, which open new doors for communication, in the completely paralyzed and rehabilitation in severely affected stroke patients. We also reflect on and describe possible neuronal and learning mechanisms responsible for BCI control.

3:30 P.M.–5:00 P.M.

Methods Q&A: NeuroModulation

BEST PRACTICES FOR tDCS: A Q&A SESSION

Marom Bikson
The City College of New York

This Q&A Session will review technical procedures and optimal protocols in tDCS.

- What are the latest update on optimal tDCS dosing in relation to mechanism?
- What aspects of electrode preparation are critical for reproducibility and tolerability?
- What are the limits of brain targeting with convention tDCS and High-Definition tDCS?
- What special consideration are needed for tDCS in susceptible populations?
- How can tDCS be customized to the injured brain?
- What critical steps must be taken for tDCS use at home?
- What technologies will emerge in the next few years that could transform how tDCS is used?
- What are the updates on tDCS safety and limits on dose delivery?

5:00 P.M.–6:30 P.M.

Invited Symposium II: Neuromodulation

NEUROIMAGING AND NEUROMODULATION

Session Chair: Bin He
University of Minnesota

The field of neuromodulation—interacting with and modulating the nervous system through stimulation—has progressed from invasive brain mapping via electrical stimulation to include implantable stimulation technology and noninvasive approaches. Neuromodulation has emerged as a research field, allowing for interaction with the nervous system through a variety of technologies. Neural stimulation technologies can excite, inhibit, or disrupt brain network dynamics in a controlled fashion, depending on the stimulation parameters and application. Neuroimaging can help determine and optimize spatial targets, temporal profiles, and stimulation dose based on neural sensing and imaging. If neural sensing is incorporated into neuromodulation techniques, the stimulation could be automatically adjusted using control strategies in response to changes in the sensed signal. We will discuss sensing and imaging guided transcranial magnetic stimulation (TMS) and transcranial focused ultrasound (tFUS).

In parallel to use of neuroimaging to guide effective neuromodulation, neuromodulation can also be used to perturb the nervous system in a controlled way. This perturb-and-record method has been used extensively in clinical applications in order to delineate eloquent areas during surgical resection. However, such perturbation-based imaging can also be used to gain information about the functional consequences of various brain areas—with high spatial and temporal precision. When used in this way, neuromodulation allows for the temporary alteration of brain networks, while neuroimaging techniques can be used to assess the functional implications of such alterations. Perturbation also allows for the distinction between correlation and causation, by tracking the propagation of induced activity through a network of brain areas in space and time. In this way, perturbation-based imaging could serve as a complement to traditional anatomical and functional mapping, and could allow for the direct testing of hypotheses regarding brain function that would otherwise be inaccessible.

TRANSCRANIAL ULTRASOUND (TUS) EFFECTS ON MOOD, VIGOR, AND NON-ATTACHMENT

Joseph L. Sanguinetti^{1,2}, Ezra Smith¹, Michael R. Goldstein¹, William J. Tyler³, Stuart Hameroff^{1,2,4}, & John J.B. Allen¹

¹University of Arizona; ²Center for Consciousness Studies; ³Arizona State University; and ⁴University of Arizona Banner Medical Center

Transcranial ultrasound (TUS) is emerging as a potential noninvasive brain stimulation method for scientific and clinical applications. Here, we report three double blind experiments where TUS at different scalp locations modified self-reported mood, mental energy (vigor), or the mental state of nonattachment. Experiments 1 and 2 used a General Electric LOGIQe ultrasound device commonly used for medical imaging. Two MHz TUS targeting a right-frontal scalp location improved self-reported mood and vigor as compared to 8 MHz (Experiment 1, $p < .05$) or compared to placebo (Experiment 2, $p < .05$). A prototype ultrasound device developed specifically for human brain stimulation (U+; Neurotek, LLC) was used in Experiment 3. At a slightly more posterior frontal location on the right-side, 500 KHz focused TUS improved subjective reports of mood and vigor relative to placebo or a control location (vertex, $p < .05$). Neuroanatomical modeling suggested ventrolateral prefrontal cortex as the stimulation location within the brain. Interestingly, participants who received TUS at the vertex reported an increase in non-attachment (i.e., release from mental fixations) on a standardized non-attachment scale derived from mindfulness practice ($p = .015$). Neuroanatomical modeling suggested anterior cingulate cortex as the site of stimulation for the vertex condition. Taken together, these experiments suggest that TUS can modulate mood and mental states. Potential therapeutic applications will be discussed.

NEUROIMAGING COMBINED WITH NEUROSTIMULATION FOR COGNITIVE RESEARCH AND CLINICAL TREATMENT

Vince Clark
University of New Mexico

Through a series of technical advances, neuroimaging has made many significant contributions to our understanding of normal and disordered brain function. However, neuroimaging is mainly correlational and cannot be used to prove causal relationships, and these many advances in neuroimaging have provided few direct benefits for treating mental illness. Recent studies have reported that neurostimulation can reduce some symptoms of brain and mental illness and may offer new methods of treatment. However, some of these treatments do not replicate well across laboratories, and their mechanisms remain uncertain. The combination of neuroimaging and neurostimulation together may provide a variety of benefits for many of these problems: improving the efficacy and replicability of neurostimulation, gaining a greater understanding of the mechanisms of neurostimulation, offering new methods to test causal hypotheses generated by imaging studies and ultimately providing new and more effective neurostimulation-based methods of treatment for brain and mental illness. Proof-of-principle examples for the combined application of neuroimaging and neurostimulation for enhancing cognition and some future possibilities for this area of research will be discussed.

SATURDAY, SEPTEMBER 24, 2016

8:30 A.M.–9:30 A.M.

PSYCHOPHYS SPECTACULAR

Session Chair: Sarah Laszlo
Binghamton University

Psychophysiology is the journal of SPR, and publishes high quality psychophysiology studies all year long! Join us at the Psychophys Spectacular to hear from the authors of three hot papers submitted to *Psychophysiology* this year.

TIME WILL TELL: A LONGITUDINAL, DATA-DRIVEN INVESTIGATION OF BRAIN-BEHAVIOR RELATIONSHIPS DURING READING DEVELOPMENT

Mallory C. Stites
Binghamton University

Brain development during reading acquisition is dynamic, in the sense that functional brain organization must change over the course of reading instruction to allow for the creation and association of the cognitive representations that support reading behavior (e.g., creation of representations for letters, linking of letter/sound representations). Here, we ask how relationships between reading behaviors (e.g., phonological awareness) and reading-related components of the event-related potential (ERP) change from one year to the next, asking, in particular, whether ERPs become more broadly predictive of behavior across time, or instead become predictive of more specific subsets of behavior. To this end, we present data from the second year of a longitudinal study of developing readers who provided several behavioral measures of reading ability, as well as ERPs in a reading task each year. We utilize a data-driven approach to statistical inference, which allows us to also address questions about whether ERP components identified as critical for reading in adults (in particular, the N/P150, N250, and N400) emerge as being relevant to reading behavior in children in the same manner. Results indicate that, in general, ERP-behavior relationships become more functionally specified over developmental time, with, for example, amplitude of the N250 component predicting all measures of behavior within a single year of the study, but only phonological awareness across years. Results also demonstrate remarkable consistency with the adult literature with respect to the temporal epochs of the ERP identified as being related to reading behaviors.

WHEN FLANKER MEETS THE N-BACK: WHAT EEG AND PUPIL DILATION DATA REVEAL ABOUT THE INTERPLAY BETWEEN THE TWO CENTRAL-EXECUTIVE WORKING MEMORY FUNCTIONS INHIBITION AND UPDATING

Christian Sharinger¹, Alexander Soutschek², Torsten Schubert³, & Peter Gerjets¹

¹Knowledge Media Research Center, ²University of Zurich, and ³Humboldt-University of Berlin

We investigated the interplay between inhibition and updating, two executive working memory (WM) functions. We applied a novel task paradigm consisting of flanker stimuli presented within an n-back task and studied the interaction between inhibitory demands and load on WM updating using behavioral measures, EEG, and pupil dilation. In contrast to studies that examine the interaction between inhibitory demands and load on WM storage components, the current task paradigm allowed testing the interaction between the executive WM components updating and inhibition. We found a reduced flanker interference effect for the highest (2-back) updating load condition compared to lower updating load conditions on most measures. We interpret these findings as indicating that inhibitory control and WM updating are closely intertwined executive functions. Increased load on updating seemed to result in an overall more activated attentional network thus enhancing inhibitory control, such that task performance is less susceptible to distracting information.

ERROR-RELATED ELECTROMYOGRAPHIC ACTIVITY OVER THE CORRUGATOR SUPERCILII IS ASSOCIATED WITH NEURAL PERFORMANCE MONITORING

Nathaniel Elkins-Brown, Blair Saunders, & Michael Inzlicht
University of Toronto

Emerging research in social and affective neuroscience has implicated a role for affect and motivation in performance monitoring and cognitive control. No study, however, has investigated whether facial electromyography (EMG) over the corrugator supercilii—a measure associated with negative affect and the exertion of effort—is related to neural performance monitoring. Here, we explored these potential relationships by simultaneously measuring the error-related negativity, error positivity (Pe), and facial EMG over the corrugator supercilii muscle during a punished, inhibitory control task. We found evidence for increased facial EMG activity over the corrugator immediately following error responses, and this activity was related to the Pe for both between- and within-subject analyses. These results are consistent with the idea that early, avoidance-motivated processes are associated with performance monitoring, and that such processes may also be related to orienting toward errors, the emergence of error awareness, or both.

SYMPOSIA ABSTRACTS

THURSDAY, SEPTEMBER 22, 2016

8:30 A.M.–10:00 A.M.

Symposium 1.1

**LABORATORY TO LIFE: LINKING BRAIN RESPONSES
TO PROBLEMS OF REAL WORLD FUNCTIONING IN
SCHIZOPHRENIA**

Chair: Scott R. Sponheim

Minneapolis VA Health Care System; University of Minnesota

Although a variety of aberrant brain responses are observed in schizophrenia, what relevance do they have to problems individuals face in their everyday lives? The ability to carry out tasks of daily living is dependent on reflexes, perceptual functions, attention, and memory – all of which have been shown to be compromised in schizophrenia. Investigations that detail neural abnormalities related to these building blocks of daily functioning may provide insight into how brain circuitry is linked to the impairment created by schizophrenia. This symposium includes independent data sets from five long-standing and productive laboratories focused on understanding neurophysiological aspects of schizophrenia. Bill Hetrick will describe neural and cognitive correlates of associative learning abnormalities in schizophrenia and how these basic functions are relevant to understanding the disorder. Holly Hamilton will present data showing that MMN, but not the more cognitively-mediated P3, is related to role functioning in schizophrenia. Dean Salisbury will present an analysis of a newly described perceptual grouping-related slow wave associated with greater negative symptoms and deficits in IQ, working memory, learning, and social cognition. Scott Sponheim will describe neural anomalies evident during focused attention in people with schizophrenia in relation to components of their real-world functioning. Jessica Lake will present data showing performance deficits and P3 modulation after psychosocial stress in patients with schizophrenia but not in healthy controls.

**CEREBELLAR FUNCTION IN SCHIZOPHRENIA: NEURAL,
COGNITIVE, AND CLINICAL CORRELATES**

William P. Hetrick¹, Jerilyn S. Kent², Dae-Jin Kim¹,

Amanda R. Bolbecker¹, Sharlene D. Newman¹, & Brian F. O'Donnell¹

¹Indiana University Bloomington, ²Minneapolis VA Health Care System

Cerebellar abnormalities in schizophrenia are hypothesized to contribute to disturbances in the fluidity and coordination of motor, cognitive, and affective processes. We examined cerebellar function using fMRI during both rest and cerebellar-dependent eyeblink conditioning (EBC) in schizophrenia and non-psychiatric controls during acquisition and maintenance phases of conditioning. Individuals with schizophrenia exhibited impaired cerebellar-dependent classical EBC. Task-related fMRI showed cerebellar Crus I and deep nuclei activation during the acquisition phase of EBC in controls but not in individuals with schizophrenia; controls, but not patients, demonstrated activation in Crus I, bilateral lobule VIIIa, and vermis lobule VI during the maintenance of conditioning. Negative symptom severity was negatively correlated with cerebellar activation in individuals with schizophrenia. Activation in cerebellar lobule VIIIa and Crus II was positively correlated with IQ scores in individuals with schizophrenia but not controls. Resting fMRI revealed decreased connectivity of the cerebellum with resting-state networks in patients; negative symptoms were negatively correlated with cerebellar connectivity with the dorsal attention and default mode networks. The results indicate that cerebellar neural activity is diminished in individuals with schizophrenia when the cerebellum is directly recruited by EBC suggesting that conditioning impairments in schizophrenia are driven by abnormal neural activity in the cerebellum during learning.

**MISMATCH NEGATIVITY BUT NOT P300 ABNORMALITIES
ARE ASSOCIATED WITH ROLE FUNCTIONING IN
SCHIZOPHRENIA**

Holly K. Hamilton¹, Veronica B. Perez², Judith M. Ford¹, Brian J. Roach¹,
Judith Jaeger³, & Daniel H. Mathalon¹

¹San Francisco VA Health Care System & University of California, San Francisco, ²California School of Professional Psychology, ³Albert Einstein College of Medicine

Mismatch negativity (MMN) and P300 ERP reductions in schizophrenia reflect pre-attentive and attention-mediated auditory processing deficits, respectively. Although both have been linked to cognitive deficits in schizophrenia, their rela-

tive contributions to real-world functioning are unclear. We sought to determine the functional significance of disrupted auditory processing in schizophrenia by examining MMN and P300 in disabled low-functioning patients and in patients with high levels of independent role functioning. MMN to auditory deviants and P300 to infrequent auditory targets and non-target novel stimuli were assessed in 20 high-functioning schizophrenia patients (HF-SZ), 17 low-functioning patients (LF-SZ), and 35 healthy comparison (HC) subjects. There were group effects on MMN and P300 amplitudes across stimulus types. MMN was diminished in LF-SZ compared to HF-SZ and HC, and HF-SZ demonstrated comparable MMN to HC. In contrast, P300 was reduced in both LF-SZ and HF-SZ compared to HC. Logistic regression suggested independent sensitivity of MMN to functioning in schizophrenia over and above P300 measures. Neither MMN nor P300 were associated with symptom severity. Results replicate MMN and P300 abnormalities in schizophrenia, and suggest that the neural mechanisms associated with the pre-attentive detection of auditory deviance are most compromised in patients with functional disability. MMN in particular may index pathophysiological processes that are critical for optimal functioning and may be useful for predicting functional status in schizophrenia patients.

**EVENT-RELATED POTENTIALS DEMONSTRATE DEFICITS
IN ACOUSTIC SEGMENTATION IN SCHIZOPHRENIA**

Dean F. Salisbury, Sarah M. Haigh, Timothy K. Murphy, Kayla L. Ward, &
Brian A. Coffman

Western Psychiatric Institute and Clinic, University of Pittsburgh School of
Medicine

Grouping of auditory percepts is necessary for making sense of the auditory scene. Schizophrenia patients have blunted responses to auditory change, such as reduced mismatch negativity (MMN), which may reflect deficits in forming perceptual groupings. Here we examined event-related potentials in response to groups of tones to measure schizophrenia-related differences in acoustic segmentation. In two separate experiments, we identified a sustained potential in HC that begins with group initiation and ends with the last tone of the group. In experiment 1, ERPs were measured in an auditory pattern in which 6 tones increased in pitch in 500 Hz steps, from 1.5 – 4 kHz. In experiment 2, the first 6 tones increased in pitch in from 1.5 – 4 kHz, and the last 6 tones decreased in pitch (4 – 1.5 kHz). All other stimulus parameters were identical between experiments (50 ms duration; SOA = 330 ms; ITI = 800 ms). Sustained potentials were reduced in schizophrenia patients compared to matched controls. We additionally found that N2 response was greater for initial and final tones in the group for healthy controls, but not schizophrenia patients, and that this correlated with sustained potential amplitude. Importantly, reductions in sustained potentials in schizophrenia patients were associated with greater negative symptoms, and impaired IQ, working memory, learning, and social cognition. These results suggest that deficits in auditory pattern segmentation occurs in schizophrenia early in sensory perception, and may compound deficits in many higher-order facets of the disorder.

NEURAL DEFICITS DURING VIGILANCE IN SCHIZOPHRENIA: DISORDER SPECIFIC AS COMPARED TO GENERAL PREDICTORS OF SYMPTOMS, COGNITION, AND FUNCTIONING

Scott R. Sponheim, Timothy Lano, & Seung Suk Kang
Minneapolis VA Health Care System & University of Minnesota

The ability to maintain focused attention (i.e., vigilance) has been found to predict current and future social functioning in schizophrenia. Cognitive remediation efforts directed at vigilance have yielded only marginal improvement in the daily functioning of individuals with severe psychopathology. To identify neural functions that may serve as specific intervention targets for optimization of cognitive remediation we examined electrophysiological responses during visual target detection. To clarify whether neural anomalies during vigilance are unique to schizophrenia or generalize across forms of severe psychopathology we also examined people with bipolar affective disorder. First-degree biological relatives of affected individuals were studied to determine which neural deficits were related to the disorder as compared to genetic liability for the condition. Electrophysiological recordings showed early posterior responses (N1) characteristic of visual sensory stimulation, mid-latency central responses (N2) associated with vigilance, and late positive responses (P300) related to detection of targets. Affected groups showed diminished N1 responses compared to their biological relatives, only people with schizophrenia exhibited reduced N2 during vigilance, and both affected individuals and their relatives had decremented P300 amplitudes to targets. N2 deficits predicted lower intellectual functioning in schizophrenia, while smaller N1 amplitudes predicted lower IQ in bipolar disorder. Current symptomatology was unrelated to neural responses.

PSYCHOSOCIAL STRESS IMPAIRS WORKING MEMORY PERFORMANCE IN PATIENTS WITH SCHIZOPHRENIA

Jessica I. Lake¹, Peter E. Clayson¹, Holly K. Hamilton^{1,2}, Peter Bachman^{1,3}, Lee J. Jasperse¹, Gregory A. Miller¹, Kenneth L. Subotnik¹, Joseph Ventura¹, Keith H. Nuechterlein¹, & Cindy M. Yee¹
¹University of California, Los Angeles, ²University of California, San Francisco, ³University of Pittsburgh

Schizophrenia (SZ) is characterized by increased reactivity to psychosocial stress, yet how such stress impacts cognitive processing in patients with SZ remains relatively unexplored. Given established working memory (WM) deficits in SZ patients, these processes may be particularly susceptible to disruption by psychosocial stress. An interaction between WM and psychosocial stress may be especially detrimental in SZ, as WM performance and stress reactivity have separately been shown to predict real-world functioning. P300 amplitude and latency are thought to index resource allocation and stimulus evaluation, respectively, and may thus help to elucidate psychosocial stress-induced WM impairments. Psychosocial stress was predicted to disrupt behavioral performance, decrease P300 amplitude, and increase P300 latency by interfering with WM retrieval, with more pronounced effects expected for SZ patients than healthy controls. Dependent measures were assessed before and after exposure to the Trier Social Stress Test (TSST) during an n-back task. SZ patients, but not controls, showed a decrement in WM performance after the TSST. Furthermore, patients showed reductions in P300 amplitude and increases in P300 latency after psychosocial stress, particularly when correctly rejecting non-match stimuli. These findings are consistent with growing evidence of heightened vulnerability in SZ patients to psychosocial stressors and implicate the impairing effects of stress on cognitive processes in SZ. The relationship between these findings and real-world functioning will be discussed.

8:30 A.M.–10:00 A.M.

Symposium 1.2

GETTING PAST THE NEGATIVITY: BUILDING A MECHANISTIC NEURAL MODEL OF COGNITIVE CONTROL

Chair: Jan R. Wessel
University of Iowa

Cognitive control, i.e., the ability to monitor, evaluate, and adapt ongoing behavior and cognition to environmental demands, is a core component of higher-level cognition. 25 years ago, the discovery of the error-related negativity in the human EEG offered one of the first tractable psychophysiological markers of

cognitive control. The subsequent years saw the discovery of many other brain potentials that relate to the processing of conflict, errors, or surprise. However, the methodological inventory of psychophysiologicalists has since evolved greatly. This evolution is reflected in a growing methodological sophistication, which facilitates the testing of concrete neural mechanisms that are engaged in the adaptive control of behavior. Single-trial methods in human psychophysiology allow inferences about well-defined neural mechanisms that interact on a millisecond level to effect cognitive control. Behavioral neuroscience provides insights from animal models that greatly inform models of human cognitive control. Psychopharmacological and patient studies elucidate the role of normal and abnormal control functioning. The speakers in this symposium will present cutting-edge multi-modal work, aimed at delineating concrete neural mechanisms that serve to adapt behavior and cognition in cognitive control situations. The overarching goal of the symposium is to motivate a movement towards a perspective of cognitive control that is focused on concrete and specific neural mechanisms that can be recruited to affect behavior during cognitive control.

ASSOCIATIONS AND DISSOCIATIONS OF ERROR-RELATED BRAIN POTENTIALS AND POST-ERROR SLOWING

Markus Ullsperger¹, Claudia Danielmeier², Tilmann Klein³, & Adrian G. Fischer¹

¹Otto-von-Guericke University Magdeburg, ²University of Nottingham, ³Max Planck Institute

Performance monitoring enables general and specific adjustments of cognition, affect, and behavior in the service of goal achievement and harm avoidance. EEG correlates of performance monitoring such as the error-related negativity (ERN) and error positivity (Pe) have been studied extensively for more than 25 years, yet how they translate into adaptation, such as post-error slowing (PES), is only beginning to be understood. To address this, we applied single-trial multiple robust regression analysis to data collected from 874 participants who performed a modified flanker task while EEG was recorded. While it is generally believed that PES is effector unspecific, we found that it was significantly increased at short delays for response hand repetitions. Only at larger delays, slowing was effector unspecific, suggesting a gradual generalization of PES across all effectors. At the within-subjects level significantly stronger PES follows larger ERN amplitudes, whereas interindividual differences in ERN are uncoupled from interindividual differences in PES. This is also reflected in dissociated sex dimorphisms: men have larger ERN amplitudes, whereas women show stronger PES. I will discuss the relationship of the mechanisms underlying the ERN and PES, respectively. In the light of recent patient, animal and pharmacological studies I will elaborate on factors influencing the coupling of EEG correlates of performance monitoring and PES and discuss the implications for the interpretation of within-subjects vs. between-group differences.

A NEURAL MECHANISM FOR MOTOR INHIBITION AFTER ERRORS, SURPRISE, AND DURING CONFLICT

Jan R. Wessel
University of Iowa

One of the most prominent cognitive-control behaviors exerted by humans is the slowing down of motor responding. It occurs after errors, after surprising events, and during response-conflict. Here, a common neural mechanism that could be underlying all these instances of control-related motor slowing will be presented. Prior research has shown that humans can actively recruit this specific prefronto-subcortical brain mechanism to cancel actions when necessary (for example, during stop-signal-type paradigms). In the first part of this talk, it will be demonstrated that this mechanism can also be recruited in a more fine-grained fashion, i.e., to slow down actions instead of fully cancelling them. In the second part, it will be shown that this mechanism is active after errors and surprising events, as well as during periods of response conflict, and that the degree of its involvement is directly related to the degree of motor slowing in all instances. The final part of the talk will focus on the specific nature of this mechanism's involvement during cognitive control. It will be shown that the prefronto-subcortical mechanism can directly act on motor representations in somatosensory cortices, and that it exerts its inhibitory influences on response emission by delaying the onset of preparatory motor activity on trials that follow errors and during response conflict. Taken together, this talk aims to provide a comprehensive picture of the involvement of a specific neural mechanism for motor inhibition in a wide array of situations that demand cognitive control.

ERROR DETECTION AND THE ADJUSTMENT OF ATTENTION IN FRONTO-CINGULATE CORTEX OF MACAQUES

Thilo Womelsdorf
York University

Adaptive behavior requires subjects to flexibly identify how much control demands are needed to succeed reaching behavioral goals. The brain circuits that implement this adjustment of control are located in prefrontal and anterior cingulate cortex and in the basal ganglia among others. This talk explores how these circuits interact during feature-based attention in control-demanding reversal learning tasks. In a first part the time course of error detecting signals is described to discern how error detecting firing rate modulations in the anterior cingulate cortex spread widely across brain circuits. The second part extends the definition of errors and describes the dynamics of fast and widespread coding of prediction error signals in the circuits during the learning period of attention tasks. These findings suggest that control circuits are rapidly detecting violations of expected events, encompassing attentional lapses, omissions of reward, and true errors of commission. A third part explores the interaction between circuits, highlighting that the spiking output from anterior cingulate cortex and prefrontal cortex is tightly coupled at theta, beta, and gamma band frequencies to the population level local field potential activity across all areas of the fronto-cingulate control network at the very moment when attention control is required for successful adaptive behavior. These results begin to highlight the unique neural signatures of fronto-cingulate and fronto-striatal circuit mechanisms underlying cognitive control.

THE ROLE OF THE DORSAL CINGULATE IN FEEDBACK-BASED ADAPTIVE BEHAVIOUR

Robert Hester
University of Melbourne

One tenet of human behaviour that permeates society is the belief that negative feedback for an error will reduce the likelihood of it being repeated. Models of error-related neural activity have argued for a relationship between outcome-related dorsal anterior cingulate (dACC) activity and adaptive changes in performance, via reinforcement learning mechanisms (e.g., Brown and Braver, 2005; Holroyd and Coles, 2002). Recent evidence has highlighted an association between the magnitude of error-related dACC feedback activity and subsequent adaptive performance. However, existing data does not clarify whether the dACC activity is a monitoring signal reflecting outcomes that were worse than expected, or, the value of an outcome to subsequent adaptive behaviour. The latter is of particular interest due to the range of clinical conditions that feature poor decision-making that reflects a tendency to adapt behaviour following positive, but not negative, feedback. To understand the influence of 'abnormal' reward sensitivity on behaviour in clinical conditions such as addiction and anxiety, we have examined how experimental manipulation of both performance expectations (or prediction errors) and adaptive value has on dACC activity and its relationship to post-error adaptive behaviour. Our human fMRI data in healthy participants suggests that the dACC is more sensitive to the adaptive value of information rather than reflecting a prediction error, whereas the insular cortex and striatum show the opposite pattern.

8:30 A.M.–10:00 A.M.
Symposium 1.3

RECENT ADVANCES IN TRANSCUTANEOUS VAGAL NERVE STIMULATION RESEARCH

Chair: Bart Verkuil
Leiden University

The vagus nerve – the longest cranial nerve - is hypothesized play a pivotal role in cognitive and emotional processes. The vagus nerve connects a wide range of organs, including the heart, to the brainstem where it projects onto brain areas involved in cognition and emotion. Animal research has demonstrated that stimulation of the vagus nerve increases firing in the locus coeruleus, the principal area for the synthesis of noradrenalin. Stimulation of the vagus nerve could therefore be expected to affect cognitive-emotional information processing in humans, but

little is still known because this stimulation could, until recently, only be performed invasively. Nowadays, it has become apparent that the vagus nerve can be stimulated non-invasively in humans, via its auricular branch. Although preclinical and clinical studies suggest that transcutaneous auricular vagus nerve stimulation (tVNS) might be an effective therapeutic method in the context of depression and anxiety, little is known about the precise cognitive and emotional effects of tVNS. This symposium aims to provide attendants with the current state-of-the-art in research on the cognitive-emotional effects of tVNS. With contributions from different laboratories, it will be outline whether tVNS affects cognitive processing (eg., task switching) and emotional learning (conditioning research).

THE EFFECTS OF TRANSCUTANEOUS VAGUS NERVE STIMULATION ON CONDITIONED FEAR EXTINCTION IN HUMANS

Andreas Burger¹, Bart Verkuil¹, Ilse van Diest², Willem van der Does¹, Julian Thayer³, & Jos Brosschot¹
¹Leiden University, ²Katholieke Universiteit Leuven, ³The Ohio State University

A critical component of the treatment for anxiety disorders is the extinction of fear via repeated exposure to the feared stimulus. This process is strongly dependent on successful memory formation and consolidation. Stimulation of the vagus nerve enhances memory formation in both animals and humans. The objective of this study was to assess whether transcutaneous stimulation of the vagus nerve (tVNS) can accelerate extinction memory formation and retention in fear conditioned humans. To assess fear conditioning and subsequent fear extinction, we assessed US expectancy ratings, fear potentiated startle responses and phasic heart rate responses. We conducted a randomized controlled trial in thirty-one healthy participants. After fear conditioning participants were randomly assigned to receive tVNS or sham stimulation during the extinction phase. Retention of extinction memory was tested 24 hours later. tVNS accelerated explicit fear extinction learning (US expectancy ratings), but did not lead to better retention of extinction memory 24 hours later. We did not find a differential physiological conditioning response during the acquisition of fear and thus were unable to assess potential effects of tVNS on the extinction of physiological indices of fear. These findings complement recent studies that suggest vagus nerve stimulation could be a promising tool to improve memory consolidation and fear extinction.

MIXED EVIDENCE FOR THE POTENTIAL OF TRANSCUTANEOUS VAGAL NERVE STIMULATION TO IMPROVE THE RETENTION OF EXTINCTION

Ilse van Diest¹, Andreas Burger², Bart Verkuil², Holly Fenlon³, Lise Thijs³, Lisse Cools³, Lisse van Duppen³, Bram Vervliet³, & Holly Miller³
¹Katholieke Universiteit Leuven, ²Leiden University, ³Harvard Medical School

Extinction memories are fragile, sometimes resulting in return of fear responses to the conditioned stimulus (CS) following successful extinction. Stimulation of the vagus nerve (VNS) has been proposed to enhance extinction memory through the increase of noradrenergic transmission. We tested whether a non-invasive way of stimulating the auricular branch of the vagus accelerates extinction and reduces spontaneous recovery of acquired fear. Healthy students (N = 41) participated in a 3-day protocol: acquisition (day1), extinction (day1) and retention of extinction (day3). Geometrical figures (30 s) served as CSs. During acquisition, the CS+ was reinforced 75% of the times with one or two painful electrical shocks. During extinction, one group received VNS concurrently with each CS, whereas the control group received sham stimulation. Measures included US-expectancy ratings, heart rate, skin conductance and startle blink EMG. Successful acquisition and extinction of fear to the CS+ was apparent from all measures, without significant group differences. Spontaneous recovery of US-expectancy on the first trial on day 3 showed up to the same extent in both groups, but subsequently extinguished again only in the VNS group. Spontaneous recovery for the skin conductance response occurred only in the sham group. No group differences were found for startle blink EMG, and heart rate (variability) on day 3. Our findings partly support the hypothesis that transcutaneous VNS improves the retention of extinction, but failed to replicate previous findings of an accelerated extinction.

TRANSCUTANEOUS VAGUS NERVE STIMULATION AND EXTINCTION LEARNING AFTER CONTEXTUAL FEAR CONDITIONING IN VIRTUAL REALITY

Hannah Genheimer, Marta Andreatta, Esther Asan, & Paul Pauli
¹University of Würzburg

Fear extinction is the experimental analogue of exposure-based therapy for anxiety disorders. An animal study demonstrated facilitated extinction by vagus nerve stimulation (VNS). We investigated the influence of transcutaneous VNS on extinction in humans. Using virtual reality, we conducted a 3-Day protocol including 75 healthy participants. During acquisition (Day1), participants received unpredictable electric shocks (unconditioned stimuli, US) when guided through one office (anxiety context, CTX+) but never when guided through another office (safety context, CTX-). During extinction (Day2), participants received t-VNS, sham or no stimulation. Both contexts were revisited and no US was delivered. On Day3, participants received three USs for reinstatement, which was followed by the test phase. On Day1, fear potentiated startle in CTX+ indicated successful context conditioning. In the end of Day2, participants exhibited similar startle responses in CTX+ and CTX- indicating extinction independent of VNS. On Day3, all participants showed reinstatement in terms of increased startle responses in both offices compared to the neutral corridor also independent of VNS. Interestingly, those participants, who received VNS and were convinced about its efficacy reported less reinstatement assessed with ratings. To conclude, we did not observe evidence for VNS effects on extinction and return of anxiety, which is in contrast to animal findings. However, the individuals' conviction about VNS effects seemed to modulate its efficacy, i.e. strengthened explicit extinction memory traces.

COGNITIVE FLEXIBILITY: THE EFFECTS OF TRANSCUTANEOUS VAGUS NERVE STIMULATION AND STRESS

Klodiana-Daphne Tona, Hans Revers, Bart Verkuil, & Sander Nieuwenhuis
 Leiden University

Vagus nerve stimulation (VNS) is a treatment which affects the locus coeruleus-noradrenergic system, enhances mood, and alleviates stress-related symptoms. Therefore, it has been suggested as a treatment for stress-related disorders, despite the fact that it impairs other important cognitive functions such as cognitive flexibility. Recently, transcutaneous VNS (tVNS) has been advocated to function in the same way as VNS. However, the effects of tVNS on cognitive flexibility and stress are still unknown. This study aims to fill this gap. Thirty-two male participants were asked to repeatedly switch between two cognitive tasks in two sessions, once during tVNS stimulation and once during sham stimulation (sessions separated by 7 days). tVNS was applied in the auricular branch of the right ear. To investigate the effect of stress, half of the participants were tested after stress was induced by means of the socially evaluated cold pressor task. To investigate effects of tVNS on psychophysiology and arousal, heart rate was continuously monitored and pupil dilation, levels of α -amylase and cortisol levels were measured at three time points. Subjects showed typical switch costs, which decreased with the time available for preparation. tVNS and stress-induction did not affect switch costs or the preparation effect. The effects of tVNS on psychophysiology will be discussed. In contrast to VNS, the non-invasive method of tVNS does not have an effect on cognitive flexibility, neither does the combination of tVNS and stress.

10:30 A.M.-12:00 P.M.

Symposium 2.1

THE PRESENT AS THE PAST'S FUTURE: EARLY CAREER AWARD WINNERS, WHERE ARE THEY NOW?

Chair: Kara D. Federmeier
 University of Illinois, Urbana-Champaign

CONFLICT AND COGNITIVE CONTROL: NEW INSIGHTS AND FUTURE CHALLENGES

Bruce D. Bartholow
 University of Missouri

Response conflict and cognitive control are key constructs in numerous psychological and neurocognitive theories, and have been used as explanatory variables for a number of widely studied event-related potential (ERP) components. In 2007 I was very fortunate to receive the Award for Distinguished Early Career Contributions to Psychophysiology, and my award address focused on the roles of conflict and cognitive control in social cognition. This topic has remained of central interest in my research, and this talk will present an overview of more re-

cent work in which the constructs of conflict and control have featured prominently in our efforts to understand alcohol's effects on brain and behavior. I will discuss findings from several recent experiments as well as a recent organizing framework arguing that the salience and aversiveness of conflict are critical to its adaptive role in harnessing attention and mobilizing control adjustments.

RESPIRATION AND ASSOCIATIVE LEARNING AS MODULATORS OF INTEROCEPTION: AN UPDATE

Ilse Van Diest
 Katholieke Universiteit Leuven

Most interoceptive events involved in bodily regulatory processes are experienced as benign and pass unnoticed. Other sensations such as breathlessness or pain are more salient and aversive; their survival function motivates us to undertake behavioral action. In a first part of the talk, I will present some of our latest experimental work on visceral pain and breathlessness. I will demonstrate that associative learning between benign and aversive interoceptive sensations can alter interoception and sometimes even dysregulate bodily processes. In a second part of the talk, I will present some of our work on respiratory hypo-algesia. Effects of slow deep breathing, different types of breath-holding and respiratory phase on experimentally induced pain will be presented and discussed.

THINKING BACK ON "THINKING AHEAD": AN AGING PERSPECTIVE ON LANGUAGE COMPREHENSION

Kara D. Federmeier
 University of Illinois, Urbana-Champaign

In my Early Career Award talk in 2006, I described electrophysiological evidence that the brain actively uses context information to predict features of likely upcoming words during language comprehension, an ability that makes use of left hemisphere mechanisms shared with language production. In the ensuing decade, prediction has taken center stage in theories of language comprehension. In this talk, I will discuss what we have learned about the mechanisms — and limitations — of prediction in language. I will also show how prediction, and comprehension more generally, changes over the course of normal aging. Emerging data show that aging is associated with changes in how attention is allocated during reading, how information accrues across a sentence, how context is used to shape word processing, and how the brain responds to unexpected language events. In turn, these age-related changes have consequences not only for how comprehension unfolds in the moment, but also for what people later remember about what they have experienced and understood. Collectively, these findings reveal the complex relations among sensory processing, attention, memory, and control systems that allow people to rapidly and fluidly understand one another across the lifespan.

10:30 A.M.–12:00 P.M.

Symposium 2.2

DOING IT RIGHT: NEURAL CORRELATES OF ACTION PREPARATION, PERFORMANCE MONITORING, AND LEARNING

Chairs: Philip A. Gable¹ and Matthew W. Miller²
¹University of Alabama, ²Auburn University

Acting at the right time in the right way is essential for performance and learning. As such, numerous neurophysiological mechanisms impact learning and performance. Across four talks, presenters will discuss how neural mechanisms of action preparation and feedback monitoring improve learning and performance. In our first talk, Hunter Threadgill will present evidence demonstrating that state and trait approach-motivation influence goal preparation using measures of motor strip beta suppression. In addition, approach motivation appears to enhance monitoring after goal performance measured using the reward positivity (RewP) ERP component. Olav Krigolson will delve deeper into the function of performance monitoring by demonstrating that the RewP indexes a neural learning system and changes in the RewP relate to dynamic deviations of human behavior. In the third talk, Matt Miller will present evidence that autonomy amplifies motor-learning and heightens feedback processing, as indexed by the N2 ERP component. Moreover, the N2 predicts motor learning, suggesting that autonomy enhances learning by increasing feedback processing. Finally, Dan Foti will examine how the RewP, P3, and LPP reflect outcome valence and expectancy during reversal learning. Moreover, his presentation will examine how individual differences in psychopathologies relate to these neural mechanisms of task performance. These data suggest that learning and performance involve complex neural correlates of active preparation and performance monitoring.

FROM PREPARATION TO PERFORMANCE: APPROACH MOTIVATION IMPACTS THE GAMUT OF GOAL PURSUIT

Hunter Threadgill, & Philip A. Gable
University of Alabama

Motivation is critical to goal pursuit. Approach-motivated goal states should impact the entirety of goal pursuit, from goal preparation to post-performance monitoring. A series of studies reveals that approach motivation enhances neural correlates of motor-action preparation and action monitoring of goal performance. Study 1 investigated action-preparation during pregoal (high approach-motivated) and postgoal (low approach-motivated) states using an index of beta suppression over the motor cortex. Approach-motivated pregoal states elicited higher levels of beta suppression. Greater beta suppression in approach-motivated pregoal states also related to enhanced cognitive narrowing. In Study 2, we sought to test whether individual differences in approach motivation related to neural correlates of motor-preparation. Greater trait behavioral approach systems (BAS) was associated with greater beta suppression at baseline. Study 3 assessed whether approach motivation would enhance performance monitoring measured by the reward positivity (RewP). Participants received win or no-win feedback after high approach-motivated or neutral goal pursuit. RewP amplitudes were larger after approach-motivated pregoal states than neutral states. Moreover, enhanced goal performance on approach-motivated trials related to larger RewP amplitudes. Together, these studies suggest that approach-motivation impacts the gamut of goal pursuit. Greater state and trait approach motivation enhances neural correlates of goal preparation and performance monitoring.

LEARNING RELATED CHANGES IN THE REWARD POSITIVITY

Olav Krigolson
University of Victoria

How do we learn? Over the past 20 years studies using EEG have examined the neural signals elicited by performance feedback. In particular, two key signals evoked by performance feedback have been identified that are thought to relate to learning: (1) the feedback-related negativity (FRN) and (2) reward positivity (RP). Theoretical accounts posit that the RP reflects the functioning of a reinforcement learning system within the human medial-frontal cortex. However, to date it is still unclear whether the RP is simply evoked by feedback or whether they are actually reflective of an underlying learning process. Here, I will review a series of studies from my laboratory that clearly demonstrate that the RP indexes a neural system for human learning and further, that changes in the RP are related to changes in human behaviour. Specifically, in the first experiment participants learned to make perceptually based categorical classifications - we show here that the amplitude of the RP diminished with learning in a manner similar to the expected "learning curve". In the second experiment, using the same task, we show retention of RP amplitude after learning has occurred, and further small increases in RP amplitude (that again diminish) that reflect neural "restart" costs. Finally, in the third experiment, in a motor learning paradigm, we demonstrate that changes in RP amplitude are correlated with subsequent changes in behavioural performance. Together, these studies strongly suggest that the RP indexes a neural learning system within the human medial-frontal cortex.

THE EFFECTS OF AUTONOMY DURING PRACTICE ON FEEDBACK PROCESSING AND MOTOR LEARNING

Matthew W. Miller, & Kirk Grand
Auburn University

Increasing learners' intrinsic motivation while they practice motor skills is thought to enhance learning. A common means to increase intrinsic motivation during practice is to give learners autonomy, which has been revealed to enhance motor learning. Increasing intrinsic motivation by providing autonomy also enhances feedback processing, but whether this enhanced processing explains the learning benefit of autonomy remains an open question. A series of studies was conducted to address this question. Specifically, participants were assigned to high-autonomy (HA) or low-autonomy (LA) groups and practiced a beanbag tossing task. HA participants were given choices over aspects of their practice environment: when they received performance feedback or the color of the beanbags with which they practiced. LA participants were given feedback schedules or

beanbag colors matched to HA counterparts. Feedback processing was indexed by ERPs, and motor learning was assessed via tossing performance on 1- and 7-day retention/transfer tests. Results revealed HA participants exhibited greater feedback processing (e.g., higher N2 component amplitude), and superior motor learning (e.g., better transfer test accuracy). Further, feedback processing predicted motor learning. Together, these results suggest HA participants processed feedback to a greater extent during practice, consequently enhancing their motor learning. Specifically, HA participants may have been more intrinsically motivated to learn, and they may have attempted to increase learning by processing feedback to a greater extent.

REVERSAL LEARNING: PARSING STAGES OF FEEDBACK PROCESSING AND INDIVIDUAL DIFFERENCES

Dan Foti, Beleb Oumeziane, & Sebastien Hélie
Purdue University

Reversal learning involves the ability to dynamically adapt behavior to changing stimulus-outcome contingencies, and impairment in this process has been linked to a range of psychiatric and neurological disorders. In the current study, we considered event-related potentials (ERPs) elicited during a reversal learning task that fully crossed the factors of outcome valence (reward vs. punishment) and expectancy (expected vs. unexpected). Of interest were the effects of these factors on three processing stages: initial feedback evaluation (reward positivity, or RewP), allocation of attention (P3), and sustained processing (late positive potential, or LPP). Data were collected from a large adult sample (N = 101). Results indicated differential patterns of valence and expectancy across stages: the RewP was selectively modulated by outcome valence, the P3 by expectancy, and the LPP by both. Links between ERPs and task performance were stage- and valence-specific: P3 amplitude to unexpected outcomes predicted successful behavioral switching, separately for reward and punishment trials. Further, we considered individual differences in these ERPs and in task performance: Current symptoms of depression were associated with reduced P3/LPP amplitude to expected reward outcomes, but not expected punishment. Pathological gambling behavior, meanwhile, was associated with behavioral insensitivity to unexpected punishment, but not unexpected reward. These findings point toward a nuanced pattern linking feedback processing to behavioral performance, as well as deficits therein.

10:30 A.M.–12:00 P.M.

Symposium 2.3

BIOMARKERS OF ANXIETY RISK FROM INFANCY TO ADULTHOOD

Chair: Antonia Kaczurkin
University of Pennsylvania

Biological markers of psychopathology provide more statistically powerful measures than categorical diagnoses and they advance the discovery/evaluation of novel therapies and drugs. Biomarkers also provide objective measures that can enhance clinical practice and they facilitate translational research by validating existing animal models and identifying targets for new models. This symposium will highlight several recently identified candidate biomarkers of anxiety vulnerability in monkeys, children, adolescents, and adults. Bell will present new data showing that electroencephalography measures collected in infants prospectively predict heightened anxiety at 3 years. Shackman will describe lesion and imaging evidence underscoring the importance of brain circuits encompassing the extended amygdala for individual differences in anxiety in monkeys and anxiety disorders in children. Meyer will highlight new longitudinal evidence that variation in the error-related negativity predicts exaggerated anxiety in children who were subsequently exposed to a natural disaster. Kaczurkin will discuss imaging data suggesting that adolescence may be a critical period for the manifestation of sex differences in anxiety. Mathersul will present new evidence in adults showing that electromyography may provide a valid measure of muscle tension as a biomarker of generalized anxiety disorder. Allen will discuss the implications of these observations for our understanding of anxiety across the lifespan and highlight the most important methodological and conceptual challenges for future research.

INFANT EEG COHERENCE PREDICTS PRESCHOOL ANXIETY

Martha Ann Bell¹, Anjolie Diaz², & Cynthia Smith¹
¹Virginia Tech, ²Ball State University

Infant EEG has been linked to concurrent individual differences in difficulty regulating emotion. We examined whether infant EEG was predictive of difficulties beyond infancy, potentially capturing the neurological foundations of later developing anxiety-related behavior problems. We focused specifically on EEG recorded from frontal-parietal scalp locations during infancy because the frontal-parietal network has been linked to attentional control and children with anxiety problems exhibit attention biases. Thus, we considered infant frontal-parietal EEG coherence as a potential indicator of a trait-like propensity for later anxiety. Participants were 188 typically-developing children representing a wide range of family socioeconomic levels. We recorded EEG during a video baseline at 5 mo. Mothers completed the Child Behavior Checklist (CBCL) at 36 mo. We focused on the DSM Anxiety Problems Scale. Using hierarchical regression analysis, we controlled for child sex and maternal education level in step 1; added 5 mo infant left and right frontal-parietal EEG coherence (infant alpha band) at step 2. In the final model, maternal education level ($\beta = -.21$, $p = .004$) and 5 mo right hemisphere frontal-parietal EEG coherence ($\beta = .20$, $p = .01$) were significant predictors and explained 8% total variance in CBCL Anxiety at 36 mo. Our data suggest infant EEG as a potential biomarker for early childhood anxiety.

NEUROBIOLOGICAL BASES AND MARKERS OF EARLY-LIFE ANXIETY

Alexander Shackman
 University of Maryland

Children with an inhibited or anxious temperament (AT) are at risk for developing anxiety disorders, depression, and substance abuse. These debilitating disorders are common and challenging to treat, underscoring the need to better understand the underlying neurobiology. Using multimodal brain imaging and a well-validated monkey model of childhood AT, we have demonstrated that heightened activity in the central (Ce) nucleus of the amygdala is a key proximal substrate for individual differences in AT ($n=238$), consistent with work in humans. Of course, anxiety, like other psychological states and psychiatric disorders, is widely thought to reflect widely distributed neural circuits. Consistent with this hypothesis, we have demonstrated that aberrant functional connectivity between the Ce and prefrontal cortex is associated with extreme anxiety in both monkeys ($n=89$) and children ($n=28$). Furthermore, elevated activity in several other regions—including the orbitofrontal cortex, bed nucleus of the stria terminalis (BST), Ce, and periaqueductal gray—predicts trait-like differences in AT ($n=592$). More recently, we have demonstrated that BST activity supports persistent signs of anxiety in the absence of immediate danger ($n=23$)—a hallmark of anxiety disorders—and helps mediate the genetic transmission of AT from parents to offspring ($n=592$). These observations provide a novel framework for understanding the development of stress-sensitive psychopathology, provide new insights into the underpinnings of early-life temperament, and set the stage for developing improved interventions.

NEURAL REACTIVITY TO MISTAKES AND TEMPERAMENTAL FEARFULNESS PROSPECTIVELY PREDICT THE IMPACT OF HURRICANE SANDY STRESSORS ON INTERNALIZING SYMPTOMS IN CHILDREN

Alexandria Meyer¹, Greg Hajcak², Carla Danielson³, & Daniel N. Klein²
¹Florida State University, ²Stony Brook University, ³Medical University of South Carolina

Although most people will experience a traumatic event, only a subset will develop significant psychological symptoms in the aftermath. Natural disasters are a unique occasion to explore factors that may confer risk for trauma-induced increases in symptoms. In the current study, we utilize a pre-existing longitudinal study located in Long Island to examine the impact of Hurricane Sandy on internalizing symptoms in a large sample of children. We focused on temperamental fear and a biomarker of risk, the error-related negativity (ERN). The ERN is a negative deflection in the event-related potential (ERP) occurring when individuals make mistakes, and is increased in anxious individuals. The final sample consisted of 223 children who had undergone an observational assessment of fear at

age 3 and an EEG assessment of the ERN at age 6. At the age 9 assessment, internalizing symptoms were assessed, and then again after the hurricane (approximately 65 weeks later). A significant three-way interaction between fearfulness, hurricane stressors, and the ERN in predicting post-hurricane increases in internalizing symptoms suggested that children who were high in fear at age 3 and experienced elevated hurricane stressors were characterized by subsequent increases in internalizing symptoms, but only when they were also characterized by an increased ERN at age 6. These findings support a diathesis-stress model, suggesting that early temperament and pre-trauma biological markers confer risk for increased psychological symptoms following environmental stressors.

SEX DIFFERENCES IN TRAIT ANXIETY DURING ADOLESCENCE IS MEDIATED BY ELEVATED AMYGDALA PERFUSION

Antonia Kaczurkin¹, Tyler Moore¹, Kosha Ruparel¹, Russell Shinohara¹, Monica Calkins¹, Mark Elliott¹, Ryan Hopson¹, David Roalf¹, Rastko Ciric¹, Simon Vandekar¹, Efstathios Gennatas¹, Daniel Wolf¹, J. Cobb Scott¹, Daniel Pine², Ellen Leibenluft², John Detre¹, Edna Foa¹, Raquel Gur¹, Ruben Gur¹, & Theodore Satterwaite¹
¹University of Pennsylvania, ²National Institute of Mental Health

Adolescence is a critical period for emotional maturation and is a time when clinically significant symptoms of anxiety and depression increase, particularly in females. However, few studies relate developmental differences in symptoms of anxiety and depression to brain development. Cerebral blood flow (CBF) is one brain phenotype that is known to have marked developmental sex differences. We investigated whether developmental sex differences in CBF mediated sex differences in anxiety and depression symptoms by capitalizing upon a large sample of 875 youths who completed cross-sectional imaging as part of the Philadelphia Neurodevelopmental Cohort. Perfusion was quantified on a voxelwise basis using arterial spin labeled MRI at 3T using a general additive model with penalized splines. Clusters found to be related to anxiety were evaluated for interactions with age, sex, and puberty. Trait anxiety was associated with elevated perfusion in a network of regions including the amygdala, anterior insula, and fusiform cortex, even after accounting for pre-scanner state anxiety. Notably, these relationships strengthened with age and the transition through puberty. Moreover, higher trait anxiety in post-pubertal females was mediated by elevated perfusion of the left amygdala. Taken together, these results demonstrate that differences in the evolution of cerebral perfusion during the adolescent period may be a critical element of the affective neurobiology underlying sex differences in anxiety and mood symptoms.

PSYCHOPHYSIOLOGICAL INVESTIGATION OF MUSCLE TENSION AS A BIOMARKER OF GENERALIZED ANXIETY DISORDER

Danielle Mathersul, Ayelet Ruscio, & Adrian Raine
 University of Pennsylvania

While worry is the defining feature of generalized anxiety disorder (GAD), muscle tension is the most discriminative somatic symptom of GAD compared to other mental disorders. Despite this, muscle tension in GAD is poorly understood. Subjective self-report measures of muscle tension may be biased in individuals with GAD due to distorted interoceptive sensitivity in anxiety disorders. Yet, few studies have measured muscle tension objectively in individuals with anxiety, with mixed findings depending on which muscles were investigated and whether participants were at rest or undergoing a stressor. The present study used electromyography (EMG) to explore muscle tension in adults with GAD ($n = 30$) compared to healthy controls ($n = 23$) (i) during baseline rest, (ii) while anticipating an upcoming stressor (speech performance), and (iii) while experiencing the stressor. We correlated maximum EMG response (forehead, jaw, neck, shoulder, forearm, calf) with a factor score of self-reported muscle tension created from standardized measures (ADIS, HAM, MASQ; Cronbach's $\alpha = .88$). Across body sites and conditions, the mean and median correlations were positive in the control group ($r = -.20$ to $.53$) and significant between self-reported tension and brow EMG during rest ($p = .011$). In contrast, the mean and median correlations were negative in the GAD group ($r = -.52$ to $.26$) and significant between self-reported tension and forearm EMG while anticipating stress ($p = .003$). These preliminary findings suggest body EMG may have promise as a biomarker of GAD. Data collection is ongoing.

3:15 P.M.–4:45 P.M.

Symposium 3.1

PSYCHOMETRIC CHALLENGES FOR PSYCHOPHYSIOLOGY IN THE AGE OF RDOC

Chair: Jesse T. Kaye
University of Wisconsin-Madison

Psychophysiology tasks are poised to become a major contributor to the NIMH RDoC initiative. For these tasks to meaningfully contribute to the goals of RDoC, the robustness of their psychometric properties must first be demonstrated rather than presumed. In light of recent widespread concerns regarding reliability and replication in psychological science, the psychometric performance of our tasks should inform their utility, application, and limitations in assessing psychopathology relevant dimensional individual differences. This symposium features how several labs are applying rigorous psychometric evaluations to popular psychophysiology tasks. Kaye et al. will discuss the psychometric properties and inter-task/inter-measure relationships of startle and corrugator response modulation across threat-of-shock and affective picture viewing tasks. Hajcak et al. will discuss recent efforts to optimize measurement of individual differences (e.g., error-related brain activity), focusing on the influence of different task parameters on internal reliability. Patrick et al. will discuss the psychometric properties and systematic sources of variance in the startle-probe P3 and its affect-modulation in a twin-sample. Nelson et al. will discuss how the psychometric properties of startle and ERP measures of responses to unpredictable vs. predictable threat are influenced by the aversive stimulus modality. Vaidyanathan will discuss how these psychometric approaches to task evaluation and refinement may aid in developing candidate tests of various constructs within the RDoC framework.

PSYCHOMETRIC PROPERTIES AND INTER-TASK/MEASURE RELATIONSHIPS OF STARTLE AND CORRUGATOR RESPONSE IN NPU, AFFECTIVE PICTURE VIEWING, AND RESTING STATE TASKS

Jesse T. Kaye, Daniel E. Bradford, & John J. Curtin
University of Wisconsin – Madison

Our study provides a comprehensive evaluation of critical psychometric properties of commonly used psychophysiology laboratory paradigms within the NIMH RDoC. Participants ($N = 128$) completed the No Shock, Predictable Shock, Unpredictable Shock (NPU) task, Affective Picture Viewing task, and Resting State task at two study visits separated by one week. We examined potentiation/modulation scores in NPU (predictable or unpredictable shock vs. no shock) and Affective Picture Viewing tasks (pleasant or unpleasant vs. neutral pictures) for startle and corrugator responses and general startle reactivity in the Resting State task. For these three tasks and two measures we evaluated effect size robustness and stability, internal consistency, and one-week temporal stability. The psychometric properties of startle potentiation in the NPU task were good but concerns were noted for corrugator potentiation in this task. Some concerns also were noted for the psychometric properties of both startle and corrugator modulation in the Affective Picture Viewing task, in particular for pleasant picture modulation. Psychometric properties of general startle reactivity in the Resting State task were good. We examined inter-task/inter-measure relationships to identify patterns of convergence/divergence within these paradigms and implications for RDoC constructs of phasic and sustained responses to threats. We discuss the future utility, applications, and limitations of these tasks to investigate individual differences within the RDoC framework in light of their psychometric properties.

PSYCHOMETRIC AND TASK PROPERTIES OF STARTLE AND EVENT-RELATED POTENTIAL MEASURES OF SENSITIVITY TO PREDICTABLE AND UNPREDICTABLE THREAT

Brady D. Nelson, & Greg Hajcak
Stony Brook University

The predictability of threat is an important characteristic that has been shown to impact psychophysiological indicators of defensive motivation (startle reflex) and

attentional engagement (event-related potentials, ERPs) and individual differences in these measures. The Research Domain Criteria initiative aims to create a framework for research on pathophysiology that will improve mental health classification, and includes separate Negative Valence Systems constructs for predictable (“acute”) and unpredictable (“potential”) threat. However, it is critical to first understand the basic psychometric and task properties of these constructs and measures. In this presentation, we will provide an overview of the psychometric properties of startle and ERP measures during a no, predictable, and unpredictable threat (NPU-threat) task. Specifically, we will present data on the internal consistency, test-retest reliability, habituation, and within-subjects correlation of these measures. It is also important to know whether paradigms like the NPU-threat task comparably engage motivation and attention across different types of aversive stimuli. This is especially important for clinical and developmental research where one type of aversive stimulus may not be feasible to use with certain populations (e.g., shocks cannot be used with children). Therefore, we will also present data on startle and ERP measures during shock, unpleasant picture, and aversive noise variants of the NPU-threat task using a within-subjects design.

SIGNAL VERSUS NOISE IN THE NOISE-PROBE P3 SIGNAL

Christopher J. Patrick, Emily R. Perkins, James R. Yancey, Laura Drislane,
& Noah C. Venables
Florida State University

The noise-probe P3 is a variant of the widely-studied P3 response elicited by sudden, incidental acoustic probe stimuli occurring in the context of an ongoing primary task. This brain-potential response contains multiple sources of variance, some in common with other P3 response variants (e.g., memory updating), some tied uniquely to the noxious quality of the abrupt noise stimulus (e.g., threat processing), some related to the task context in which the noise occurs (e.g., attentional engagement), and some reflecting unsystematic (error) variance. This talk focuses on psychometric properties and systematic sources of variance in the noise-probe P3 response evoked by startling noises occurring during viewing of pleasant, neutral, and unpleasant IAPS picture stimuli. Response parameters of interest included general P3 amplitude and modulation of amplitude by foreground picture-valence. Study participants were monozygotic and dizygotic twins, allowing for use of twin concordances as a point of reference for evaluating score reliability and partitioning different sources of systematic variance. Findings are reported from analyses focusing on: (1) split-half reliabilities and twin concordances for general amplitude and valence-modulation quantified in alternative ways; (2) systematic, psychological-trait related variance in these two parameters of probe P3 response; and (3) additional systematic sources of variance revealed by robust associations with other physiological response variables. Implications for physiological quantification of psychological constructs are discussed.

USING PSYCHOMETRICS TO OPTIMIZE TASKS FOR INDIVIDUAL DIFFERENCES RESEARCH

Greg Hajcak¹, Alexandria Meyer², & Roman Kotov¹
¹Stony Brook University, ²Florida State University

Psychometric issues are not only relevant for self-report measures of individual differences. Progress in clinical neuroscience cannot be made with unreliable neural measures. Yet, the psychometric properties of task-dependent neural and other psychophysiological measures are largely unknown and rarely reported in studies on individual differences. The reliability of any measure is impacted by its length (i.e., number of items); in terms of psychophysiological measures, reliability will depend on task length and the number of trials that go into individual's score. Yet, decisions about task length in individual differences research are not based on psychometric data. I'll focus on the assessment of internal reliability, especially as it relates to task parameters. I will also discuss how task parameters impact between-subjects' measures of effect size and the ability to classify individuals. Overall, I'll propose an approach in which psychometric properties of psychophysiological measures are used to guide task development and optimization for individual differences research.

3:15 P.M.–4:45 P.M.
Symposium 3.2

**PSYCHOPHYSIOLOGICAL EVIDENCE ON THE
SIGNIFICANT AND INTERDEPENDENT RELATIONSHIP
BETWEEN HEALTH BEHAVIORS AND COGNITIVE
FUNCTIONING**

Chair: Kaylie Carbine
Brigham Young University

Discussant: Matthew Miller
Auburn University

Health behaviors like diet and exercise are essential for decreasing risk of mortality and disease. Therefore, understanding cognitive underpinnings of health behaviors, in addition to how health factors influence cognition, is imperative to improve physical and mental health. How health factors relate to changes in cognitive functioning and in turn how cognition influences engagement in health behaviors remains unclear. Psychophysiological measures provide rigorous methods to examine these questions. Our symposium will not only discuss why health behaviors and cognitive functioning are essential for each other in order to maintain optimal functioning, but also demonstrate the interdisciplinary utility of psychophysiology as it can assess the impact of health factors by examining underlying cognitive processes. First, Kaylie Carbine will present how food-related inhibitory control varies for food cues and predicts food intake. Next, Carson Smith will show the protective nature of exercise against cognitive decline in older adults. Brandon Alderman will examine the benefits of exercise and meditation on cognitive control in depression. Finally, Matthew Pontifex will present how physical activity improves attention and action monitoring in children. Matthew Miller will then discuss. Results support how various health behaviors like exercise, meditation and eating habits have an important role in optimal cognitive performance across different populations and show promise as to how health factors and cognitive functioning can be used to benefit each other and overall wellbeing.

**EXAMINING FOOD-RELATED INHIBITORY CONTROL:
NEURAL ELECTROPHYSIOLOGICAL RESPONSES TO FOOD
STIMULI PREDICT CALORIC INTAKE**

Kaylie Carbine, Edward Christensen, James D. LeCheminant, Bruce W. Bailey, Larry A. Tucker, & Michael J. Larson
Brigham Young University

Healthy eating is essential for optimal wellbeing. Food-related inhibitory control, or the ability to withhold dominant responses to eat palatable foods, may relate to food intake, although this remains unclear. We assessed how food-related inhibition, measured by N2 amplitude, differed towards high- and low-calorie food images and related to food intake. Healthy subjects (n=166) completed two food go/no-go tasks, one with high-calorie no-go stimuli and one with low-calorie no-go stimuli, and recorded their diet using the Automated Self-Administered 24-hour multiple-pass recall. N2 amplitude was stronger towards no-go relative to go trials and high- relative to low-calorie images ($p < .01$). Accuracy was higher for go-trials and high-calorie images ($p < .02$). Go RTs were faster towards low- relative to high-calorie images ($p < .01$). Increased high-calorie N2 amplitude correlated with decreased RTs for high-calorie images while increased low-calorie N2 amplitude correlated with increased accuracy and longer RTs for low-calorie images ($p < .02$). Controlling for sex, age, and BMI, high-calorie N2 amplitude predicted caloric intake. Subjects with larger N2 amplitude toward high-calorie stimuli consumed less calories ($p < .05$), suggesting as individuals recruit more cognitive resources to withhold a dominant response to eat high-calorie foods they eat less. Sex predicted that females consume fewer calories ($p < .01$). Low-calorie N2 amplitude didn't predict caloric intake. While high-calorie stimuli elicit an enhanced inhibitory response, this may be necessary to regulate caloric intake.

**THE NEUROPROTECTIVE EFFECTS OF EXERCISE WITH
INCREASED RISK FOR ALZHEIMER'S DISEASE**

J. Carson Smith
University of Maryland

Lifestyle physical activity and exercise interventions are among the most promising preventative strategies for Alzheimer's disease. However, there remain many unanswered questions regarding the efficacy and treatment potential of physical

activity and exercise to prevent or decelerate cognitive decline leading to Alzheimer's disease, particularly among those who are at increased genetic risk through the apolipoprotein E epsilon4 (APOE- ϵ 4) allele, or who have already progressed to mild cognitive impairment. I will discuss our recent work examining interactions between physical activity and genetic risk for Alzheimer's disease in healthy older adults, as well as outcomes from an exercise intervention in individuals diagnosed with mild cognitive impairment. Our longitudinal studies suggest that physical activity may protect APOE- ϵ 4 allele carriers from cognitive decline and hippocampal atrophy associated with Alzheimer's disease. Moreover, we have found that a supervised moderate intensity walking exercise intervention in individuals diagnosed with mild cognitive impairment may help to preserve memory networks, assessed with both task-activated fMRI and resting state fMRI, and provide protection against cortical thinning. Collectively, our work provides evidence that exercise training and physical activity may be very potent strategies to affect brain structure and function in older adults, and perhaps prevent the onset and progression of clinical Alzheimer's disease in the people who are most at risk.

**COMBINING AEROBIC EXERCISE AND FOCUSED-
ATTENTION MEDITATION TO TARGET COGNITIVE
CONTROL PROCESSES IN MAJOR DEPRESSIVE DISORDER**

Brandon L. Alderman, Ryan L. Olson, Christopher J. Brush, Peter J. Ehmann, & Tracey J. Shors
Rutgers University

A number of behavioral interventions have been studied as complementary and alternative approaches to conventional treatments for major depressive disorder (MDD). However, few studies have examined whether the antidepressant effects of these interventions are associated with changes in underlying cognitive processes. We investigated the effects of a mental and physical (MAP) training intervention through focused-attention meditation and aerobic exercise on cognitive control as indexed by the N2 event-related potential (ERP), and whether N2 amplitude covaried with ruminative thought patterns and symptoms of depression. Following the 8-week intervention, individuals with MDD (n=22) reported significantly less depressive symptoms and ruminative thoughts. Typical healthy individuals (n=30) also reported less depressive symptoms at follow-up. N2 increased relative to baseline, with a larger effect observed among individuals with higher depressive symptoms. Findings suggest that enhanced conflict monitoring processes following the intervention are associated with less ruminative thoughts in MDD. To begin to understand the contribution of each treatment arm, we conducted a follow-up randomized trial of moderate-intensity aerobic exercise (AE+) vs. sham exercise (AE-) in 24 participants with MDD. Using N2 and error-related negativity (ERN) ERPs, AE+ was found to improve cognitive control processes and reduce symptoms of depression and rumination relative to AE-. Implications for using ERPs to assess modifiable neural targets in clinical research will be discussed.

**FROM CHRONIC TO ACUTE, HOW PHYSICAL ACTIVITY
BEHAVIORS INFLUENCE COGNITION IN CHILDREN**

Matthew B. Pontifex
Michigan State University

As epidemiological investigations within industrialized societies have revealed increases in the prevalence of sedentary behaviors during childhood, a greater understanding of the extent to which physical activity relates to brain health and cognition during development is of increasing importance. Leveraging insights provided through recordings of electrophysiological activity, we have examined the association and effects of physical activity behavior and attributes as it relates to neural processes associated with the allocation of attentional resources and action-monitoring. In ongoing research, we have specifically focused on 1) how these processes are influenced by a lack of chronic physical activity, 2) the effect of a single dose of physical activity on these processes, and 3) the neurobiological mechanisms that regulate the relationship between physical activity and these neural processes. Our results highlight the importance of physical activity, with greater cardiovascular health relating to a greater ability to allocate attention and modulate action monitoring processes. Further, our results indicate a single dose of physical activity may be particularly beneficial for attentional processing in those children with poorer cognitive abilities and attention-related impairments — such as ADHD. Although the mechanisms underlying such findings are still unknown, early evidence suggests that the beneficial effects of these single doses of physical activity for attention may result from modulation of the locus-coeruleus-norepinephrine system.

FRIDAY, SEPTEMBER 23, 2016

1:30 P.M.–3:00 P.M.

Symposium 4.1

**LEVERAGING SPONTANEOUS AND TASK-RELATED
OSCILLATORY CORTICAL ACTIVITY IN THE STUDY OF
NORMAL AND ABNORMAL BRAIN FUNCTION ACROSS
THE LIFESPAN**

Chairs: Pierre Jolicoeur and Christine Lefebvre
Universite de Montreal

The analysis of oscillatory electrical brain activity using time-frequency (TF) methods opens an ever-widening window on brain-behavior relationships. These methods enable researchers to tap into a rich array of signals that are lost with an exclusive reliance on event-related averaging. In this symposium, four laboratories highlight the usefulness of TF approaches for the study of normal and abnormal brain function. Miskovic and Gibb focus on normal brain development from early to late childhood. They found changes in localized brain oscillations, long-range networks, and highlight a greater dynamic repertoire of cortical states with increasing age. Drisdelle, Lina, and Jolicoeur examine changes in alpha amplitude, alpha phase, and alpha – gamma phase amplitude coupling in young adults performing a visual spatial attention task. Brain activity is interpreted both from stimulus-locked and response-locked event-related measures. Combining EEG and MEG data, Coffman et al. examined changes in alpha power over time during visual working-memory tasks in first-episode schizophrenia-spectrum participants and healthy controls. Their results reveal possible markers of psychosis-related changes in brain activity. Finally, at the other end of the lifespan, Phillips and her colleagues examined EEG coherence at rest and during executive function and working memory tasks to study functional variations in brain activity associated with mild cognitive impairment and Alzheimer's disease.

**THE DEVELOPMENT OF INTRINSIC CORTICAL ACTIVITY
FROM EARLY TO LATE CHILDHOOD**

Vladimir Miskovic, & Brandon E. Gibb
Binghamton University

Computational modeling studies have demonstrated that it is possible to mathematically represent large populations of cortical neurons as self-organizing coherent units that are governed by a set of dynamical equations and that exhibit a rich, endogenous spatiotemporal structure in the absence of external perturbations. This intrinsic cortical activity constrains the dynamics of evoked and task-related processes. In a community sample ($N > 260$), we investigated changes in the development of endogenous cerebral electric fields from early to late childhood, a period during which the cortex undergoes extensive maturational changes. We will highlight the most salient functional changes that occur during this ontogenetic stage: first, in terms of shifts in the absolute and relative power of dominant cortical oscillations and then in terms of the tuning of long-range functional networks, specifically within the alpha-band. Finally, we will consider the development of cortical fluctuations and brain signal complexity across multiple time scales. Our findings provide evidence of large scale reorganization in endogenous cortical oscillations from early to late childhood, suggesting reduced amplitudes in the presence of more integrated and band limited coordination of neuronal activity. These developmental changes are associated with an expanded dynamic repertoire of functional cortical states with increasing age, particularly within the frontal lobes.

**RESPONSE-LOCKED PHASE AMPLITUDE COUPLING
RELATED TO THE DEPLOYMENT OF VISUAL SPATIAL
ATTENTION**

Brandi Lee Drisdelle¹, Jean-Marc Lina², & Pierre Jolicoeur¹
¹Université de Montréal, ²Ecole de Technologie Supérieure

Phase/amplitude coupling (PAC) is an electrophysiological measure that quantifies the degree to which the amplitude of a higher frequency oscillation (e.g., gamma) is related to the phase of a lower frequency oscillation (e.g., theta; Canolty et al., 2006). It is suggested that PAC is associated with long-range commu-

nication between populations of neurons. We developed an event-related measure of PAC, ERPAC, and found an increase in alpha-gamma ERPAC during a visual-spatial attention task, observed following the presentation of a peripheral pop-out target. However, given the timing of this activity, there is a possibility that the observed increase is due to phase-resetting of alpha band activity instead of a response evoked by cognitive processes, such as attention, involved in target processing. Alpha band phase resetting results from the sudden onset of visual search arrays and potentially impacts the measure of ERPAC. To overcome this technical difficulty, we will compare ERPAC time-locked to the response with ERPAC time-locked to the stimulus. Using this method we reduce the impact of phase resetting on measures of ERPAC and provide a converging measure of ERPAC related to the deployment of visual-spatial attention.

**ALPHA MODULATION DEFICITS DURING VISUAL
WORKING MEMORY MAINTENANCE IN FIRST-EPISODE
SCHIZOPHRENIA-SPECTRUM**

Brian A. Coffman, Avniel S. Ghuman, Sarah M. Haigh, Timothy K. Murphy, Kayla L. Ward, Maria Jabrzikowski, Beatriz Luna, & Dean F. Salisbury
University of Pittsburgh School of Medicine

Alpha power is reduced during working memory maintenance in posterior cortex contralateral to the attended visual hemifield. Working memory is impaired in schizophrenia. It is not known whether alpha power reduction is impaired as well. We measured alpha power during a visual working memory task in 16 first-episode schizophrenia-spectrum participants (FESz) and 19 healthy controls (HC) using concurrent EEG and MEG. Participants covertly attended to one hemifield, then viewed 1 (low-load) or 3 (high-load) colored circles in each hemifield for 200 ms. One second later, a probe array was presented. Participants indicated if any attended circles changed color. Source-level alpha-band activity was extracted from combined EEG/MEG data for dorsolateral prefrontal cortex (DLPFC), lateral occipital cortex (LOC), and superior parietal lobule (SPL). In SPL, ipsilateral alpha power increased from baseline more than contralateral for HC ($p < 0.05$), but not FESz. In LOC, decreased alpha power persisted longer contralaterally than ipsilaterally for HC ($p < 0.05$), but not FESz. This effect was strongest for high-load. In DLPFC, alpha power decreased for HC, but increased for FESz ($p < 0.05$). Differences between groups were strongest for left hemisphere responses. These preliminary data suggest FESz were unable to modulate lateralized posterior alpha activity to the same degree as HC and have abnormal frontal alpha modulation. This cortical pathophysiology early in the disease course may relate to emerging left hemisphere psychosis-related functional connectivity deficits.

**EEG COHERENCE AND EXECUTIVE FUNCTION IN MILD
COGNITIVE IMPAIRMENT AND ALZHEIMER'S DISEASE**

Natalie Phillips¹, Erin Johns¹, Howard Chertkow², & Jim Nikelski²
¹Concordia University, ²Lady Davis Institute for Medical Research Jewish General Hospital/McGill University

Deficits in executive functioning have been reported in the early stages of Alzheimer's disease (AD) and in mild cognitive impairment (MCI), a risk state for AD. Although the neural underpinnings are unclear, these deficits may relate to dysfunctional connectivity between brain regions. I will present three research studies that examined group differences for MCI and AD patients relative to controls for EEG coherence within a fronto-parietal network measured at rest (Study 1), during a Go/No-go inhibitory control task (Study 2), and during an N-back working memory task (Study 3). The relationships between coherence and measures of cognitive performance and brain integrity (cortical thickness and PiB retention) were also explored. Overall, the results broadly demonstrate that functional connectivity within a fronto-parietal network is altered in both AD patients and MCI patients during the performance of executive functioning tasks. In AD patients, coherence tended to be decreased, but in MCI patients there was a potential compensatory increase in fronto-parietal coherence. These data are consistent with the notion that AD can be characterized as a disconnection syndrome, in which functional connectivity between brain regions is compromised, and that altered functional connectivity may be related to executive functioning in MCI and AD.

1:30 P.M.–3:00 P.M.
Symposium 4.2

**EXTERNALIZING PRONENESS AND SUBSTANCE USE:
THEORETICAL FRAMEWORK AND EVIDENCE FROM
PSYCHOPHYSIOLOGICAL AND NEUROIMAGING
STUDIES**

Chair: Bruce Bartholow
University of Missouri

Externalizing proneness and behavioral disinhibition are heritable traits that have been related to a number of poor outcomes, such as substance use and addiction. This symposium will bring together current research from four different laboratories to explore the underlying neurobiology of externalizing prone behavior on several different levels. First, a theoretical framework provided by Bartholow et al. will aim at integrating risk factors, phenotype, and endophenotype into a coherent model. Moser et al. will present an investigation of error-related electrophysiology in a pediatric sample as it relates to a familial transmission of externalizing liability. Using resting-state functional neuroimaging in a sample of young adult twins, Burwell et al. will evaluate the etiology of brain circuits important to theories of addiction; are functional circuitry differences due to substance use or preexisting familial factors? The last presentation by Foell et al. will present task-based neuroimaging results showing deficient neural preparation to emotive situations in individuals with high trait disinhibition, and will discuss related findings from the large-scale IMAGEN study comprised of more than 1800 subjects using a monetary incentive delay task. Finally, discussant W.H.R. Miltner will comment and integrate these talks and provide his perspective on the presented topics and methods. Collectively, this symposium will assess externalizing proneness from multiple levels and brain research modalities, with a focus on current and future liability for substance use and addiction.

**TOWARD A MULTIPLE ENDOPHENOTYPE MODEL OF
ALCOHOLISM RISK: DISINHIBITION, INCENTIVE
SALIENCE, AND P300**

Bruce D. Bartholow
University of Missouri

Following the recent Research Domain Criteria (RDoC) initiative spearheaded by the NIMH, alcoholism researchers have called for a similar functional domains approach to understanding the heterogeneity of alcohol use disorder (AUD), generally referred to as the Alcohol Addiction RDoC (AARDoC). Several candidate functional domains have been proposed, among them incentive salience, subjective response to alcohol, and executive functioning. Although historically investigated independently, I propose a conceptual model linking these functional domains as part of a multiple endophenotype framework specifying separable pathways to AUD. Central to this framework is P3 amplitude and its known associations with disinhibited psychopathology and executive functioning on the one hand (i.e., externalizing), and low subjective response, the incentive salience of alcohol-related cues and craving on the other hand. The proposed model hypothesizes functional and neurobiological distinctions between the P3s in these different contexts and links these distinctions to separable pathways to AUD, consistent with the AARDoC initiative. Recent data from my lab and others consistent with elements of the proposed model will be presented. Discussion will center on the need to expand endophenotype approaches in addiction by considering cases in which different risk factors contribute independently to putatively similar neurophysiological responses tied to theoretically and empirically distinct phenotypes.

**ERROR MONITORING BRAIN POTENTIALS AS INDICATORS
OF FAMILIAL TRANSMISSION OF EXTERNALIZING
LIABILITY**

Jason Moser¹, Sharon Lo¹, & Brian Hicks²
¹Michigan State University, ²University of Michigan

Externalizing problems (rule breaking, aggression) are associated with low effortful control (ability to inhibit a dominant response and perform an alternative response), which likely accounts for difficulties inhibiting prepotent urges that results in impulsivity. Evidence of this association has mainly come from self-report and behavioral studies; however, more recent work has incorporated neural measures. The error-related negativity (ERN), an event-related brain potential, is

one such neural measure of effortful control that has been shown to be smaller in individuals with externalizing problems, indicating reduced engagement of frontal control networks. However, the nature of the relationship between externalizing and reduced ERN is unclear. We report on our work examining whether reduced ERN indexes a neural liability for externalizing problems that is transmitted in families. To test this idea, we draw from two studies involving children ages 3-13 years old and their biological parents selected for higher risk of externalizing problems. Results were consistent across both samples as the children of mothers with more externalizing problems demonstrated smaller ERN amplitudes. In contrast, fathers' externalizing symptoms were unrelated to child ERN. Further, the correlation between ERN amplitude in mothers and children was greater than the correlation between fathers and children. Results are consistent with reduced ERN being a neural indicator of familial transmission of externalizing liability that may be primarily transmitted through mothers.

**RESTING-STATE FUNCTIONAL CONNECTIVITY OF
ANTERIOR CINGULATE CORTEX AND SUBSTANCE USE: A
CO-TWIN CONTROL ANALYSIS**

Scott Burwell, Stephen Malone, Kathleen Thomas, Ruskin Hunt, & William Iacono
University of Minnesota

Current research suggests that resting-state functional connectivity (rsFC) between dorsal anterior cingulate cortex (dACC) and brain regions important for goal-directed behavior is reduced in individuals diagnosed with substance use disorders relative to controls. Yet, it remains unclear whether substance exposure itself causes diminished rsFC, or whether preexisting genetic and shared environmental vulnerabilities are responsible for this difference. A co-twin control (CTC) analysis may be used to distinguish shared familial effects from exposure effects by re-expressing an individual's substance use as between-pair (average exposure among twins from the same family) and within-pair (differing exposure among twins from the same family) use, respectively. Functional magnetic resonance imaging data and self-reports of prior substance use were acquired from a sample of 50 pairs of female twins (approximate age = 25 years). Consistent with published research, we found that rsFC strength between dACC and regions spanning thalamus and striatum was inversely related to quantitative measures of illicit substance use (marijuana, cocaine, amphetamine). Further examination using the CTC elucidated this association attributable to between-pair effects rather than within-pair effects. These results are consistent with a familial vulnerability to substance use behavior, and support the notion that reduced rsFC between dACC and these subcortical regions may serve as a potential endophenotype for substance use disorders.

**BRAIN MECHANISMS OF EXTERNALIZING PRONENESS:
RESULTS FROM FUNCTIONAL MRI STUDIES IN
ADOLESCENTS AND ADULTS**

Jens Foell, Sarah J. Brislin, Isabella Palumbo, Emily R. Perkins, & Christopher J. Patrick
Florida State University

The specific neural mechanisms behind externalizing proneness are not yet fully understood. It has been proposed that this personality trait reflects an inability to track implicit cues from the environment, leading to altered reactions to emotional stimuli when compared with healthy controls. To test this, trait disinhibition was assessed in the context of an emotional picture paradigm. The study also used functional magnetic resonance imaging (fMRI) to investigate brain activation during the viewing of emotional pictures as well as during a preparation phase. It was found that participants high in disinhibition showed less preparatory emotional activation in nucleus accumbens (relative to low-disinhibition participants), and that the same participants reacted with larger amygdala activation at the point of picture presentation. Furthermore, this amygdala effect was shown to be statistically dependent on the preparatory nucleus accumbens activation, suggesting that reduced anticipatory processing contributes to the noted overreactivity in affective brain regions. Another fMRI study, using a large-scale adolescent sample across different scanning sites in Europe, investigates similar effects in a monetary incentive delay task: analyses include brain activation data and externalizing proneness scales from more than 1800 subjects, which allows for the examination of subtle relationships between neural activation and externalizing traits.

1:30 P.M.–3:00 P.M.

Symposium 4.3

EXPLORING NEUROECONOMICS AND THE NEURAL BASES OF DECISION-MAKING

Chairs: Michael Inzlicht
University of Toronto

The field of neuroeconomics seeks to explain human decision making by using neuroscientific discoveries to guide models of economic behavior. It combines research methods from neuroscience, behavioral economics, cognitive and social psychology, as well as computational approaches from computer science and mathematics. Here, we present four talks that offer a sample of what the field offers, and demonstrate how physiological methods can be used to inform psychological models of choice. Dr. Cendri Hutcherson combines computational modeling with multivariate decoding of fMRI to determine whether there are common mechanisms for self-control across different value-based choice domains. Using eye-tracking, Dr. Milica Mormann examines how incidental emotions can impact people's attention to stock-price information, showing that physiological data can improve predictions of standard economic models. Dr. Uma Karmarkar examines the neural underpinning of decision-making under uncertainty, finding that valenced information differentially engages reward-related circuitry in ambiguous decisions. Using ERPs, Dr. Michael Inzlicht examines how the brain tracks subjective conflict during decisions involving personal trade-offs, finding that the brain is not only attuned to objective conflict, but also to fine gradations of subjective conflict. Together, these talks suggest that economic models can help inform our understanding of the neural and physiological correlates of decision making; but, also, that neuroscience can be used to improve psychological and economic models of choice.

NEURAL MECHANISMS OF COGNITIVE REGULATION IN SOCIAL AND NON-SOCIAL CHOICE

Cendri Hutcherson¹, Anita Tusche², & Antonio Rangel²
¹University of Toronto, ²California Institute of Technology

Does resisting cheesecake operate via the same self-control mechanisms as resisting the urge to act selfishly? We combined computational modeling with multivariate decoding of fMRI data to determine how the value of different choice attributes (e.g. a food's tastiness and healthiness, benefits for self and others) are reweighted when pursuing different self-control goals. Participants (n = 36) completed two choice tasks involving either foods varying in healthiness and tastiness or monetary proposals varying in benefits for self and others. In both tasks, participants made choices under "natural" and "regulated" conditions (e.g., "respond naturally", "focus on the food's healthiness", "focus on your partner's feelings"). Results suggest that although the neural mechanisms recruited to enact self-control overlap to an extent, there is also considerable differentiation as a function of choice domain. These results have important implications for understanding when and why self-control successes or failures correlate within an individual and across contexts.

THE ROLE OF ATTENTION AND EMOTIONS IN REFERENCE POINT FORMATION: AN EYE-TRACKING EXPERIMENT

Milica Mormann, Luke Nowlan, & Joseph Johnson
University of Miami

Financial outcomes are coded as gains or losses relative to the reference point. The literature shows that task-relevant information affects the reference point, e.g., when trading stocks, investors are influenced by stocks' previous prices. We

show that incidental information that is unrelated to the current decision task, specifically incidental emotions, also affect reference point formation. Using eye-tracking data we test the underlying mechanism. We conduct an experiment in which incidental emotions are manipulated prior to a stock-trading task. During the task, we measure i) participants' attention to key price regions on stock charts, and ii) participants' stated reference points for the stocks. We show that emotions affect how investors pay attention to financial information and that, in turn, this differing attention allocation influences reference point formation. In addition, we model the underlying process and show that physiological data can improve predictions of standard economic models.

THE REPRESENTATION OF VALENCE INFORMATION DURING AMBIGUOUS DECISION-MAKING

Uma Karmarkar¹, Shengxuan Ye¹, Vaida Rimeikyte², Erik Kastman¹,
Alexander Peysakhovich³, & Joshua Buckholz¹
¹Harvard University, ²Cornell University, ³Facebook

In many choice situations, people have incomplete knowledge, or face ambiguity about their options. Using fMRI, we compared how people process the favorable and unfavorable information they do have in such uncertain decisions. Participants (n=34) indicated their willingness-to-purchase tickets for games in which one poker chip was drawn from a bag of 100 red and blue chips. For each game, partial information about the color composition of the bag was revealed. Since a red chip draw meant "winning", the number of red chips shown represented the amount of favorable information, while blue represented unfavorable information. Whole brain analyses showed that the total amount of revealed information (red-blue) correlated with activity in dlPFC, striatum, and areas in OFC. Strikingly, NAcc appeared to track increasing amounts unfavorable information, while OFC and dlPFC activity varied according to favorable information. Thus we show that valenced information may differentially engage reward-related circuitry in ambiguous decisions.

THE CONFLICT NEGATIVITY: A NEURAL SYSTEM TRACKING PARAMETRIC VARIATION IN SUBJECTIVE CONFLICT DURING VALUE-GUIDED DECISIONS

Michael Inzlicht, Blair Saunders, & Hause Lin
University of Toronto

Decision-making often entails tradeoffs between various competing attribute dimensions. Although there is a rich neuroscience literature on the importance of conflict in instigating cognitive control, these conflicts are typically objective qualities of the stimuli or responses themselves (e.g., incongruent vs congruent trials; error vs. incorrect responses). Here, we ask if the brain tracks subjective conflict during decisions involving personal preferences and tradeoffs between choice options by measuring the Conflict Negativity (CN). In Study 1, we investigated decision conflict in a simulated stock market game. Participants were presented with pairs of stock options that varied by expected value, selecting one stock from each pair to add to their investment portfolio. Results suggest that the CN tracked decision conflict, and was larger for decisions between stocks of equivalent expected value compared to decisions where one stock was objectively more valuable. In Study 2, we investigated parametric variation in decision conflict by having participant perform a delay discounting choice task. We parametrically varied the amount of conflict in choice pairs by generating choices based on each participant's idiosyncratic hyperbolic discount function. Results indicate a large CN at the point of maximal conflict. The magnitude of this signal discerns not only high- vs low-conflict choices but also different ranges of decision conflict. Taken together, results indicate that the brain is not only attuned to objective conflict, but also to fine gradations of subjective conflict.

Poster Session Abstracts

POSTER SESSION I WEDNESDAY, SEPTEMBER 21, 2016

Poster 1-1

“THE SOUND AND THE FURY”: AFFECTIVE SOUNDS MODULATE BUT DON’T ELICIT AN LPP

Darin R. Brown, & James F. Cavanagh
University of New Mexico

Descriptors: emotion, LPP, multimodal

Emotion is thought to be an emergent construct of multiple primitive sub-processes. EEG is particularly sensitive to real-time neural computations, and thus is an excellent tool for the study of the construction of emotion. This series of studies aimed to probe the mechanistic contribution of the Late Positive Potential (LPP) to emotion perception. Experiment 1 (N = 23) revealed statistically significant differences in brain potentials between positive and negative valenced pictures (negative > positive), but not sounds. Interestingly, paired picture-sound conditions had the greatest differentiation. Experiment 2 manipulated this enhanced effect by altering the valence pairings with congruent (i.e. positive audio + positive visual) or conflicting emotional pairs (i.e. positive audio + negative visual). The results of Experiment 2 replicated the findings from Experiment 1, whereby negative visual stimuli evoked larger LPPs. Time frequency analyses revealed significant mid frontal theta-band power differences between conflicting and congruent stimuli pairs suggesting very early (>500ms) realizations of thematic fidelity violations. Together, these findings suggest that rapid mechanistic processes for affective valence are dependent on visual modalities, but these are enhanced by concurrent affective sounds, paving the way towards an understanding of the construction of multi-modal affective experience.

Poster 1-2

A “GOLDILOCKS EFFECT” IN TRIAL TIMING: PERFORMANCE AND NEURAL INDICES OF SELF- MONITORING DEPEND ON THE INTER-TRIAL INTERVAL DURATION

Rebecca Compton, Elizabeth Heaton, & Emily Ozer
Haverford College

Descriptors: cognitive control, ERN, error-monitoring

Seemingly trivial changes in task parameters may alter behavior and psychophysiological measures during task performance, contributing to variability across labs and potential failures of replication. Addressing one such parameter, this study assessed the effect of inter-trial interval (ITI) duration on self-monitoring. In a between-subjects design using a Stroop task, the ITI—the interval between a keypress response and next-stimulus onset—was 768 ms (Short ITI), 1280 ms (Medium ITI), or 1792 ms (Long ITI). All other task procedures were identical across groups. Participants in the Medium ITI group had higher accuracy ($F(2,32) = 3.9, p < .05$), better correct-error differentiation in the error-related negativity, even once group differences in accuracy were statistically controlled (Group x Accuracy, $F(2,31) = 6.5, p = .005$), and better error-correct differentiation in post-response alpha power (Group x Accuracy, $F(2,32) = 4.0, p < .05$), compared to the other two groups. These results imply a “Goldilocks effect” in which performance and self-monitoring are optimal when trial timing is neither too quick nor too slow. Moreover, post-error slowing (PES) decreased linearly with increasing ITI (Group x Previous-Trial Accuracy, $F(2, 31) = 5.3, p = .01$). The latter result is inconsistent with the notion that PES is an adaptive compensatory process, and better fits the idea that PES reflects arousal or confusion that dissipates during the ITI. Together results indicate that changes in trial timing can alter performance and error-related control processes.

Poster 1-3

A BAYESIAN APPROACH TO EVALUATING THE PSYCHOMETRIC PROPERTIES OF ERP MEASUREMENTS: THE ERP RELIABILITY ANALYSIS TOOLBOX

Peter E. Clayson
University of California, Los Angeles

Descriptors: psychometrics, generalizability theory, ERP measurement

Generalizability theory provides an approach for isolating and estimating multiple sources of measurement error, such as diagnostic status and numbers of trials needed for stable event-related brain potential (ERP) measurements. The present study demonstrates the use of an open-source Matlab program, ERP Reliability Analysis (ERA) Toolbox, to evaluate reliability using generalizability theory. The purpose of the toolbox is to characterize the reliability of ERP measurements to facilitate the calculation and reporting of these estimates. Present analyses examine the impact of numbers of trials and diagnostic status on the dependability of error-related negativity (ERN) measurements. EEG was recorded from 34 participants with major depressive disorder (MDD), 29 participants with an anxiety disorder (ANX), and 319 health controls while completing a modified Eriksen flanker task. A level of .70 was considered the threshold for acceptable dependability coefficients. The number of trials needed to obtain dependable ERN measurements was 13 for controls, 23 for the MDD group, and 41 for the ANX group. Dependability coefficients for the data including all trials were .90 for controls, .87 for the MDD group, and .78 for the ANX group. Coefficients remain unchanged when samples sizes were matched. This study highlights how the ERA Toolbox characterizes the dependability of a dataset, which may differ by sample, condition, electrode, etc., and explores the impact of numbers of trials on dependability. Such analyses can be beneficial either before or after undertaking a study.

Poster 1-4

A BIOBEHAVIORAL STUDY OF ATTENTIONAL BIAS MODIFICATION FOR ALCOHOL

Courtney Louis¹, Peter Luehring-Jones¹, Joshua Schwartz¹, Tracy Dennis-Tiwary^{1,2}, & Joel Erblich^{1,2,3}
¹Hunter College, The City University of New York, ²The Graduate Center, The City University of New York, ³Icahn School of Medicine at Mount Sinai

Descriptors: attentional bias modification, alcohol, electroencephalography

Past research on alcohol consumption shows that drinkers preferentially allocate attention toward alcohol-related stimuli in the environment. In the present study, the collection of scalp-recorded event related potentials (ERPs) during a dot probe task allowed us to examine the N2pc component as a measure of differential allocation of attention toward alcohol versus neutral images. Attentional bias (AB) toward alcohol cues was measured in a group of young adult social drinkers (N=44) before and after they were randomly assigned to complete either the active or sham version of a single-session attentional bias modification (ABM) training program designed to reduce AB to alcohol. We hypothesized that the modification of AB during the ABM training would alter the N2pc component indicating less allocation of attention to alcohol-related stimuli in the active training group. Counter to predictions, the N2pc did not differ between training groups. Instead, the magnitude of the N2pc significantly predicted post-training implicit associations about alcohol ($\beta = .559, t(20) = 3.016, p = .007$) in the active training group but not the sham training group ($\beta = -.139, t(20) = -.628, p = .537$), such that greater N2pc was associated with implicit avoidance of alcohol-related stimuli. While a single session of ABM training did not appear to modify the N2pc as a measure of selective attention, results suggest that the training did bolster an association between AB toward alcohol and implicit responses to alcohol-related stimuli. Treatment implications will be discussed.

R21AA020955 from NIAAA.

Poster 1-5**A LITTLE GOES A LONG WAY: LOW WORKING MEMORY LOAD IS ASSOCIATED WITH OPTIMAL DISTRACTOR INHIBITION AND INCREASED VAGAL CONTROL UNDER ANXIETY**

Derek P. Spangler, Lilian Hummer, Laura Braunstein, Xiao Yang, & Bruce H. Friedman
Virginia Polytechnic Institute & State University

Descriptors: anxiety, working memory, autonomic activity

Anxiety is marked by impaired inhibition of distraction (Eysenck et al., 2007). It is unclear whether these impairments are reduced or exacerbated when loading working memory (WM) with non-affective information. Cardiac vagal control has been related to emotion regulation and may serve as a proxy for load-related inhibition under anxiety (Thayer & Lane, 2009). The present study examined whether the enhancing and impairing effects of load on inhibition exist together in a nonlinear function, and whether there is a similar association between inhibition and concurrent vagal control. During anxiogenic threat-of-noise, 116 subjects (68 women, mean age = 19.28, S.D. = 2.78) maintained a digit series of varying lengths (0, 2, 4, 6 digits) while completing a visual flanker task. The task was broken into four blocks, with a baseline period preceding each. ECG was acquired throughout to quantify vagal control as high-frequency heart rate variability (HRV; .15-.4 Hz). Task HRV was computed with difference scores. There were significant quadratic relations of WM load to flanker performance ($B = -1.31$, $p = .045$) and to HRV ($B = -.015$, $p = .006$), but no quadratic association between HRV and performance emerged ($B = 3.91$, $p = .401$). Low load was associated with relatively better inhibition and increased HRV. Findings suggest that attentional performance under anxiety depends on the availability of WM resources, which might be reflected by vagal control. These results have implications for treating anxiety disorders, in which emotion regulation can be optimized for attentional focus.

Poster 1-6**CARDIAC VAGAL ACTIVITY IN COMPLEX PTSD**

Alisa Huskey¹, Caleb Lack², & Kyle Haws²
¹Virginia Tech, ²University of Central Oklahoma

Descriptors: respiratory sinus arrhythmia, complex PTSD, affect regulation

Distinctions in physiological reactivity between Complex PTSD (CPTSD) and PTSD diagnoses have yet to be examined. Dysregulation in the parasympathetic branch (i.e. vagus nerve) of the autonomic nervous system is implicated in emotion-regulation deficits. Dysregulation of these systems is presumed to be greater with the CPTSD symptom constellation, as these symptoms are characterized by dysregulation of many functional domains— affect, relationships, personalization and memory (dissociation), self-perception, meaning, and physiology (somatization). Vagal regulation was indexed via correlations between Respiratory Sinus Arrhythmia (RSA) and Heart Period (HP) over 3 epochs: baseline, stressor task, and recovery. Hypotheses were confirmed, indicating that vagal brake does not reengage during the recovery period in either the CPTSD ($N = 12$; $r = -.29$, ns) or PTSD ($N = 24$; $r = .02$, ns) groups; similarly, but unexpectedly, the control group did not demonstrate vagal re-engagement during the recovery period ($N = 18$; $r = .102$, ns). Further investigation indicates a main effect of diagnostic group on the RSA change by HP change interaction variable, $F(2, 51) = 3.318$, $p = .044$, $\eta^2_{\text{partial}} = .12$, obs. power = .603; specifically, RSA change from baseline was most pronounced in the PTSD group and HP change is most pronounced in the CPTSD group. As anticipated, average RSA is lowest in CPTSD group ($M = 5.52$, $SD = 0.31$) followed by the PTSD group ($M = 5.66$, $SD = .27$), and the control group had highest RSA ($M = 6.1$, $SD = 0.31$). This trend in average RSA was observed across epochs.

Research, Creativity, and Scholarly Activity Award University of Central Oklahoma.

Poster 1-7**ACTIVATION IN THE RIGHT ANTERIOR INSULAR CORTEX IN ANTICIPATION OF REWARD INFORMATION**

Yasunori Kotani¹, Yoshimi Ohgami¹, Nobukiyo Yoshida², Shigeru Kiryu², & Yusuke Inoue³
¹Tokyo Institute of Technology, ²The University of Tokyo, ³Kitasato University

Descriptors: stimulus-preceding negativity (SPN), insular cortex, reward

The right anterior insular cortex is involved in the salience network. The region is also a physiological source of the stimulus-preceding negativity (SPN). The SPN studies revealed that the SPN shows increased amplitudes before a feedback stimulus that conveys information whether a task response was correct or incorrect. On the other hand, the SPN is not observed before an instruction stimulus that has information about how to perform an experimental task. In the present fMRI study ($N = 30$), we added monetary reward information to an instruction stimulus to increase saliency of the instruction stimulus, and investigated if the right anterior insular cortex is activated even before an instruction stimulus when reward information is added to the stimulus. Participants were asked to perform a time estimation task where a visual stimulus was presented 3 seconds after the button press, and the content of information of the visual stimulus (instruction or feedback) and reward level (reward or no-reward) were manipulated. The analyses revealed that the right anterior insular cortex was more activated in the instruction/reward condition than in the instruction/no-reward condition. The region was also more activated in the feedback/reward than in the feedback/no-reward condition. These findings indicate that the right anterior insular cortex is activated even before an instruction stimulus when reward information is added to the stimulus, and suggest that the SPN might be observed before an instruction stimulus if reward information is added to the stimulus.

Poster 1-8**ACOUSTIC SEGMENTATION DEFICITS IN FIRST-EPISODE SCHIZOPHRENIA**

Brian A. Coffman, Sarah M. Haigh, Timothy K. Murphy, Kayla L. Ward, & Dean F. Salisbury
University of Pittsburgh School of Medicine

Descriptors: schizophrenia, auditory perception, sustained potential

Grouping of auditory percepts is necessary for interpretation of patterns. Long-term schizophrenia patients (Sz) have blunted responses to deviance from an established pattern, such as reduced mismatch negativity (MMN). Sz also show impairments segmenting groups of acoustic stimuli into discrete percepts, indexed by reduced N2 and sustained potential amplitudes in response to auditory patterns. Recent meta-analysis suggests that standard MMN is not much affected at first-episode of schizophrenia, but it is unknown whether acoustic segmentation is intact at early stage of illness. Nineteen FESz (within 6 months of first-episode), 20 age-matched healthy controls (FEHC), 20 Sz (minimum 5 years of disease), and 17 age-matched controls (SzHC) ignored tone groups while watching a silent video. Stimuli comprised 300 groups of three identical tones (1 kHz; 80 dB; 50 ms duration; SOA = 330 ms). Groups were separated by 750 ms ITI. Sustained potentials were measured from data filtered between 0.5-1.5Hz, from 300ms to 900 ms after onset of the first tone. Sustained potentials and N2 to initial and final tones were reduced in both Sz and FESz compared to matched controls ($p < 0.05$), and sustained potentials were correlated with negative symptoms as measured with the PANSS in FESz ($r = 0.3$). Individual item correlations were strongest for emotional withdrawal, poor rapport, and social withdrawal. These results suggest that deficits in auditory pattern segmentation in schizophrenia occur early in the disease course, and may compound deficits in higher-order cognitive functions.

NIH MH094328.

Poster 1-9**ACUTE EFFECTS OF DIFFERENTIAL, CONTEXTUAL INTERFERENCE, AND REPETITIVE BADMINTON SERVE TRAINING ON EEG BRAIN ACTIVITY**Diana Henz, & Wolfgang I. Schöllhorn
University of Mainz*Descriptors: EEG, motor learning, badminton*

Several studies have demonstrated increased learning rates in variable over repetitive practice. More specifically, this has been demonstrated for the contextual interference (CI) and the differential learning (DL) approach which are representatives of variable practice. To date, little is known on post-training effects on brain activity comparing CI and DL that contribute to the beneficial effect of variable over repetitive practice. In the present study, we compared post-training effects of repetitive, CI, and DL on electroencephalographic (EEG) brain activation patterns. Twenty-two semi-professional badminton players performed repetitive, CI, and two DL (gradual, chaotic) badminton serves in a randomized within-subjects design. Spontaneous EEG activity was recorded before, and immediately after each twenty-minute exercise. Increased theta and alpha activity was obtained in parietal regions in DL compared to repetitive training. After CI, increased beta and gamma activity was obtained in anterior areas. Occipital alpha activity was increased after repetitive training. Results indicate different underlying neuronal processes in repetitive training, CI, and DL. Our results suggest that DL stimulates the somatosensory system extensively, whereas CI affords specifically focused attentional processing located in anterior areas. Repetitive training induces rather visually guided attentional processing.

Poster 1-10**ACUTE EFFECTS OF NEUROBIKE CYCLING ON EEG BRAIN ACTIVITY AND ATTENTIONAL PERFORMANCE**Christian Merz, Diana Henz, & Wolfgang I. Schöllhorn
University of Mainz*Descriptors: EEG, cycling, attentional performance*

Recent electroencephalographic (EEG) studies have shown effects of gross-motor movements on brain activity and attentional performance. In the present study, we investigated acute effects of NeuroBike cycling on spontaneous EEG brain activity and on short-term attentional performance. NeuroBike cycling places high demands on motor control due to the joint in the center of the bicycle frame. Therefore, we expected stronger effects of NeuroBike cycling on EEG brain activity and attentional performance than cycling on a common bicycle. Subjects performed two trainings (NeuroBike, common bicycle) in a between-subjects design. Two training durations (10 and 20 minutes) were tested on a bicycle course followed by a 5-minute assessment of attentional performance. Spontaneous resting EEG was recorded before and after each training session, and during assessment of attentional performance. Heart rate (HR) was measured as control variable. Behavioral data showed a decrease in attentional performance with longer training duration on a common bicycle. Attentional performance was increased with longer training duration on a NeuroBike. EEG data revealed increased beta and gamma power in occipital and parietal areas during assessment of attentional performance after NeuroBike cycling. In line with previous studies, overall alpha and beta power was increased in the common bicycle group. No significant difference was obtained in HR between both groups. Our results indicate beneficial effects of NeuroBike cycling on short-term attentional performance that are mirrored in EEG brain activity.

Poster 1-11**AFFECTIVE MODULATION OF THE LATE POSITIVE POTENTIAL FOLLOWING REPEATED EXPOSURE TO CIGARETTE CUES IN SMOKERS AND NEVER-SMOKERS**Menton M. Deweese¹, Hannah L. Stewart¹, Kimberly N. Claiborne¹, Jennifer Ng¹, Paul M. Cinciripini¹, Maurizio Codispoti², & Francesco Versace³¹University of Texas MD Anderson Cancer Center, ²University of Bologna, ³Stephenson Cancer Center, University of Oklahoma Health Sciences Center*Descriptors: addiction, late positive potential (LPP), emotion*

Smokers reliably show higher reactivity to cigarette than neutral stimuli; however, never-smokers also show enhanced brain responses to cigarette cues, albeit less than smokers. Here, we recorded event-related potentials during a repetitive

picture-viewing paradigm to assess the effects of stimulus repetition on the amplitude of the late positive potential (LPP) in a sample of 23 smokers (SMO) and 29 never-smokers (NEV). We predicted higher LPP amplitude to cigarette cues in SMO, and habituation of the LPP response to cigarette cues in NEV, as a function of repetition. This pattern of amplitude modulation would suggest that cigarette cues are motivationally relevant stimuli only for SMO. In line with previous work, we observed greater LPP amplitude to pleasant ($p < 0.04$) and unpleasant ($p < 0.002$) cues relative to neutral, across repetition blocks for all subjects. Supporting our hypothesis, we observed greater LPP amplitude to cigarette cues relative to neutral in SMO ($p < 0.04$). Interestingly, NEV did not consistently habituate to the smoking cues. While SMO and NEV reported no difference in self-reported stimulus ratings of pleasant, unpleasant, or neutral stimuli (all $ps > 0.2$), NEV rated smoking cues as unpleasant ($p < 0.0001$). In sum, cigarette cues remained salient for both SMO and NEV following stimulus repetition. These data suggest that SMO and NEV both process cigarette cues as salient stimuli, but for different reasons: for NEV, cigarette cues are perceived as unpleasant, whereas for SMO these cues have acquired significance through repeated pairing with nicotine.

Menton M. Deweese and the research presented here are supported in part, by a cancer prevention educational award (R25T CA057730, Dr. Shine Chang, Ph.D., Principal Investigator), and by the MD Anderson's Cancer Center Support Grant (CA016672, Ron DePinho, M.D., Principal Investigator) funded by the National Cancer Institute.

Poster 1-12**AFFECTIVE STARTLE DURING UNPLEASANT PICTURES PREDICTS A FUTURE SUICIDE ATTEMPT IN VETERANS**Erin Hazlett, Nicholas Blair, Nicolas Fernandez, Kathryn Mascitelli, David Banthin, & Marianne Goodman
Icahn School of Medicine at Mount Sinai and James J. Peters VA Medical Center*Descriptors: startle eyeblink, emotion, depression, suicide*

Recent studies demonstrate that Veterans exhibit higher suicide risk compared with the general U.S. population. Despite increased attention to clinical risk factors of suicide and efforts to develop psychosocial interventions to reduce suicide risk, the underlying biological factors that confer this risk are not understood. This study examined whether baseline affective startle modulation (ASM), a metric of emotion processing, predicts a future suicide attempt at 12-mo follow-up in a transdiagnostic sample of Veterans at high risk for suicide. Participants were outpatients who underwent ASM just prior to being randomly assigned to the TAU arm of a larger study (6-mo randomized DBT trial). Suicide risk was determined using the Columbia Suicide Severity Rating Scale (10 ideators, 9 attempters). The ASM paradigm involved intermixed unpleasant, neutral, and pleasant pictures. At follow-up, 4 of 19 Vets had been hospitalized for a suicide attempt in the prior 6-mos. Logistic regression was conducted with suicide attempt (no/yes) as the dependent variable while baseline Beck Depression Inventory (BDI) score and mean ASM during unpleasant pictures were covariates. Results showed that the two categories of the target variable were perfectly predicted with no misclassification. Partial correlation indicated greater baseline ASM during unpleasant pictures (controlling for BDI) was associated with a future suicide attempt. Although preliminary, these findings suggest ASM during unpleasant pictures is a promising non-verbal, low-cost psychophysiological predictor of suicidal behavior.

This research was supported by a Department of Defense grant (W81XWH0910722) to EAH and MG; MPis), a VA Merit Award (I01CX00026) to EAH, and the VISN 2 South Mental Illness, Research, Education, and Clinical Center (MIRECC) at the James J. Peters VA Medical Center.

Poster 1-13**AFTER-EFFECTS SELF CONTROL ON ERPS TO ACOUSTIC STARTLE PROBES DURING EMOTIONAL IMAGES**

Anna J. Finley¹, Katie E. Garrison¹, Adrienne L. Crowell², & Brandon J. Schmeichel¹

¹Texas A&M University, ²Hendrix College

Descriptors: attention, self-control, event related potentials

We examined the after-effects of self-control on attention to acoustic startle probes during emotional images by assessing probe-elicited N1 and P3 ERPs. According to the process model of ego depletion (Inzlicht & Schmeichel, 2012), exercising self-control causes temporary shifts in attention. Prior research by Cuthbert et al. (1998) found startle probes elicit a larger N1 during negative images relative to positive and neutral images (reflecting selective attention to startle probes under threat), whereas the probe P3 is smaller during emotional relative to neutral images (reflecting resource allocation to emotional images). Participants were fitted with an EEG cap, completed either a free (n = 49) or controlled (n = 51) writing task previously used to manipulate self-control, then viewed a series of positive, negative, and neutral IAPS images interspersed with acoustic startle probes. Writing condition interacted with image type on the probe N1, such that N1 amplitudes in the free writing condition were largest during negative images relative to positive (replicating prior research), while in the controlled writing condition the N1 was largest during neutral images but did not differ between positive and negative images. The probe P3 was smaller in amplitude during emotional versus neutral images but was not affected by prior exercise of self-control. The aftereffects of self-control on neural responses to startle probes were thus seen only on the N1, suggesting that prior self-control exertion modulates early attentional capture by startle probes during affective images.

Poster 1-14**AGE AND GENDER DIFFERENCES IN ERPS ELICITED BY COMPLEX SOCIAL SCENES**

Jill Grose-Fifer¹, Danielle diFilipo¹, & Taylor Valentin²

¹John Jay College of Criminal Justice and The Graduate Center, CUNY,

²John Jay College of Criminal Justice, CUNY

Descriptors: adolescents, ERP, social

Adolescents are vulnerable to the dysregulating influences of motivationally salient stimuli, and in general, are more responsive to appetitive stimuli than adults. Few studies have examined whether social stimuli (photos of people) produce greater neural processing in adolescents than other appetitive stimuli. In this study, we recorded ERPs (N1, N2, and LPP) in response to pleasant photographs from the International Affective Picture System in 30 adolescents (12 to 17 years) and 29 adults (25 to 37 years). Half of the stimuli were complex scenes that featured pictures of people (mostly adults) and the other half were photos of comparable complexity, luminance, and contrast, but did not feature people. To maintain interest in the stimuli, participants were asked to respond to the infrequent appearance of a novel target. We found that compared to nonsocial images, social scenes elicited enhancements in early ERPs (larger N1 over right hemisphere) in adolescents, but only in later ERPs (LPP) in adults. Although we found no evidence for a female advantage for social information processing, males (regardless of age) had enhanced N2s for nonsocial relative to social stimuli. Our data suggest that adolescents may initially orient toward social information in a scene, perhaps to facilitate social categorization, and then use this information to decide whether further attention is required. In our study, social and nonsocial stimuli produced LPPs that were comparable in size in adolescents, suggesting that both types of stimuli were equally appetitive to them.

Support for this project was provided by a PSC-CUNY Award, jointly funded by The Professional Staff Congress and The City University of New York.

Poster 1-15**AGGRESSION, HEALTH, AND HEART RATE FROM TEEN TO ADULT YEARS**

J. Richard Jennings¹, Dustin Pardini², Adrian Raine³, & Karen Matthews¹

¹University of Pittsburgh, ²Arizona State University, ³University of Pennsylvania

Descriptors: adult health, heart rate, development

Low resting heart rate (HR) has been associated with higher aggressive behavior from childhood through adulthood. The reason for this linkage remains unclear: some postulate that individuals with a low HR may be relatively insensitive to punishment and/or engage in high risk antisocial behaviors to achieve a heightened level of arousal. High resting HR and autonomic reactivity though have been associated with the hostile affect and hostility linked to the development of cardiovascular disease. Does aggression or low HR of teens relate to health risk as they age into adulthood? In a longitudinal community sample of 203 men we asked whether HR levels, reactivity and hostility/aggression at teen and adult ages related to health in early middle age. Medical complaints, blood pressure, and metabolic indices assessed adult health. Measures were available in teen (mean age=16.1) and adult years (mean age=32.0). Buss-Perry and Cook-Medley measures of aggression and hostility were available as adults and the Zuckerman hostility/aggression scale as teens. Mean resting HR and HR reactivity to a similar speech challenge were significantly correlated between teen and adult years. Teen mean HR, but not reactivity, was negatively related to hostility/aggression. Developmental patterns of HR suggested reaching high HR in adulthood was related to poor health; low HR related to better health even though it continued to relate to aggression. These findings could not be accounted for by body mass index (BMI), change in BMI, socioeconomic status, race, health habits, or medication use.

This work was funded by NIH grant, RO1 HL11802.

Poster 1-16**ALCOHOL AND PREPOTENT RESPONSE INHIBITION: ERP EVIDENCE OF IMPAIRED COGNITIVE CONTROL**

Katherine P. Magruder, & John J. Curtin

University of Wisconsin - Madison

Descriptors: alcohol, cognitive control, ERPs

Theory suggests that alcohol impairs cognitive control processes required to inhibit prepotent responses. To test this theory, we examined alcohol's effect on task performance when an incorrect, prepotent response was activated. P3 and Error Related Negativity (ERN) were measured to assess processes related to stimulus evaluation and cognitive control.

Intoxicated (target BAC=.08%) and non-intoxicated participants performed a modified Flanker task. Each trial consisted of a string of 5 letters (H's & S's). Participants responded to indicate the center target letter while ignoring surrounding flanker letters. Flankers were either compatible (e.g., HHHHH) or incompatible (e.g., SSHSS), with compatible/incompatible trials equally probable. A prepotent response was established by manipulating target letter probability with one response more probable (p = .80) than the other (p = .20).

Alcohol did not impair behavioral response or P3 on incompatible flanker trials. Instead, alcohol produced response slowing that increased over time selectively on low probability target trials. Furthermore, alcohol reduced P3 on these low probability trials and ERN when errors occurred. These results suggest alcohol impaired response as conflict increased over trials. The alcohol effect on P3 to low probability targets and ERN combined with a pattern of within group correlations among measures to suggest this impairment resulted from alcohol-induced deficits in the cognitive control system responsible for initiating controlled, attentional processing required in this context.

Poster 1-17**ALPHA AND THETA PHASE-LOCKING AND SPECTRAL POWER DEFICITS IN BIPOLAR DISORDER IN THE AUDITORY ODDBALL PARADIGM**

Nancy B. Lundin¹, Giri P. Krishnan², Lisa A. Bartolomeo¹, Patricia D. Krempley¹, William P. Hetrick¹, & Brian F. O'Donnell¹

¹Indiana University Bloomington, ²University of California, Riverside

Descriptors: bipolar disorder, phase-locking factor, spectral power

Previous research findings demonstrate prominent electrophysiological deficits in bipolar disorder in the auditory oddball paradigm. However, the majority of clinical electroencephalography (EEG) studies utilizing the paradigm restrict their analyses to the temporal domain by only analyzing event-related potentials (ERPs), such as the P3 wave that is thought to represent context updating. Less is known about EEG-based abnormalities in the frequency domain that could relate to the etiology and symptomatology of bipolar disorder. We analyzed auditory oddball EEG data from subjects with bipolar disorder (n=84) and non-psychiatric controls (n=106). We measured P3 peak latency and mean amplitude, as well as event-related spectral power (ERSP) and phase-locking factor (PLF) in the theta and alpha frequency bands in the time range of the P3 from the target tones at the Pz electrode site. Our study replicated previous findings of blunted P3 amplitude and prolonged P3 latency to rare stimuli in bipolar disorder compared to controls. Additionally, we found decreased phase-locking in theta and alpha bands during the perception of rare stimuli in the range of the P3 wave in bipolar subjects, as well as decreased ERSP in the theta band. Decreased PLF indicates an increase in the variability of the electrophysiological response, consistent with deficits of timing and neural synchronization in bipolar disorder. Reduced theta ERSP in this group suggests further frequency domain deficits during context updating. Future directions will be to investigate prestimulus activity in this paradigm.

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Poster 1-18**AMPLIFIED PREFRONTAL NEURAL FUNCTIONING IN COGNITIVE CONTROL IS ASSOCIATED WITH ENHANCED WORKING MEMORY IN CHILDREN**

Diana A. Hobbs, Carl A. Armes, Mejdy M. Jabr, Eric Rawls, & Connie Lamm

University of New Orleans

Descriptors: working memory, cognitive control, developmental

In a model of prefrontal cortical functioning underlying cognitive control, Braver and colleagues utilized the AX-Continuous Performance Task (CPT) to highlight the relationship between proactive control and working memory. Specifically, working memory performance has been associated with a proactive strategy in cognitive control in young and old adults (Braver, T.S., Gray, J.R., and Burgess, G.C., 2007). We were interested in examining if proactive control also contributes to working memory capacity in children. Our study examined the relationship between proactive control and working memory in children (7-17 years of age) using event-related potentials. Specifically, we examined N2 amplitudes, a medio-frontal component that has been associated with aspects of cognitive control. We further inspected working memory capacity using the WAIS Digit Span, both forward and backwards. Results revealed that better digit span performance was associated with higher task performance (Forward: $\beta = .523$, $t(14) = 2.30$, $p = 0.037$) and greater (more negative) N2 amplitudes (Forward: $\beta = -0.70$, $t(14) = -3.07$, $p = 0.010$; Backward: $\beta = -0.78$, $t(14) = -2.07$, $p = 0.061$). These results indicate that enhanced working memory is associated with the recruitment of more prefrontal cortical resources. These results have implications for the evaluation of targeted working memory training programs in children.

Poster 1-19**AMYGDALA-PREFRONTAL CORTEX CONNECTIVITY IN PSYCHOTIC DISORDERS: A RESTING-STATE FMRI STUDY**

Amri Sabharwal, Eric Petrone, Roman Kotov, & Aprajita Mohanty
Stony Brook University

Descriptors: psychotic disorders, schizophrenia, resting-state fMRI

Psychotic disorders are debilitating conditions that involve significant and enduring impairments in cognitive and emotional functioning. Functional dysconnectivity models of schizophrenia suggest that cortical and limbic brain regions, associated with cognitive and emotional functions, interact abnormally to generate the schizophrenia phenotype. However, it is unclear if this altered connectivity is indicative generally of psychosis, or specifically of schizophrenia, and whether it is associated with symptoms and real-world functioning. Using a dimensional approach, the present study investigated resting state functional connectivity between amygdala and prefrontal cortex using an epidemiologic, diagnostically heterogeneous cohort of psychotic disorders (N=39) and never-psychotic matched adults (N=25). Preliminary results indicate that individuals with psychosis show greater resting-state connectivity between amygdala and inferior frontal gyrus (IFG) compared to never-psychotic individuals. Furthermore, greater connectivity between amygdala and IFG was associated with greater negative symptoms and greater impairment in real-world functioning across all psychotic disorders. Overall, these results elucidate the fronto-limbic functional connectivity that is involved in emotion-cognition deficits as well as its alteration in psychotic disorders. Although further research is required, the current findings show promise of a window into the pathophysiology of psychosis that can be translated into more effective transdiagnostic intervention approaches.

Poster 1-20**AN ELECTROPHYSIOLOGICAL INVESTIGATION OF THE EFFECTS OF EXPECTEDNESS, SENTENTIAL CONSTRAINT, AND PLAUSIBILITY ON MEMORY FOR WORDS**

Ryan J. Hubbard, & Kara D. Federmeier

¹University of Illinois at Urbana-Champaign

Descriptors: memory, language, prediction

Prior electrophysiological work has shown that sentence context information shapes online word processing, manifesting as facilitation for contextually expected words (e.g., in the form of N400 amplitude reductions), as well as processing consequences for unexpected but plausible (post-N400 frontal positivities) or anomalous (post-N400 posterior positivities) words. In a series of studies, we have examined the downstream consequences for memory of having contextual expectations confirmed or disconfirmed. Here, participants read sentences that ended with expected, plausible unexpected, and anomalous words, followed by a recognition memory test. Behaviorally, unexpected/anomalous words show high levels of recognition; however, participants also tend to false alarm to the words that were highly expected in those contexts but never seen. ERPs at test reveal multifaceted consequences of expectancy, constraint, and plausibility. Anomalous words elicit enhanced N1 responses, suggesting that they were attentionally "tagged". N400 responses are facilitated for old relative to new words, and particularly so for plausible unexpected words in strongly constrained contexts. Finally, only plausible unexpected items led to LPC old/new effects, suggesting greater recollection-based memory for these words. Overall, results reveal that violations of expectancy tend to grab attention and enhance memory, particularly when these words can be plausibly integrated into the context, but that, at the same time, expectations are not fully overridden and continue to have consequences for memory.

NIH James S. McDonnell Foundation.

Poster 1-21**AN EVENT-RELATED POTENTIAL INVESTIGATION OF THE ROLE OF FIXATION AND RACIAL CUES IN PERSON CONSTRUAL**

Hannah I. Volpert, & Bruce D. Bartholow
University of Missouri

Descriptors: social perception

Person construal is the process by which perceivers categorize others and interpret their significance. Precisely how this process unfolds during perception remains controversial. Here, ERPs and RTs were measured while participants (Ps) completed two tasks designed to investigate how visual fixation to typical (between the eyes) or atypical (the forehead) facial locations affect racial categorization when faces were either relevant or irrelevant to Ps' explicit task goals. Analysis of ERP amplitudes showed similar effects of race in both the N170 (structural encoding of faces) and the P2 (attention to threat) across tasks, such that Black faces elicited larger amplitudes than White faces ($F_s > 5.0$, $ps < .03$). Additionally, in both tasks P2 amplitude was larger when fixating between the eyes compared to the forehead ($F_s > 12.0$, $ps < .001$). More interestingly, when faces were task relevant (but not when they weren't) a Race x Fixation interaction emerged ($F = 7.0$, $p = .008$), such that Black faces elicited a larger P2 when Ps fixated on the eyes compared to the forehead ($p < .001$), with effect of fixation for White faces ($p = .202$). Furthermore, these neural responses had implications for overt categorization, in that variability in the sensitivity of the P2 response to race and fixation location predicted variability in categorization RT. Findings suggest that although some features of race are processed automatically regardless of top-down goals, other features appear to be goal-dependent. Implications of these findings for theories of person construal will be discussed.

Missouri Life Sciences Graduate Fellowship.

Poster 1-22**AN EXPLORATORY ANALYSIS OF THE EFFECTS OF TASK ENGAGEMENT ON FEEDBACK PROCESSING: AN ERP INVESTIGATION**

Matthew W. Miller, Marcos Daou, Caroline C. Meadows, Jence A. Rhoads, & Keith R. Lohse
Auburn University

Descriptors: feedback processing, engagement, ERPs

Evidence suggests that making a task more engaging increases task learning. A plausible mechanism for this effect is that increased engagement during task practice may enhance feedback processing and dopaminergic signaling, which are believed to facilitate learning. The present study began to test this theory. Specifically, we attempted to modulate participants' engagement during a task while indexing their feedback processing with ERP components reflective of dopaminergic signaling: the reward positivity (RewP) and feedback-related negativity (FRN). Specifically, 30 participants were randomly assigned to an engaging or sterile group, and all participants performed a stimulus categorization task. However, the engaging group was told their stimuli were goblins (as opposed to complex stimuli), and their task was to strike the goblins (as opposed to categorize the complex stimuli). Both groups received feedback stimuli identical with respect to physical properties: a checkmark for successfully striking the goblin/categorizing the stimulus, and an X for failing to strike the goblin/categorize the stimulus. The RewP and FRN were derived from ERPs time-locked to success and failure feedback, respectively. After completing 50 trials of the task, participants completed an engagement scale. The RewP, FRN, and the engagement scale did not differ between groups. Further, neither the RewP nor FRN correlated with the engagement scale. Future research may attempt to better manipulate engagement and provide greater statistical power for correlation analysis.

Poster 1-23**DIMINISHED CORTICAL PLASTICITY IN CHRONIC PHASE SCHIZOPHRENIA: AN ELECTROPHYSIOLOGICAL STUDY**

Amanda McCleery¹, Jonathan K. Wynn¹, Nora Polon², Warren Szwedczyk², Brian J. Roach³, Daniel H. Mathalon³, & Michael F. Green¹
¹University of California, Los Angeles; VA Greater Los Angeles, ²University of California, Los Angeles, ³University of California, San Francisco & San Francisco VA Health Care System

Descriptors: long-term potentiation (LTP), short-term plasticity (STP), event-related potentials

Cortical plasticity includes both short-term plasticity (STP) and long-term potentiation (LTP). Abnormalities in cortical plasticity are hypothesized to underlie the widespread cognitive impairment observed in schizophrenia. However, the extent to which plasticity is impacted in the illness is unclear. Here we present data from two electrophysiological paradigms that are thought to assess neural plasticity: 1) a roving standard auditory mismatch negativity (MMN) paradigm to probe STP, and 2) a visual high frequency stimulation (HFS) paradigm to probe LTP-like plasticity. We assessed 28 patients with chronic schizophrenia and 14 healthy controls. The schizophrenia group exhibited smaller MMN amplitude compared to controls [$F = 5.99$, $p = .02$, Cohen's $d = .80$]. Across participants, the MMN amplitude increased linearly as the number of repetitions of the standard tone in the series increased [$F = 14.07$, $p < .001$]. Regarding LTP-like plasticity, significant potentiation of the C1 amplitude was observed following HFS in healthy controls [$t = 3.34$, $p = .006$, Cohen's $d = 1.07$], but not in patients [$t = -.07$, $p = .95$, Cohen's $d = -.02$]. The effect size for between-group differences in C1 potentiation was medium in size [Cohen's $d = .51$]. These data suggest that both short-term and long-term plasticity is diminished in chronic schizophrenia. Further research is needed to understand the implications of impaired plasticity for cognition and functional outcome in patients.

VA Greater Los Angeles VISN 22 Mental Illness Research, Education, and Clinical Center (MIRECC) Pala Grant (PI: McCleery).

Poster 1-24**AN INVESTIGATION OF NICOTINE-WITHDRAWN SMOKERS' COGNITIVE AND EMOTIONAL PROCESSING OF ANTI-TOBACCO COMMERCIALS**

Russell Clayton¹, Rachel Tomko², Glenn Leshner³, Timothy Trull⁴, & Thomas Piasecki⁴

¹Florida State University, ²Medical University of South Carolina, ³University of Oklahoma, ⁴University of Missouri

Descriptors: cognition, message processing, tobacco

This experiment examined how nicotine-withdrawn tobacco smokers' process anti-tobacco commercials that vary in depictions of smoking cues and disgusting images. A 2 (smoking cues: present/absent) x 2 (disgust: high/low) x 3 (ads) repeated measures experiment was conducted. Participants were 50 nicotine dependent, adult tobacco smokers (Mage = 30; 54% male) who were instructed to abstain from tobacco for 12 hours prior to participating in the experiment. After measuring for nicotine withdrawal symptoms, participants randomly watched 12, 30-second ads in each message condition. Cardiac activity and skin conductance were collected for a five second baseline prior to each ad and were time-locked during message exposure. Participants reported self-report smoking urges and intentions to quit after each ad. An audio recognition test was given at the end of the study. The results of this experiment showed that the presence of smoking cues was associated with elevated craving reports. The combination of smoking cues and disgust images diminished craving reactivity slightly, but still resulted in craving that was more intense compared to ads containing only disgust. Disgust increased intentions to quit, but this effect was diminished when disgust and smoking cues were presented together. Heart rate acceleration, an indicator of defensive cognitive processing, was more pronounced for ads containing both cues and disgust compared to three other message conditions. Defensive processing was further reflected by poor recognition of message content for ads depicting both cues and disgust.

Poster 1-25**ANALYSIS OF MEG AS RELATED TO SPATIAL TRANSFORMATION AND TOP-DOWN CONTROL OF SACCADE BEHAVIOR**

Lindsey R. Tate¹, Nick Woodruff¹, Brett Clementz², & Lauren Ethridge³
¹University of Oklahoma, ²University of Georgia, ³University of Oklahoma Health Sciences Center

Descriptors: saccade, MEG, spatial transformation

Preparatory brain activity can provide insight into goal-oriented action and inhibitory processes related to both motor and cognition. In the current study participants performed an interleaved prosaccade (PS) and antisaccade (AS) task in which two checkerboards located in the cue/target locations to the left and right of the focal point flickered at different frequencies (12Hz and 15Hz). Participants (n=16) were cued as to trial type (AS or PS) and direction (left or right, 30 trials each condition), immediately followed by a saccade preparatory period wherein participants fixated on the central point (7500ms). At the end of the preparatory period, participants made a memory-guided saccade to the cue location (PS) or its mirror image location (AS). Neural oscillatory power locked in time to the checkerboard oscillatory frequencies was measured over occipital cortex over the preparatory period in 1750 ms bins to capture covert directional attention shifts related to spatial transformation from cue-to-target in AS, relative to PS in which no spatial transformation is necessary to correctly perform the task. The time-course of the 12/15 Hz power ratio for left and rightward AS suggests that participants were more likely to perform the attentional shift late in the preparatory period (5000 to 7500 ms post-cue) rather than immediately following cue presentation. Given that the attentional shift occurs closely coupled to the actual saccade generation, outliers in trial-wise shift timing may predict failure of inhibitory processes related to subsequent behavioral errors.

Poster 1-26**AUDITORY NEURAL OSCILLATORY SYNCHRONIZATION ABNORMALITIES ACROSS THE GAMMA FREQUENCY RANGE IN AUTISM SPECTRUM DISORDER**

Lisa De Stefano¹, Jun Wang², Stormi P. White³, Matthew W. Mosconi⁴, John Sweeney⁵, & Lauren E. Ethridge^{1,6}
¹University of Oklahoma, ²Zhejiang University of Technology, ³University of Texas Southwestern Medical Center, ⁴University of Kansas, ⁵University of Cincinnati, ⁶University of Oklahoma Health Sciences Center

Descriptors: autism spectrum disorder

Individuals with autism spectrum disorders (ASD) often have hypersensitivity to sounds and abnormalities in auditory cortex function. These abnormalities may be linked to inhibitory interneuron dysfunction. Inhibitory interneurons modulate synchronization of cortical oscillations, which have been found to be abnormal in EEG studies of ASD and rodent models of ASD; however the extent to which these abnormalities are present across a wide range of frequencies is unknown. The present study used a sensory entrainment task with dense array EEG to examine differences in auditory processing in children and adults with ASD and age- and sex- matched controls. Participants listened to 200 trials consisting of a 1000 Hz tone amplitude modulated by a chirp sinusoid linearly increasing in frequency from 0-100 Hz over two seconds. Data were analyzed using spatial PCA to define the auditory scalp topography and single trial time-frequency analyses to capture neural phase-locking across the chirp frequency range. Participants with ASD showed significantly decreased gamma phase-locking compared to controls in the 30-40 Hz range, $t(21) = 2.46$, $p = .02$, Hedges's $g = 1.02$, and in the 80 Hz range, $t(21) = 2.49$, $p = .02$, Hedges's $g = 1.04$. These results suggest that the inhibitory network function that determines the ability to phase-lock to an oscillatory stimulus is abnormal across both low and high gamma frequency bands in ASD. Translation of these findings to rodent models of ASD may provide additional insight on neural mechanisms and novel treatment options for auditory hypersensitivity.

Poster 1-27**ANXIETY IS ASSOCIATED WITH ENHANCED REACTIVITY TO EMOTIONAL CONTRASTS: A TRIAL-TO-TRIAL EXAMINATION OF THE LATE POSITIVE POTENTIAL**

Hans S. Schroder, Yanli Lin, & Jason S. Moser
 Michigan State University

Descriptors: anxiety, late positive potential, contrast avoidance

The contrast avoidance model posits that individuals with problematic anxiety are sensitive to sudden negative emotional shifts such as going from a relatively neutral or relaxed state to one of turmoil (Newman & Llera, 2011). As a result, these individuals use worry to try to maintain negative emotions in order to avoid experiencing sudden increases in affect. However, the neural underpinnings of this sensitivity to contrasts remain unknown.

We examined trial-to-trial influences on the late positive potential (LPP), an event-related potential that reflects emotion processing, during a picture-viewing task and its relationship to anxiety. Fifty participants viewed negative and neutral IAPS images presented randomly for 5 seconds each. Analysis focused on LPP amplitudes on negative-image trials that followed neutral (high contrast) or negative (low contrast) images.

Trait anxiety scores were positively correlated with LPP amplitudes on high-contrast trials at Fz ($r = .47$), FCz ($r = .44$), and Cz ($r = .35$; $ps < .05$), but were uncorrelated with LPP amplitudes on low-contrast trials ($-.01 > rs > -.16$). These data suggest that trait anxiety is associated with more attention allocation to negative imagery immediately preceded by neutral stimuli. Results provide the first neural support for the contrast-avoidance model by demonstrating heightened sensitivity to emotional contrasts among high-anxious individuals. The study also provides a novel technique in assessing emotional contrasts by examining LPP differences among particular trial sequences.

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Poster 1-28**ANXIETY SENSITIVITY MODERATES THE EXTENT TO WHICH GENERALIZATION OF PAVLOVIAN FEAR LEADS TO MALADAPTIVE INSTRUMENTAL AVOIDANCE**

Christopher Hunt, Samuel E. Cooper, Melissa P. Hartnell, John S. Gaffney, & Shmuel Lissek
 University of Minnesota, Twin Cities Campus

Descriptors: fear generalization, avoidance, anxiety sensitivity

Generalized Pavlovian fear and instrumental avoidance are central to etiological accounts of clinical anxiety. Although recent evidence links generalized Pavlovian fear to maladaptive avoidance, little is known about individual differences that may moderate this relationship. One potential moderator is anxiety sensitivity (AS), which captures the degree to which a person catastrophically misattributes anxiety-related bodily sensations as harmful and is also a robust risk factor for clinical anxiety. To test this relationship, a healthy college sample ($n = 95$) completed the Anxiety Sensitivity Index as well as a validated, generalized fear and avoidance paradigm. The paradigm measures both fear-potentiated startle and avoidance responses to previously conditioned danger (CS+: paired with shock) and safety cues (CS-) as well as generalization stimuli (GS) parametrically varying in similarity to CS+. On avoidance trials, participants choose whether to behaviorally avoid shock at the cost of poorer performance. Whereas avoidance during CS+ is considered adaptive, avoidance during GSs is considered maladaptive because shock is not possible and thus performance is unnecessarily compromised. Results indicate that AS positively moderates the relationship between generalized fear-potentiated startle and maladaptive avoidance, such that greater AS was associated with stronger maladaptive behavioral consequences of Pavlovian fear generalization. These results suggest that AS confers risk for clinical anxiety by facilitating transfer of Pavlovian fear to instrumental avoidance.

Poster 1-29**DETECTING THE SIGNAL FROM THE NOISE: PPI AS A MEASURE OF FILTERING EFFICIENCY**

Bryan D. Fox, Amanda J. Wilkes, Olivia D. Cross, Adriana M. Capraio, Grace M. Smith, Kong Hoang, Zach B. Wrehe, & Diane L. Filion
University of Missouri - Kansas City

Descriptors: attention, filtering, fatigue

Prepulse inhibition of startle (PPI) is frequently used as an index of sensorimotor gating, a process assumed to underlie efficient attentional function. However, it remains unclear which aspect of attentional processing is most closely related to PPI. The present study investigated whether PPI reflects individual differences in efficient filtering of environmental stimuli. We examined the relationship between PPI and a behavioral test of attention, hypothesizing that efficient discrimination between stimuli would correlate with PPI. Healthy college-aged volunteers (N=26) completed the Conner's Continuous Performance Task (CPT v.2) and a PPI assessment that included lead intervals of 30, 120, and 240ms. An ANOVA revealed that PPI differed across the three lead-interval conditions [$F(3,68) = 5.18, p = .006$], with the largest PPI occurring at the 120ms lead interval. Detectability (d') was calculated from the CPT as a measure of perceptual sensitivity in discriminating target signals from noise distributions, and correlations between d' and PPI at each lead interval revealed that d' was inversely related to PPI in both the 30ms ($r = -.52, p = .004$) and the 120ms condition ($r = -.67, p = .01$), supporting our hypothesis. These results indicate that participants with high PPI scores were faster at discriminating between target and distractor stimuli in the CPT, supporting the view that PPI reflects the efficiency of early attentional filtering. The implications of these findings as well as the relationship of PPI to self-reported fatigue and mood will also be discussed.

Poster 1-30**ASSESSMENT OF COGNITIVE CONTROL OF AUTONOMIC REGULATION IN CHILDREN USING THE METHOD OF PACED BREATHING**

Vladimir Trubachev¹, Vera Trubacheva¹, Andrei Gorbunov¹, & Evgeny Vaschillo²
¹Mari State University, Russia, ²Rutgers, The State University of New Jersey

Descriptors: children, cardiorespiratory plasticity, paced breathing

The cardiorespiratory plasticity in healthy children of 9-10 years old (n = 72) was studied during the procedure of paced breathing. The observations of every child after an informed consent taken from him, his parents and teachers were carried out by a psychologist, a physiologist and a doctor after the lessons. In a preliminary series 1 minute trials of paced breathing with various frequencies (22-5.5 times/minute) were used which showed a good endurance of slow breathing in children. In the main series a 3 minute baseline recording and 4-5 periods of 1.5 minute duration of paced breathing with a stepwise reduction of breathing rate of 12, 8, 7, 6 times/minute and in 10 children - 5.5 times/minute were registered. Computer-aided pacer set the durations of inspiration, expiration, and pause. Main parameters of heart-rate variability (HRV) and corresponding FFT spectra were analyzed with ANOVA. In children a high cardiorespiratory plasticity of heart rhythm according to frequency of paced breathing was observed. During the stepwise reduction of breathing rate a quasilinear growth of HRV and peak power of FFT spectra of RR-intervals was registered, reaching the maximum level in HF-band at frequency 12 breaths/minute and in LF-band at frequencies of 6-5.5 breaths/minute that were critical to the sustained volitional control of cardiorespiratory processing in children.

Poster 1-31**ASSESSING SOLDIER ADAPTABILITY: DECISION MAKING TO AUTHENTIC CHALLENGE**

Amy J. Hauffer¹, Jaime Arribas Starkey-El¹, Maria Davila², Paul Fernan¹, James Gavrilis¹, Joseph Kelleher¹, Bradford Lapsansky¹, Gregory Lewis², William McDaniel¹, Kelly O'Brien¹, Morgan Southern³, & Felipe Westhelle¹
¹Johns Hopkins University, ²UNC-Chapel Hill, ³The Asymmetric Warfare Group, U.S. Army

Descriptors: decision making, cognition, executive function

The increasingly complex, dynamic, and asymmetric nature of modern day warfare requires acute, real-time soldier adaptive decision making in order to meet changing and uncertain operational challenges. The purpose of this proof of concept study was to confirm the metrics of adaptive behavior at the individual level via relevant neuropsychological assessments, performance on controlled, mission-relevant test tasks, and direct measurement of psychophysiological responses during challenge. A positive relationship between adaptability and executive function was hypothesized. It was also hypothesized that lower scores on the Adaptability task would be associated with higher stress reactivity (less self-regulation) as indicated by lower HRV, faster HR, higher frequency of skin conductance responses and larger neuroendocrine responses. The sample consisted of healthy male (n=14) volunteers (M=34.85 yrs, SD=4.12) with active duty and leadership experience in the U. S. Army Combat Arms military occupational specialty. Higher scores on the Adaptability task were negatively correlated with Eriksen-Flanker RTs and positively correlated with 2-Back RTs. RSA suppression was significantly correlated with higher scores on the adaptability task ($r(7) = -0.56, p = 0.04$). Within subject examination indicated a pattern towards greater RSA suppression during 'best' responses and was observed significantly in the best performers. As an indicator of focused attention, RSA suppression appears to be associated with higher levels of adaptive decision making.

Funding for this project was provided by the Asymmetric Warfare Group, U. S. Army.

Poster 1-32**ASSESSMENT OF THE BIOMETRIC PERMANENCE OF THE CEREBRE BIOMETRIC PROTOCOL**

Maria Ruiz-Blondet, & Sarah Laszlo
Binghamton University

Descriptors: biometrics

Recent work has demonstrated that visually evoked event-related potentials (ERPs) display enough individual variation to be used as highly accurate brain biometrics. That is, individual ERPs are unique enough to serve as identifiers in the same way that fingerprints do. However, it is also well known that the brain is plastic, and that anatomical and functional brain organization changes over time. Therefore, it is unclear whether brain biometrics possess biometric permanence, that is, the characteristic of remaining stable over time. Here, we investigated this question by asking individuals to provide biometric data in the CEREBRE ERP biometric protocol, and then return to the lab to provide biometric data again between 5 and 10 months later. Results indicate that, even with delay of up to 10 months between data acquisition sessions, individuals can still be identified on the basis of their CEREBRE biometric data with 100% accuracy. This result suggests that, though individual brain anatomy does change over time and individual brain states fluctuate due to any number of factors (e.g., mood, wakefulness, stress), the CEREBRE protocol nevertheless displays at least 10 months of biometric permanence.

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Poster 1-33**BRAIN FINGERPRINTING DETECTS REAL CRIMES DESPITE \$100K REWARD FOR BEATING IT: CLASSIFICATION CONCEALED INFORMATION TEST WITH P300 OUTPERFORMS COMPARISON CIT**

Lawrence A. Farwell
Brain Fingerprinting Laboratories, Inc.

Descriptors: brain fingerprinting, concealed information test, p300

We applied the "brain fingerprinting" (BF) method of classification concealed information test (CIT) with P300 and P300-MERMER to detect concealed information on real crimes, including murders. Some had real-world judicial consequences (e.g., life in prison). 12 subjects were offered a \$100k reward for beating BF test and were taught countermeasures. We presented probe (relevant to crime, known only to perpetrator and investigators), target (relevant to crime, known to subject), and irrelevant words/phrases for 300 milliseconds every 3000 milliseconds, 1/6 probes, 1/6 targets, 2/3 irrelevants. Subjects pushed 1 button for targets, another button for all others. We computed a determination of information present or information absent and a statistical confidence for each subject. The BF classification CIT (probe responses to probe stimuli are classified as being more similar to targets or to irrelevants) detected presence/absence of crime-relevant information with 0% error rate, with median statistical confidence for individual determinations of 99.7%, using bootstrapping on double-centered correlations. Comparison CIT (probe responses compared to irrelevant responses to determine if they have larger P300 peak-to-post-peak amplitude; targets ignored) had 67% correct and valid determinations. 33% were invalid: nominal determination contradicted probability computation, i.e., computed probability of being correct was less than 50%. Median statistical confidence was 69%; as in all previous studies, for information-absent determinations it averaged approximately chance, 49%.

Poster 1-34**ATTENTION PROFILING IN RAJAYOGA MEDITATORS: EEG DYNAMICS AND TASK BASED FINDINGS**

Kanishka Sharma¹, Amritha Abdul. Salam¹, Richa Trivedi¹, Ashok Dubey², & Sushil Chandra¹

¹Institute of Nuclear Medicine & Allied Science, Defence R&D Organization, ²Division of Biotechnology, Netaji Subhas Institute of Technology, Dwarka, Delhi

Descriptors: long term meditation, attention network, electroencephalograph
Attention is a state of mind that links alertness, orientation and executive control. Meditation primarily enhances efficiency of brain regions, which govern attention. This study examines the effect on the attentional network of long-term raj yoga meditators using a single attention network task and dynamics of 64 channel EEG. Rajayoga Meditation taught by Brahmakumari's is a practice of self-regulation of mind, intellect and sub consciousness by engaging in a specific attentional set. Here we investigated the brain activations during meditation for long-term meditators and resting state for non-meditators using sLORETA. No other reported study has investigated the distinct meditation practice of Rajayoga and the brain activation patterns. Higher activations were observed on the parietal region for long-term meditators. Parietal activation is related to alerting and orientation. Anterior cingulate and Angular gyrus were among other activated regions. Brain activation pattern indicate higher self-awareness and alertness in long-term Rajayoga meditators. The behavioral study shows higher accuracy in the attention network task in long-term meditators when compared to control subjects.

Poster 1-35**ATTENTIONAL BIAS AND AUTONOMIC NERVOUS SYSTEM RESPONSE TO EMOTIONALLY LOADED STIMULI IN A DOT-PROBE TASK: EVIDENCE FROM SKIN CONDUCTANCE MEASUREMENTS**

Toshihiko Sato¹, Kento Takahashi², Naohiro Yamamoto³, & Toshiteru Hatayama⁴

¹Tohoku Bunka Gakuin University, ²Tohoku University, ³Yamagata Prefectural Police, ⁴Hachinohe Gakuin University

Descriptors: attentional bias, skin conductance response, a dot-probe task

The present study examines the association between individual differences in the magnitude of attentional bias and autonomic reactivity. Sixteen university students engaged in a dot-probe task, which consisted of 16 congruent, 16 incongruent, and 16 neutral trials. In congruent and incongruent trials, both angry and neutral expressions of the same face were presented simultaneously, while two neutral expressions were presented in neutral trials. Participants were asked to press one of two buttons to indicate which side of the screen contained a probe stimulus. The magnitude of attentional bias was calculated as the difference in mean reaction times between congruent trials, in which the probe was presented on the same side as the angry face, and incongruent trials, in which it was presented on the opposite side of the angry face. ECG and skin conductance responses (SCRs) were recorded for the duration of the task. Online analysis of the heartbeat interval was used to determine heart rate. Participants were then assigned to either a high or low attentional bias group. Subjects in both groups showed greater mean SCR values during the 10-second period after the onset of stimulus presentation in the congruent and incongruent trials when compared to those observed in neutral trials. In addition, mean SCR values were greater for participants exhibiting lesser degrees of attentional bias. These results suggest that the allocation of more attention to threat stimuli causes significant inhibition of early neural discharge in the sympathetic nervous system.

Poster 1-36**ATTENTIONAL CONTROL IN MEDIA MULTITASKING**

Eunsam Shin
Yonsei University

Descriptors: media multitasking, attentional control, individual differences

The current study investigated how the degree of media multitasking (MMing) is related with attentional control abilities using behavior and electrophysiological measures. Abilities to switch task sets and focus on a given task were tested using a number-letter and a book-reading task, respectively. In the number-letter task, classifying odd or even numbers and Korean consonants with or without double sounds was the number and the letter task, respectively. During this number-letter task, participants were presented with a cue "number" or "letter," followed by a target comprising a number and a Korean consonant. The cue category indicated which task to perform upon target appearance and was repeated or switched to the other category. For this task a switch cost (i.e., difference between switched and repeated trials) was calculated for RT and accuracy data. In the reading task, participants were repeatedly presented with a train of five distracting tones while reading a self-selected book. In the ERP, the N1 component reflects auditory attention. Its amplitude elicited by each tone was observed. Finally, each participant completed a media use questionnaire that assesses the degree of MMing. Results showed:(a) the switch cost in RT was larger for higher than for lower MMers; (b) N1 amplitude was similar for the first tone across the participants but was larger for the repeated tones in higher than in lower MMers. These results suggest that high MMing is negatively associated with the ability to switch task sets and to focus on a task while filtering out distracting stimuli.

This work was supported by the National Research Foundation of Korea Grant funded by the Korean Government (NRF-2014S1A5B5A07042485).

Poster 1-37**ATTENTIONAL SCOPE DIFFERENTIALLY IMPACTS ANTICIPATORY VERSUS CONSUMMATORY REWARD-RELATED NEURAL ACTIVITY**Ajay Nadig¹, Narun Pornpattananangkul², Nicholas J. Kelley¹, James Glazer¹, & Robin Nusslock¹¹Northwestern University, ²National University of Singapore*Descriptors: attention, motivation, reward*

Narrowing versus broadening attentional scope enhances motivation-relevant neural reactivity to appetitive stimuli (Gable & Harmon-Jones, 2011). It has also been demonstrated that appetitive (pre-goal) and consummatory (post-goal) positive affect engage distinct psychological and neural processes (Gable & Harmon-Jones, 2010). As such, although narrowing scope enhances the intensity of appetitive stimuli, it is unclear whether the same effect will be observed with consummatory stimuli. The present study clarifies this issue by investigating how altering cognitive scope differentially affects appetitive and consummatory neural processes in a rewarding task. Twenty-one participants completed an EEG task where each trial contained three stages: a cue that signaled whether winning money is possible, a classic Navon letters stimulus (Navon, 1977) which either narrowed or broadened attentional scope, and feedback that indicated whether the participant had pressed correctly and fast enough to earn money. As expected, in local versus global trials, the possibility of winning money had an enhanced effect on the Cue-N2, taken as an index of appetitive neural reward processes. Surprisingly, in global versus local trials, the valence of the feedback (positive or negative) had an enhanced effect on the Feedback-P3, taken as an index of consummatory neural reward processes. These results suggest that narrowing attentional scope enhances motivational processes only for appetitive stimuli, whereas broadening attentional scope does so for consummatory processes.

Northwestern University Office of Undergraduate Research.

Poster 1-38**ANODAL TRANSCRANIAL DIRECT CURRENT STIMULATION OF THE RIGHT DLPFC FACILITATES ATTENTION AS INDEXED BY THE LATE POSITIVE POTENTIAL (LPP)**Raoul Dieterich¹, Anna Weinberg², & Norbert Kathmann¹¹Humboldt-University of Berlin, ²McGill University*Descriptors: transcranial direct current stimulation (tDCS), late positive potential (LPP), attention*

The late positive potential (LPP) is frequently used to index attention to motivationally salient stimuli. A broad network of brain regions was identified as a neural correlate of the LPP, but it is unclear which regions are causally involved in modulating it. One potential candidate is the dorsolateral prefrontal cortex (DLPFC), which is engaged in attention and emotion regulation. We used anodal and cathodal transcranial direct current stimulation (tDCS) to temporally excite or inhibit the right DLPFC, respectively. Twenty-four undergrads underwent separate sessions of anodal, cathodal, or sham tDCS (20 min, 2mA, double-blind) of the right DLPFC. Thereafter, subjects performed two tasks featuring unpleasant and neutral pictures, in response to which the LPP was recorded: passive picture viewing, requiring active engagement of the pictures, and an emotional interrupt task, where pictures serve to distract a two-choice response. The order of stimulation and tasks was balanced across subjects. We observed broadly distributed increases in LPP amplitudes after anodal tDCS compared to sham. During passive viewing, this effect was sustained and specific to unpleasant pictures. During emotional interrupt, it was limited to the P3 interval but evident for both picture types. These findings suggest that exciting the right DLPFC is associated with facilitated attentional processing and that this region drives modulations of the LPP. However, this effect seems to be governed by context-dependent dynamics, differentially affecting its duration and specificity to stimulus valence.

Poster 1-39**AUDITORY PRIMING IMPROVES NEURAL SYNCHRONIZATION IN AUDITORY MOTOR ENTRAINMENT**Patricia L. Davies¹, Jewel Crasta¹, Michael H. Thaut², & William J. Gavin¹¹Colorado State University, ²University of Toronto*Descriptors: auditory motor entrainment, EEG, music therapy*

Neurophysiological research has shown that auditory and motor systems interact during movement to rhythmic auditory stimuli through a process called entrainment. This study explores the neural mechanisms underlying auditory-motor entrainment using EEG. Forty young adults were randomly assigned to one of two priming conditions: an auditory-only task or a motor-only task. Participants assigned to the auditory-only task listened to 400 trials of auditory stimuli presented every 800ms, while those in the motor-only task were asked to press a button rhythmically every 800ms without any external stimuli. After the priming condition, all participants completed an entrainment task requiring pressing a button along with auditory stimuli every 800ms (auditory-motor combined). For the combined task, time-frequency analysis of total power at C3 site indicated that the oscillations in the gamma and beta band were better synchronized with button presses for the group given the auditory-only task first compared to the group given motor-only first, indicating different neural processes based on the priming. T-maps of time-frequency analysis showed that the group given auditory-only first had significantly greater power around 200-300ms before the onset of the auditory stimuli, while the group given motor-only first had significantly greater power around 200ms after the onset of the auditory stimuli ($p < .05$). Results suggest that even brief periods of rhythmic training of the auditory system leads to shifts in neural synchronization of the motor system during the process of entrainment.

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Poster 1-40**DEVELOPMENTAL TRENDS OF THETA POWER FOLLOWING CORRECT AND INCORRECT RESPONSES DURING A FLANKER TASK**

Mei-Heng Lin, Patricia L. Davies, & William J. Gavin

Colorado State University

Descriptors: theta oscillation, correct-related negativity (CRN), latency variability

Correct-related negativity (CRN) is related to response monitoring in correct trials. Yet little is known about developmental trends of CRN theta oscillations. Latency variability of error-related negativity (ERN) has been shown to confound developmental trends of the ERN, which is associated with theta oscillations. We examined developmental trends of theta power in correct and incorrect trials from a Flanker task in 240 participants (7-25yrs). Two time-frequency analyses were performed at the trial level then averaged; before and after applying a Woody filter to adjust for latency variability in a window of 0-180ms after responses. Before latency variability adjustment, no age relationship with theta power was found in correct trials. However, theta power in incorrect trials significantly increased with age [cubic trend, $\beta = -5.19$, $t(236) = -2.55$, $p = .01$]. Comparisons of theta power between correct and incorrect trials revealed no significant differences after controlling for age, $F(1,238) = 0.81$, $p = .37$. After latency variability adjustment, theta power significantly decreased with age with different trends for correct and incorrect trials [Correct: quadratic trend, $\beta = 1.1$, $t(237) = 3.5$, $p = .001$; Incorrect: cubic trend, $\beta = -5.11$, $t(237) = -2.48$, $p = .01$]. Comparisons of theta power showed that theta power in incorrect trials was significantly larger than correct trials after controlling for age, $F(1,238) = 14.47$, $p < .001$. The different maturational timelines suggest different underlying neural mechanisms of response monitoring for correct and incorrect trials.

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Poster 1-41**AUTONOMIC DIFFERENTIATION FOR EMOTIONS? HOW ABOUT AUTONOMIC DIFFERENTIATION FOR EMOTION-ELICITING TASKS?**

Talar Simon¹, Kyle Berger¹, Bruce H. Friedman², & Jared J. McGinley¹
¹Towson University, ²Virginia Polytechnic Institute & State University

Descriptors: emotion, autonomic, respiration

Autonomic differentiation of emotions has been highly debated. Few studies, however, have focused on how multiple manipulations differentially contribute to the autonomic profile of the elicited emotions. The present study explored the degree of variation in respiration rate (RR) across emotions elicited by multiple manipulations. The participants were 64 undergraduates (28 female). The emotions of amusement, contentment, fear, and sadness were elicited via personal recall, film viewing, and standardized imagery. Respiration was collected using a thoracic strain gauge from which RR was extracted. Repeated measures ANOVA revealed that RR was more effective in differentiating the type of manipulation used to elicit an emotion than it was in differentiating emotions. Notably, the amusement and sadness conditions directionally varied in RR with increases for the film inductions, but reductions during recall ($ps < .005$). In contrast, none of the emotions were differentiable when analyzed within each manipulation (all $ps > .10$). In line with previous research presented at this conference (i.e., McGinley, Choi, & Friedman, 2015), there is continued support for univariate autonomic responses varying across manipulations targeting the same emotion. These findings yield continued support for the utility of multivariate-based research in autonomic patterning of emotion states. Additionally, these results suggest the importance of the demand characteristics of the method employed to elicit emotions.

Poster 1-42**BASAL EXHALED NITRIC OXIDE AND VASCULAR ENDOTHELIAL GROWTH FACTOR IN EXHALED BREATH CONDENSATE AND SALIVA PREDICT COLD SYMPTOMS AFTER ACADEMIC STRESS**

Thomas Ritz¹, Ana Trueba², Pia Vogel¹, & David Rosenfield¹
¹Southern Methodist University, ²University of San Francisco de Quito

Descriptors: immune system, respiration, stress

Prior research has demonstrated that psychosocial stress is associated with respiratory infections. Immunologic, endocrine, and cardiovascular predictors of such infections have been explored with varying success. We therefore sought to study the unexplored role of airway mucosal immunity factors, nitric oxide (NO) and vascular endothelial growth factor (VEGF). NO is secreted by airway epithelial cells as part of the first line of defense against bacteria, viruses, and fungi. VEGF is expressed by mast cells in respiratory infections and recruits immune cells to infected sites, but in excess lead to vulnerability of the airway epithelium. We measured exhaled NO, exhaled breath condensate VEGF, and salivary VEGF in 36 students (6 with asthma) undergoing final academic examinations at three occasions: a low-stress baseline during the term, an early phase of finals, and a late phase of finals. They also reported on cold symptoms at these time points as well as 5 and 10 days after the final exam stress period. Higher baseline levels of NO were associated with fewer cold symptoms after stress, whereas higher baseline levels of EBC and salivary VEGF were associated with more cold symptoms after stress. Changes in these immune markers during final exams did not contribute to the prediction of later cold symptoms. Asthma was associated with more cold symptoms after stress. Thus, habitual levels of NO and VEGF may serve as an indicator of mucosal immunocompetence, and hence can guide preventative treatments against airway infections from periods of stress in daily life.

This study was partly funded by a Southern Methodist University URC (University Research Council) grant (401608) to TR.

Poster 1-43**BASELINE FRONTAL ALPHA ASYMMETRY IS RELATED TO SLEEP AND QUALITY OF LIFE**

Alexandra Stephenson, Eric Watson, & D. Erik Everhart
 East Carolina University

Descriptors: EEG, sleep

Poor sleep is related to chronic health conditions, neurocognitive dysfunction, and impaired daily function. Reinforcement Sensitivity Theory (RST) has been employed to investigate individual differences associated with sleep disorders. RST consists of Behavioral Activation (BAS) and Behavioral Inhibition (BIS) Systems. BAS is associated with left frontal activity and approach, while BIS is associated with right frontal activity and withdrawal. In this study 53 college students were utilized to examine the relationships between BIS, BAS, sleep quality using the Pittsburgh Sleep Quality Index (PSQI), quality of life using the Short Form Health Survey (SF-12) and baseline alpha (8-13 Hz) frontal asymmetry scores ($\log[\text{right alpha}] - \log[\text{left alpha}]$) for five frontal scalp site pairs. Higher asymmetry scores indicate relatively greater left frontal activity. It was hypothesized that greater right than left frontal activity would be related to individual components of the PSQI and SF-12. This was partially supported. Greater right activity was associated with sleep duration for F3-F4, $r(52) = -.279, p < .01$, while the opposite was observed for sleep latency for F3-F4, $r(52) = .333, p < .05$, and sleep efficiency for F7-F8, $r(52) = .453, p < .01$, F3-F4, $r(52) = .308, p < .05$, and FT7-FT8, $r(52) = .354, p < .01$. Greater left activity was weakly associated with the physical component summary (PCS) of the SF-12v2 for FT7-FT8, $r(52) = .305, p < .05$. These results suggest that frontal asymmetry is related to sleep and life quality. Implications for these findings are discussed.

Poster 1-44**BEHAVIORAL AND ELECTROCORTICAL CORRELATES OF FEAR GENERALIZATION TO FACES - AN SSVEP STUDY**

Matthias J. Wieser, Lea Ahrens, & Paul Pauli
 University of Würzburg

Descriptors: anxiety, ssVEP, fear conditioning

Fear generalization is thought to contribute to the etiology of anxiety disorders, but little is known about its underlying brain mechanisms. As aversive learning experiences are reflected in short-term plasticity of the brain's sensory neurons, the present study examines fear generalization by assessment of mass neural activity in visual cortex. Sixty-seven participants were differentially conditioned to two faces flickering at a frequency of 12 Hz. Afterwards, in order to investigate fear generalization, four generalization stimuli (GS) were shown which were created by morphing the two original faces into each other in 20% steps. The conditioned response was measured via steady-state visually evoked potentials (ssVEPs), valence, arousal and US expectancy ratings. Analyses revealed significant generalization gradients in all ratings with highest fear responses to the CS+ and a progressive decline of these responses with increasing similarity to the CS-. In contrast, in the ssVEP signal a sharp discrimination between the CS+ and the GS most similar to the CS+ was observed, which might be interpreted as lateral inhibition in visual cortex. The observed dissociation among explicit and implicit measures points to different functions of behavioral and sensory cortical processes during fear generalization: While the ratings might reflect an individual's consciously increased readiness to react to threat, the lateral inhibition pattern in the occipital cortex might serve to maximize the contrast among stimuli with and without affective value and thereby improve adaptive behavior.

Poster 1-45**BINGE DRINKING ENHANCES N1 ASSESSED ALCOHOL CUE REACTIVITY**

Nicole C. Mechin, Samantha Thomas, Kary Reynolds, & Philip A. Gable
University of Alabama

Descriptors: alcohol, motivation, N1

Alcohol is an approach motivating substance. Exposure to alcohol cues can cause a narrowing of attentional scope (virtual alcohol myopia) related to approach motivation. Previous work also suggests that individuals high in approach motivation are at greater risk for hazardous drinking behaviors and demonstrate increased attentional biases toward alcohol related stimuli. However, it is unclear how hazardous drinking behaviors influence rapid appetitive attentional processing of alcohol related stimuli. The current study sought to investigate the relationship between binge drinking behaviors and early neural processing of alcohol and neutral cues. In addition, we investigated the impact of a manipulated attentional scope on this relationship. Attentional scope was manipulated by having participants identify local (or global) targets of hierarchical stimuli prior to cue exposure. A global attentional scope attenuated N1 amplitudes to alcohol cues. However, binge drinking related to larger N1 amplitudes in response to alcohol cues regardless of attentional scope. These results reveal that past binge drinking enhances rapid alcohol cue reactivity. Moreover, binge drinking enhances motivated attentional processing even when reactivity is attenuated by manipulations of attentional scope.

Poster 1-46**BLAST-RELATED MILD TBI SEVERITY AND CURRENT PTSD SYMPTOMATOLOGY ARE DIFFERENTIALLY ASSOCIATED WITH REGIONAL HOMOGENEITY IN PARIETAL CORTEX**

Casey Gilmore¹, Jazmin Camchong², Seth Disner¹, Nicholas Davenport³,
Kelvin Lim³, & Scott R. Sponheim³

¹Minneapolis VA Health Care System, ²University of Minnesota, ³University of Minnesota, Minneapolis VA Health Care System

Descriptors: traumatic brain injury, regional homogeneity, PTSD

Blast-related mild traumatic brain injury (mTBI), commonly reported in veterans of Operations Enduring and Iraqi Freedom (OEF/OIF), has been associated with (a) post-deployment rates of PTSD, and (b) long-distance resting state brain functional connectivity (FC) dysfunction. Little is known, however, about short-range spontaneous brain activity, or Regional Homogeneity (ReHo), in these veterans. This study used ReHo analysis to identify regional resting state FC associated with blast mTBI severity and PTSD symptoms. Six-minute eyes-closed resting-state fMRI was collected from 127 OEF/OIF veterans. Whole-brain ReHo maps representing local FC were calculated for each subject. Regression of blast mTBI severity scores with the ReHo values revealed a brain region in right parietal cortex, Inferior Parietal Lobule (IPL), that was negatively correlated with blast mTBI severity (Spearman's $\rho = -.19, p = .03$). Then, correlations between ReHo in IPL and scores on the Clinician Administered PTSD Scale (CAPS) revealed that higher ReHo in right IPL was correlated with higher current CAPS criterion B ($r = .27, p = .01$), criterion D ($r = .25, p = .02$), and Total scores ($r = .25, p = .02$). Blast mTBI severity was associated with lower magnitude of ReHo in right IPL. Increased ReHo in IPL was associated with greater PTSD symptomatology. IPL is involved in the retrieval of unpleasant experiences and recollection of previously experienced events, crucial aspects of PTSD. These results highlight the detrimental relationship between blast-related brain injury and neural dysfunction underlying PTSD.

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Poster 1-47**BLOCKING MIMICKRY - OR NOT?**

Ursula Hess¹, Christophe Blaison¹, & Gün Semin²
¹Humboldt University of Berlin, ²Instituto Superior de Psicologia Aplicada

Descriptors: facial mimicry, affective priming

Facial mimicry is the imitation of the emotional facial expressions of others. Mimicry is said to be an embodiment process that is relevant for emotional understanding. Studies aiming to block mimicry to assess the influence on emotional processes use various techniques. Two of these are instructions "don't move your face" and holding a pen in the mouth using the lips. We used these methods to "block" mimicry in an affective priming paradigm with a no block control condition. Facial EMG was recorded throughout at the Corrugator Supercilii (frown) and Zygomaticus Major (smile) sites. In all conditions a significant affective priming effect was found, suggesting that both primes and targets were processed.

EMG results showed consistent significant mimicry effects for Corrugator activity in response to angry versus happy targets, suggesting that the upper face was not affected by the manipulation. Results for Zygomaticus Major suggest inconsistent blocking effects depending on the preceding prime. In sum, the two blocking procedures tested only resulted in incomplete blocking. This incomplete blocking did not affect the emotional processes underlying affective priming.

Poster 1-48**BOTH SAFETY AND RELIEF INHIBIT CONDITIONED FEAR**

Marta Andreatta, & Paul Pauli
University of Würzburg

Descriptors: fear conditioning, safety vs. relief, SCR, startle response

Predicting threats is crucial for organisms' survival. Stimuli signaling threats elicit fear, while stimuli predicting threats' absence (safety) elicit appetitive responses. Termination of an aversive event is characterized by an appetitive response, called relief. Notably, relief-associated stimuli elicit appetitive response similar to safety signals. However, it is unclear, whether relief-associated stimuli can reduce fear as safety-associated stimuli do. Twenty healthy volunteers participated at the study. During conditioning, one geometrical shape (conditioned stimulus, fearCS) was presented before a painful electric shock (unconditioned stimulus, US), a geometrical shape (reliefCS) was presented after US, and a third shape (safetyCS) was never associated with US. During summation test, no US was delivered and fearCS was presented in compound with either safetyCS or reliefCS. After conditioning and test, fearCS was rated more negative, arousing, anxiogenic and associated with US compared to both safetyCS and reliefCS. Startle potentiation and larger skin conductance response (SCR) to fearCS compared to both safetyCS and reliefCS indicate successful acquisition of conditioned fear responses. As expected, SCR to fearCS was significantly reduced by the presence of safetyCS and interestingly also by the presence of reliefCS. Together, our results indicate that acquired fear can be inhibited by both safety and relief cues. Thus, relief does not only entail reward-like properties, but also safety-like properties and such safety-like properties seem crucial for reducing fear.

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Poster 1-49**BRAIN ACTIVITIES DURING HYPNOSIS-INDUCED RESTRICTION OF VISION: A REPLICATION**Wolfgang Miltner¹, Barbara Schmidt², & Holger Hecht²¹University of Trier, ²Friedrich Schiller University of Jena*Descriptors: hypnosis, P3b, individual differences*

We investigated ERP amplitudes/latencies (N1, P3a, P3b) and counting errors in 60 healthy participants with different levels of suggestibility who were exposed to a 3-stimulus visual oddball task. Participants were instructed to count a square that appeared in 10% of the trials. In the hypnosis condition, participants' vision was blocked by the suggestion of a wooden board in front of their eyes. In the non-hypnotic control condition, there was no visual blockade. Sequence of conditions was balanced across participants.

Replicating observations of a similar study with 19 participants presented at the 2015 SPR meeting, our new data reveal a) a significant increase of counting errors and b) significant suppression of late ERP amplitudes, most expressed in response to the counted infrequent stimulus (P3, slow wave) and an extension of ERP latencies in the hypnosis condition as compared to the control condition. These effects were modulated by the degree of suggestibility and most expressed in highly suggestible participants. Furthermore, similar N1 amplitude variations as a function of stimulus type in both experimental conditions indicate that the processing of stimuli was not affected by a modulation of attention to the stimuli during the hypnosis condition as compared to the control condition. Data are discussed within a framework of executive control, suggesting that the effects of hypnosis might be due to activities in frontal brain areas that suppress the activity of neural structures in occipital and parietal areas that are relevant for correct stimulus categorization.

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Poster 1-50**BRAIN DERIVED NEUROTROPHIC FACTOR GENOTYPE MODULATES RECOGNITION MEMORY RELATED EVENT RELATED POTENTIALS**Nicole S. McKay, Paul M. Corballis, & Ian J. Kirk
University of Auckland*Descriptors: recognition memory, BDNF, ERPs*

A common single nucleotide polymorphism (SNP) within the gene for brain derived neurotrophic factor (BDNF) is known to impact performance on recognition memory tasks. Previous research has identified two subcomponents of recognition memory, familiarity and recollection. Here we use EEG to dissociate the familiarity and recollection components of recognition memory using event related potentials (ERPs) gathered during a source recognition task. This task is comprised of an old-new discrimination and a source discrimination, allowing us to examine both familiarity and recollection processes. While the neural circuits that underpin each of these processes are related, a major distinction is that recollection is dependent upon the hippocampus. Given that genotype for BDNF impacts the expression of BDNF in the hippocampus it is of interest to examine how genotype for BDNF interacts with each aspect of recognition memory. Familiarity has been associated with modulations to the N400, while recollection has been associated with a late positive component (LPC). Our results show differences between the genotype groups for the overall patterns of these two ERP components. Val homozygotes show greater amplitudes of the N400 and LPC compared to Met allele carriers, despite both groups showing similar patterns of increased positivity for correctly identified old vs new items. We therefore conclude that Val homozygotes appear to show greater amplitudes for ERP components that index both familiarity and recollection.

Poster 1-51**ATTENTION DEFICIT PROBLEMS OF ADULTS AND TASK ORIENTED BIOFEEDBACK**Anna Vinkova
Moscow State University*Descriptors: attention-deficit disorder*

Attention deficit disorder (ADD) is likely to consider as a developmental disorder. However, adults' inattentiveness in computerized work produces crucial mistakes in human professional activity. We conducted 12 subjects aged 24-34 years, 7 of which were males, with ADD symptoms and developed a training technique using EEG biofeedback to form directed attention to special stimuli. The stimuli were real examples of human professions' tasks like searching mistakes in book-keeper's accountants.

The subjects received EEG biofeedback from two active electrodes Fz and Pz using the 10-20 International System. Each subject participated in about 20 trainings to increase beta activity according to the Othmer's protocol (Othmer & Othmer (1992)). Real adult subjects' working tasks were used as stimuli during training session. Before and after the series of trainings the subjects were tested by working task for searching mistakes in accountants. The results were processed statistically using Wilcoxon test.

After the trainings with biofeedback the results of testing the subjects with working tasks showed statistically significant increase in beta against the level before trainings ($p < 0.033$); increase in beta/alpha ratio ($p < 0.034$) and improvement in psychological tests for attention ($p < 0.034$). The subjects learned to increase their functional state activity level when solving working task and to reduce the number of errors to an acceptable minimum ($p < 0.014$).

The experiment shows the importance of the choice of stimulus material for ADD adults' biofeedback depending on the task.

Poster 1-52**BRAIN RESPONSES TO AFFECTIVE FACES IN AN EMOTIONAL STROOP TASK: HERITABILITY AND ASSOCIATIONS WITH CALLOUS-UNEMOTIONALITY**Isabella Palumbo, James R. Yancey, Sarah J. Brislin, Daniel Blonigen, & Christopher J. Patrick
Florida State University*Descriptors: ERP, N170, LPP*

Callous-unemotional (CU) tendencies have been linked to impaired recognition of affective (in particular, fearful) faces and reduced fMRI brain (amygdala) reactivity to such stimuli in young participant samples (Marsh & Blair, 2008). Cortical ERPs provide another means for examining responses to affective faces. Components of ERP response to fearful faces show high heritability in adults (Shannon et al., 2013) and appear sensitive to individual differences in CU tendencies (Brislin et al., 2016). The current work evaluated the heritability of three face-related ERP components, N170, P200 and LPP, in a large adult twin sample ($N \sim 400$) tested in an emotional Stroop task calling for identification of face stimuli as either fearful or happy, with superimposed words either matching or mismatching the expressed emotion. Consistent with data from other tasks, robust N170 and P200 responses were evident over temporal-occipital sites and central-parietal sites, respectively, in relation to affective faces. Twin-concordance analyses provided evidence for genetic contributions to these ERP components. Also consistent with expectation, scores on a measure of CU tendencies predicted reduced N170 and LPP amplitudes for faces of both types, suggesting that variations along this trait dimension are associated with deficits in both early recognition and later elaborative processing of affective face. Taken as whole, results suggest that N170 and LPP responses in an emotional Stroop task operate as heritable brain indicators of affect-processing deficits associated with CU traits.

Poster 1-53**BREW TO YOUR SCHOOL: UNIVERSITY AFFILIATION ENHANCES THE MOTIVATIONAL SIGNIFICANCE OF SPECIFIC BEER BRANDS**

Meredith P. Johnson¹, Chris Loersch², Tiffany A. Ito², Elizabeth E. Stillwell¹, Hannah I. Volpert¹, & Bruce D. Bartholow¹
¹University of Missouri, ²University of Colorado

Descriptors: P300, alcohol, advertising

Advertisers frequently leverage the affinity people feel for their ingroups to affiliate their products with those groups, implicitly conveying that those products are safe and trustworthy. This practice can have dangerous consequences when the product itself is inherently risky. Prior work from our lab shows that beer packaged in university colors is perceived to be safer than standard beer, and that strength of identification with the university is positively associated with P3 amplitude elicited by beer shown in a university context. Here, we used an evaluative conditioning procedure to mimic marketing approaches employed by alcohol beverage companies to create university affiliations with their products. Specifically, in a between-subjects design, underage, undergraduate student participants were repeatedly exposed to one of four critical stimuli pairings: a beverage brand (beer or water) paired with school logos (representing their university or a different university), in addition to other stimuli not paired with a university logo. They then completed a visual oddball task while ERPs were recorded, in which the beer and water brands appeared as infrequent targets amid more frequent neutral IAPS images. Findings suggest that the beer brand previously paired with students' university elicited larger P3 amplitude than beer previously paired with a different university, suggesting university affiliation enhances motivated attention to beer brands. Potential implications of university-affiliated beer marketing for underage drinking are discussed.

Poster 1-54**COGNITIVE AND AFFECTIVE STRATEGIES DURING GAZING AT ONE'S OWN FACE IN PATIENTS WITH MAJOR DEPRESSIVE DISORDER: AN EYE TRACKING STUDY**

Lyubomir Aftanas, Olga Akhmetova, Ivan Brack, Ekaterina Nikolenko, Konstantin Loktev, Alexey Tumyalis, & Konstantin Danilenko
 Federal State Scientific Budgetary Institution "Scientific Research Institute of Physiology & Basic Medicine"

Descriptors: psychopathology, emotion/affect

Self-face processing plays a vitally important role in the study of complex conceptions of self and its aberration in depression. We examined self-face processing in major depressive disorder (MDD) using eye-tracking. Eyes were tracked while 14 MDD patients and 14 healthy subjects (age and sex matched) viewed centrally displayed facial expressions (angry, happy, sad, neutral, famous and self-faces) for 15 s. Measures of biases in initial orienting and maintenance of attention were assessed. The participants also rated the complete set of the presented faces for the perceived intensity of 12 primary and secondary emotions in every face type. The MDD patients showed an avoidance of self-face features, particularly the eyes, but extensive scanning of non-features, compared with the controls. Beck Depression Inventory (BDI-II) scores significantly negatively correlated (Pearson correlations) with the first ($r = -0.38$; $p < .05$) and mean ($r = -0.46$; $p < .01$) fixation time on the eye region of the self-face. Furthermore, BDI-II scores significantly positively correlated with the perceived intensity of shame ($r = 0.68$; $p < .001$), guilt ($r = 0.56$; $p < .01$), disgust ($r = 0.47$; $p < .01$) and sadness ($r = 0.45$; $p < .05$) of the self-face. The findings suggest that attentional strategies for the active avoidance of salient facial features along with perceived negative emotionality (shame, disgust and sadness) of the self-face may be regarded as important potential markers of a distorted self-concept in MDD.

Keywords: Emotion; Major depressive disorder; Self-face processing; Eye Tracking;

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Poster 1-55**CARDIORESPIRATORY PARAMETERS CORRELATED WITH SELF-FORGIVENESS**

Kyle W. Eaton, & Thomas M. Ferrari
 Oakland University William Beaumont School of Medicine

Descriptors: self-forgiveness, heart rate variability (HRV), internal family systems

We are interested in the physiological correlates of self-forgiveness (SF). First, we collect psychometric data on stress levels, trait anger, and trait and state forgiveness. Participants are then connected to a 3-lead ECG, frontalis EMG, and respiratory belt (ADI PowerLab 26T, LabChart v8) and listen to a 40 min SF audio based on the Internal Family Systems (IFS) model. Afterwards, we re-administer the three forgiveness instruments. Our hypothesis was that ratings of SF, and possibly other-forgiveness, would increase after listening to the IFS-based audio. Scores did increase very significantly for all three forgiveness instruments (p -level = 0.005, 0.00001, and 0.008, $n = 15$), confirming the effectiveness of the IFS-based imagery. HR did not vary during the recording, but heart rate variability (HRV-SDRR) was significantly different from baselines during a guided relaxation ($p = .011$) as well as the SF portion ($p = 0.02$). A similar pattern was observed for HRV total power and the LF/HF ratio, but not the VLF or LF bands. Power in the HF band dropped significantly during the guided relaxation and remained significantly lower for the remainder. A significant decrease in respiration rate (BPM) for most participants also occurred during guided relaxation ($p = .001$) and was correlated with SF ($R = 0.56$, $p = 0.03$). BPM variability, inspiration t, and expiration t were also significantly different during the guided relaxation. The findings indicate the IFS-based SF intervention is effective and may be facilitated by enhancing parasympathetic tone.

Poster 1-56**CARDIOVASCULAR REACTIVITY DURING SCRIPT DRIVEN IMAGERY AND A SPEECH PERFORMANCE TASK IN POSTTRAUMATIC STRESS DISORDER (PTSD) AND COMORBID DEPRESSION**

Paula Castro-Chapman^{1,5}, Jessica Yanson^{1,5}, Suzanne Pineles^{2,3}, Scott Orr⁴, & Kristen Salomon⁵

¹James A. Haley VA Hospital, ²National Center for PTSD at VA Boston Healthcare System and ³Boston University School of Medicine, ⁴Harvard Medical School at Massachusetts General Hospital, ⁵University of South Florida

Descriptors: PTSD (combat stress), depression, cardiovascular reactivity

Depression is commonly associated with PTSD. Differential diagnosis is complicated by symptoms these diagnoses share, e.g., anhedonia, poor concentration, disrupted sleep. Research has shown PTSD to be associated with exaggerated physiological reactivity, whereas depressive symptomatology is associated with blunted reactivity. In the current study, individuals with PTSD, subthreshold PTSD and combat-exposed healthy controls completed a trauma-related script-driven imagery (SDI) task and a non-trauma speech task. Depressive symptoms were examined as a moderator of the relationship between PTSD status and cardiovascular reactivity. Depression symptom scores did not moderate cardiovascular reactivity during SDI. Depression did moderate the relationship between PTSD status and cardiovascular reactivity for: heart rate reactivity and pre-ejection period while preparing and delivering the speech (p 's $< .03$), systolic blood pressure during speech preparation ($p < .01$) and cardiac output during speech delivery ($p < .01$). These effects reflect a positive association between depression symptoms and cardiovascular reactivity in individuals with PTSD or subthreshold PTSD; depression enhanced, rather than dampened, responses. The presence of depression symptoms in the absence of PTSD resulted in blunted reactivity. Results suggest that cardiovascular reactivity in those with PTSD and comorbid depression may be distinctively different from depression alone. This difference may reflect both emotional and motivational dysregulation.

The study was partially funded by VA HSR&D and the James A Haley VA Research Service.

Poster 1-57**CHANGES IN BLOOD OXYGEN LEVEL-DEPENDENT (BOLD) RESPONSE TO AFFECTIVE PICTURE VIEWING AFTER ACUTE EXERCISE**

Lauren R. Weiss¹, Alfonso J. Alfini¹, Theresa J. Smith¹, & J. Carson Smith²
¹University of Maryland, College Park, ²University of Maryland

Descriptors: exercise, affect, fMRI

A single session of exercise is known to decrease negative affect and increase positive affect, but little is known regarding the brain systems underlying exercise-induced changes in affective responsiveness. We aimed to determine differences in brain activation during emotional picture viewing after acute moderate-intensity exercise compared to rest. Healthy young adults ($n = 8$) completed two conditions on different days: a 30-minute session of seated rest or moderate-intensity cycling exercise. Following rest and exercise, fMRI data were acquired while participants viewed 90 pleasant, unpleasant, and neutral pictures from the International Affective Picture System. The fMRI data were analyzed with the Analysis of Functional NeuroImages (ANFI) software package. Whole-brain analysis revealed main effects of Condition and Valence in several regions. A region of interest (ROI) analysis was conducted to examine the BOLD response to pleasant and unpleasant picture viewing in task-activated brain regions. Mean activation statistics were extracted from each ROI and submitted to a 2 (Condition) \times 2 (Valence) repeated-measures ANOVA and FDR corrected. Significant main effects of Valence were revealed in four regions, including the middle temporal gyri. A main effect of Condition was revealed in the left lingual gyrus, and a Condition \times Valence interaction was revealed in the left superior temporal gyrus, however; none of these effects survived the FDR threshold. The present study suggests a neural basis for changes in affective responsiveness and improved mood after exercise.

Poster 1-58**CHANGES IN CARDIOVASCULAR REACTIVITY IN RESPONSE TO EXPOSURE TO MULTIPLE AFFECTIVE STRESSORS: EXAMINING CHANGES IN RIGHT HEMISPHERE ACTIVATION IN HIGH AND LOW TRAIT ANXIOUS MEN**

Kate Holland¹, Cristina Blanco¹, Alana Rosa¹, Michael Doster¹, & David Harrison²

¹University of South Carolina Lancaster, ²Virginia Tech

Descriptors: sex differences, right hemisphere activation, trait anxiety

Sex differences in brain morphology indicate that men have a smaller anterior corpus callosum relative to women, resulting in a potential decrease in interhemispheric transfer of information conveying affect. High levels of trait anxiety have reliably been associated with increases in cardiovascular reactivity, which is proposed to be especially evident in high trait anxious men upon exposure to affective (right hemisphere) stress. High trait anxious men were predicted to show increased heart rate (HR) when exposed to 3 affective stressors. Men ($n = 110$) completed screening measures including the trait scale of the State-Trait Anxiety Inventory (STAIT), and were asked to identify 7 affective facial expressions. Simple linear regression analysis revealed that scores on the STAIT are a reliable predictor for the number of errors made in identification of facial expression of emotion ($F(1, 109) = 5.262, p = .02$). Ten high anxious and 10 low anxious men meeting our inclusion criteria were exposed to 3 right hemisphere stressors. A main effect for HR was found ($F(1, 18) = 6.47, p = .02$), indicating that high anxious men had higher HR across all conditions. Moreover, a Trait \times Condition interaction for HR was found ($F(3, 54) = 4.93, p = .004$), indicating that HR for low anxious men remained stable across the experimental conditions relative to high anxious men. These results were not significant when analyzing the same data obtained from women. The results indicate that right hemisphere neural systems are especially compromised in high anxious men upon exposure to multiple affective stressors.

Poster 1-59**CHILD EMOTION REGULATION AND SOCIAL CONTEXT: A MULTI-MODAL PHYSIOLOGY STUDY**

Sarah Babkirk, Jean Quintero, Samantha Birk, Joshua Schwartz, & Tracy Dennis-Tiway
 Hunter College, The City University of New York

Descriptors: emotion regulation, the late positive potential, developmental psychophysiology

Emotion regulation (ER), the ability to modulate emotions, predicts adjustment in childhood. This study examined two biosignatures of child ER: the late positive potential (LPP) and respiratory sinus arrhythmia (RSA). While RSA is a well understood index of child ER, the LPP's utility in children is unclear. We examined the LPP during developmentally-relevant social contexts in a directed reappraisal task (DRT), in relation to RSA. Twenty-seven 5- to 8-year-olds ($M = 6.89, SD = 1.01$) completed a baseline RSA measure and a DRT with EEG in one of three social contexts [parent scaffolding (PS), parent present (PP), or parent absent (PA)]. The LPP was generated for three conditions in the DRT (reappraisal, negative appraisal, neutral). A repeated-measure ANOVA showed a Condition \times Group interaction, $F(4, 48) = 3.72, p = .01, \eta^2 = .24$. For PS and PP groups, but not the PA group, children showed reduced LPPs via reappraisal versus negative [$t(9) = 2.30, p < .05, d = 1.53$ vs $t(8) = 2.52, p < .05, d = 1.78$]. There was no significant correlation between RSA and LPPs ($p > .05$). RSA and LPPs were compared to behavioral ER strategy use in an emotionally challenging waiting task (WT). Greater reappraisal-induced reduction of the LPP was related to less withdrawal ($r = -.62, p < .05$), while greater resting RSA was related to more self-comforting ($r = .65, p < .05$). Findings substantiate the LPP as a context-sensitive index of child ER, suggesting that children's ER is bolstered by the parent's presence. Also, the LPP may reflect ER processes distinct from those indexed by RSA.

Poster 1-60**CHILDHOOD MALTREATMENT AFFECTS ATTENTION TO THREATENING FACIAL EMOTION IN ADULTHOOD: EVIDENCE FROM THE LATE POSITIVE POTENTIAL**

Aislinn Sandre, Paige Ethridge, Insub Kim, & Anna Weinberg
 McGill University

Descriptors: child maltreatment, late positive potential, emotion

Maltreatment in childhood can lead to long-lasting difficulties in regulating emotions within social contexts, and thus confer greater risk for anxiety and depression. One explanation for this is that maltreatment may increase attention to interpersonal, threat-related cues. The Late Positive Potential (LPP) is a useful neural marker of attention to threat, as it reflects preferential processing of motivationally-salient information. The present study, therefore, sought to explore the influence of childhood maltreatment on LPP modulation by ambiguous and non-ambiguous facial threat. To that end, we examined modulation of the LPP during the viewing of morphed anger and fear faces in individuals reporting a childhood history of moderate emotional abuse ($n = 21$), and a control group of individuals reporting no history of emotional abuse ($n = 50$). Participants viewed 108 blends of angry-neutral or fear-neutral faces (e.g., neutral, 25% angry, 50% angry, 75% angry, 100% angry) presented for 300 ms, and rated faces according to level of affect expressed. Across groups, as emotional intensity increased, both the LPP and ratings of emotional intensity increased in a linear fashion. Additionally, maltreated individuals showed larger LPP amplitude when viewing 100% fearful faces than controls; the two groups were comparable in their ratings of faces and LPP to angry-neutral face morphs. These findings indicate that childhood experiences of maltreatment may have long-lasting effects on allocation of attention and sensitivity to selective, threatening interpersonal signals.

Poster 1-61**CLAUSTRUM FUNCTIONAL CONNECTIVITY DEFICITS ASSOCIATED WITH ABNORMAL VISUAL PERCEPTION IN SCHIZOPHRENIA**

Seung Suk Kang, & Scott R. Sponheim
 Minneapolis VA Health Care System; University of Minnesota

Descriptors: schizophrenia, visual perception, the claustrum

Hallucinations and perceptual deficits are hallmark symptoms of schizophrenia, but their precise neural mechanisms have not yet been clarified. Recent findings suggested that hallucinations might be related to abnormalities in the claustrum. The claustrum, a thin grey matter deep brain structure, has uniquely high structural connectivity with almost all cortical regions. The claustrum has been hypothesized to be a neural locus of conscious awareness, enhancing perceptual salience through its neural oscillatory synchronization with sensory cortical regions. To investigate if claustral-cortical functional connectivity is impaired in people with schizophrenia (SZ), we collected magnetoencephalography (MEG) from 12 SZ and 12 healthy controls while they performed a visual perception task. The claustrum volumes were segmented using individual T1-weighted MRI and cortical/claustral source time-series were computed using individual head-models and L-2 norm source localization algorithm with depth-weighting. It was found that early evoked (40-140 ms) and late induced (400-600 ms) gamma frequency (30-120 Hz) neural oscillations increased in interregional phase synchrony between the claustrum and visual cortices during degraded target detection. Notably, the induced gamma synchrony between the right claustrum and visual cortices that were highly predictive of target detection sensitivity (d') were largely diminished in SZ, especially in SZ with prominent visual hallucinations, suggesting that deficient claustral-cortical synchrony might lead to hallucinations in SZ.

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Poster 1-62**ABNORMAL SPONTANEOUS NEURAL ACTIVITY IN PTSD: A RESTING-STATE META-ANALYSIS AND fMRI VALIDATION**

Seth Disner¹, Craig Marquardt², Bryon Mueller²,
 Philip Burton², & Scott R. Sponheim²
¹Minneapolis VA Health Care System, ²University of Minnesota

Descriptors: PTSD, resting-state fMRI, meta-analysis

Posttraumatic stress disorder (PTSD) is a common focus for neuroimaging research due to widespread prevalence in military and civilian populations. The majority of published functional neuroimaging studies and all known functional meta-analyses of PTSD have examined task performance and/or exposure to affective stimuli. However, spontaneous neural activity at rest (measured using methods such as positron emission tomography and amplitude of low frequency fluctuation) may provide valuable insights about localized abnormalities contributing to the pathophysiology of PTSD. The current study used activation likelihood estimation (ALE) meta-analysis on 15 published resting-state neuroimaging studies (N=314 PTSD cases; 437 controls) to identify regions of divergent spontaneous activity in participants with PTSD. Results suggest individuals with PTSD experience greater spontaneous neural activity in the bilateral subgenual anterior cingulate, left inferior parietal lobule, and bilateral cerebellar tonsil. These areas were used as regions of interest in a resting-state fMRI analysis of an independent sample of combat-exposed US Army veterans (N=248). The analysis aims to validate the ALE findings and determine if spontaneous neural differences are correlated with specific PTSD symptom clusters. Results add to our understanding of the neural underpinnings of PTSD while providing guidance for future rehabilitative interventions.

Poster 1-63**AUDITORY PROCESSING ABNORMALITIES IN SCHIZOPHRENIA AND A PRELIMINARY ANALYSIS OF POLYGENETIC RISK.**

Christopher Hollowell¹, Elle Stahura¹, Seth Disner², & Scott R. Sponheim³
¹Minneapolis Veteran Affairs Health System, ²Minneapolis VA Health Care System, ³Minneapolis VA Health Care System; University of Minnesota

Descriptors: schizophrenia, ERP, genetics

Event-related potentials (ERPs) have been extensively used to document auditory processing abnormalities in schizophrenia as well as neural anomalies associated with genetic liability for the disorder. It remains unclear whether such auditory processing abnormalities are evident in other severe mental disorders such as bipolar affective disorder and what specific aspects of genetic liability are most related to the documented ERP abnormalities. The current study used a dichotic listening task to examine abnormalities in the N100 and P300 components in patients with schizophrenia (n=60). Bipolar disorder patients (n=46) were included to examine the diagnostic specificity of findings and first-degree relatives of the schizophrenia patients (n=48) were examined to additionally explore the possible effect of genetic liability for the disorders on aberrant neural responses. It was found that schizophrenia patients, bipolar patients, and the first-degree relatives of schizophrenia patients displayed significantly smaller N100 peak amplitudes and P300 mean amplitudes compared to healthy controls. A preliminary follow-up analysis calculated a polygenic risk score (PGRS) for each individual, which was derived from 75 single nucleotide polymorphisms previously linked to schizophrenia based on a large genome-wide association study. However, the PGRS was not associated with electrophysiological differences observed between groups. Although deviant auditory processing is associated with severe psychopathology relevant aspects of genetic variation remain unknown.

Poster 1-64**COGNITIVE LOAD IN MILD TRAUMATIC BRAIN INJURY: A PUPILLOMETRIC ASSESSMENT OF MULTIPLE ATTENTIONAL PROCESSES**

Jamie N. Hershaw, & Mark L. Ettenhofer
 Uniformed Services University of the Health Sciences

Descriptors: pupillometry, attention, mild traumatic brain injury

Individuals with a history of mild TBI may have an impaired ability to allocate sufficient neural resources necessary to successfully complete cognitive tasks. Due to this reduced cognitive efficiency, cognitive tasks may impose greater cognitive load on individuals with mild TBI compared to their uninjured counterparts. Using pupillary measures of cognitive load, this study sought to test the effect of mild TBI on multiple attentional processes, including alerting, orienting, and controlled attention. The relationship between cognitive load as indexed by pupillometrics and behavior was also assessed for both the mild TBI group and controls. The mild TBI group (n=25) had faster response time to controlled attention (invalid spatial cues) trials but were similar to controls (n=51) for alerting (temporal cues) and orienting (valid spatial cues) trials. Pupillometry data showed that the clinical sample had smaller baseline pupil diameter, greater baseline pupil diameter variability, and greater cue-locked pupil diameter variability for controlled attention trials than controls. Additionally, larger pupil diameter in response to task-relevant stimuli correlated with faster response time. Consistent with prior literature, the current study indicates that individuals with a history of mild TBI experience greater cognitive load during controlled attention tasks. The data also suggest that those with mild TBI engage in less preparatory activation, but rather employ a reactive cognitive strategy in response to task-relevant stimuli and this strategy is behaviorally beneficial.

Poster 1-65

**COGNITIVE REAPPRAISAL INTERACTS WITH
MOTIVATION-RELATED NEURAL RESPONSES TO SAD
FACES TO PREDICT INDIVIDUAL DIFFERENCES IN
ADOLESCENT PROSOCIALITY**

Jonas G. Miller, David Weissman, Amanda E. Guyer, & Paul D. Hastings
University of California, Davis

Descriptors: empathy, cognitive reappraisal, prosocial behavior

When does the motivational salience of reflecting on how adolescents feel in response to the distress of others contribute to empathy/prosociality? This study tested the role of cognitive reappraisal in linking activation of motivation-related neural regions to sad faces with empathy and prosociality. 228 Mexican-origin youth reported on their prosociality and use of reappraisal, and underwent fMRI while viewing sad faces. The fMRI task included two conditions – an affective condition in which youth were asked to rate how sad each face made them feel, and a non-affective condition in which they were asked to rate how wide the nose was for each face. We created a region of interest containing the nucleus accumbens and ventral tegmental area to examine mesolimbic (ML) response to the affective versus non-affective contrast. Boys and girls differed in ML response to affective versus non-affective condition being related to prosociality. Boys who showed a greater ML response to the affective condition were more prosocial when they reported high reappraisal, but were less prosocial when they reported low reappraisal. In addition, prosocial boys who showed a ML response reported feeling more sadness, whereas less prosocial boys who showed a ML response reported feeling less sadness. Conversely, reappraisal predicted prosociality in girls who showed a greater ML response to the non-affective compared to the affective condition. Implications for the roles of emotion regulation and gender in transforming adolescent motivational processing into prosociality will be discussed.

Poster 1-66

**COMPARATIVE ANALYSIS OF THE STOP-SIGNAL AND GO/
NOGO TASK PERFORMANCE: A FMRI STUDY**

Julia A. Marakshina, Natalia S. Buldakova, Alexander V. Vartanov,
Julia A. Isakova, Vladimir V. Popov, Aleksandr A. Baev,
Andrey A. Kiselnikov, & Stanislav A. Kozlovskiy
Lomonosov Moscow State University

Descriptors: cognitive control, response inhibition, fMRI

Previous studies of mechanisms of response inhibition revealed that the left brain hemisphere mainly relates to the Go/NoGo task performance while the right hemisphere is activated in the Stop-signal task. We compared fMRI activation in execution of these tasks in the study. We used BOLD-fMRI (GeneralElectric scanner, 1.5 T) and FSL software. 32 subjects of both sexes performed the Go/NoGo and Stop-signal tasks. The Go/NoGo task: green or red stimuli were presented alternately to the left or right side of the butterfly image which appeared in the center of the monitor. The participants were asked to press different keys depending on the place of appearance of the green stimulus and to ignore the red stimulus. The Stop-signal task: stimuli consisted of vowel and consonant letters in green or red. The participants had to distinguish between green vowels and consonants while red letters had to be ignored. As result, the greatest activation was observed in the cerebellum. The left cerebellum was activated mainly in the Stop-signal task, both cerebellum hemispheres were activated in the Go/NoGo task. It's known that cerebellar hemispheres are partly connected with the contralateral cerebral hemispheres. The large left cerebellum activation in the Stop-signal task may be related to the right hemisphere which associated mainly with cognitive control. The bilateral cerebellum activation in the Go/NoGo task may be related to the involvement of spatial attention. Spatial information processing may be associated with bilateral extension of the brain network of cognitive control.

The research was supported by the Russian Science Foundation (project № 16-18-00066).

Poster 1-67

**COMPARING BRAIN ACTIVITY RELATED TO ATTENTION
FOR LATERAL VERSUS CENTRAL TARGETS PRESENTED
AMONG DISTRACTORS**

Mattia Doro¹, Pierre Jolicoeur², & Roberto Dell'Acqua¹
¹University of Padova, ²Universite de Montreal

Descriptors: visuospatial attention, event-related potentials

The deployment of visual attention is usually examined using the visual search (VS) paradigm, in which subjects are required to find a target item embedded among distractors. Many studies that investigate the neuronal mechanisms of visual attention use electroencephalography and the N2pc lateralized event-related potential. The N2pc is a greater negative deflection at contralateral parieto-occipital scalp electrodes compared with the potential at the corresponding ipsilateral electrode, and it usually peaks within a time range of 200–300 ms following the onset of the VS array. It has been argued by some researchers that the N2pc is the summation of a wider contralateral negativity that reflects target selection, and an ipsilateral positive shift that reflects distractor suppression. In this set of studies, we investigated the modulation of the electrical activity in parieto-occipital areas for both lateralized and central targets, in order to test whether N2pc may actually be related to the activity of both hemispheres. Results showed that the voltages at posterior lateralized electrodes are the same for lateral and central targets, and the only lateralized effect is a positive shift at ipsilateral sites (when the target is lateralized). The implication of these results will be discussed in the context of the relative importance of target processing versus distractor suppression.

Poster 1-68

**CONCORDANCE OF INDIVIDUALS' SUBJECTIVE DISTRESS
AND HEART RATE DURING 7.5% CO₂ CHALLENGE**

Rachel Wallace, Charles Calderwood, Roxann Roberson-Nay, & Scott Vrana
Virginia Commonwealth University

Descriptors: co2 challenge, heart rate, multilevel modeling

Literature suggests that an individual's self-reported experience during psychological distress is associated with their psychophysiological response. The CO₂ challenge reliably elicits changes in physiological responding, self-reported distress/anxiety, and physical symptoms. This study examines the relationship between heart-rate, Subjective Units of Distress (SUDS) ratings, and gender within an undergraduate sample (n=164, Mage=20.1, 55.3% female) during CO₂ challenge. Participants breathed a steady state 7.5% CO₂ gas mixture for 8 minutes, preceded and followed by a 5-minute pre-CO₂ phase and a 5-minute recovery phase breathing room air. Average heart rate data and SUDS ratings were collected every 2 minutes and a series of multilevel models were employed to assess whether SUDS and gender predicted HR. An unconditional model revealed that 76% of the criterion variance in heart rate was at the between-participants level. Entry of SUDS ratings and gender in the next step led to an improvement in model fit, difference of $-2 \log \text{likelihood} = -15.38$, $p < .05$. The coefficient relating SUDS ratings to heart rate was positive and statistically significant ($\gamma = 0.12$, $p < .001$) indicating heart rate was higher when SUDS rating was higher. Women had higher HR than men ($\gamma = 5.45$ $p < .001$). A cross-level analysis found that, while there was significant between-subject variance in the slope of the HR-SUDS relationship, this variance was not significantly explained by gender.

Poster 1-69**DOES INCENTIVE SALIENCE DIRECT EARLY ATTENTION?
AN ERP INVESTIGATION**

Constanza de Dios, & Geoffrey Potts
University of South Florida

Descriptors: event-related potentials, medial-frontal negativity

The study used event-related potentials (ERPs) to study the influence of expected value on spatial attention. The medial frontal negativity (MFN) indexes expected value, being negative to unexpected punishments and positive to unexpected rewards. The N1 indexes spatial attention, being larger to stimuli in attended locations. This design attached value to locations by making one visual hemifield economically rewarding (greater probability of a rewarding outcome) and the other punishing (greater probability of a punishing outcome). Keypresses to a dot probe following a reward-signifying stimulus were awarded money if correct, and penalized following a punishment-signifying stimulus if incorrect. We predicted that the MFN would be most negative to punishing outcomes in the rewarding hemifield and most positive to rewarding outcomes in the punishing hemifield. We also predicted that the N1 would be larger and keypresses faster to probes appearing on the same side as an outcome that violated expected value, indicating attention allocation to a location where expectation was violated. Consistent with our hypothesis, in a sample of 38 participants, the MFN was most negative to punishments in the rewarding hemifield and most positive to rewards in the punishing hemifield, indicating that value was attached to location. The N1 was larger and keypresses faster to probes on the side opposite an outcome, signifying a potential inhibition of return effect. Although incentive salience can be attached to location, it may not direct spatial attention the same way as perceptual salience.

Poster 1-70**CONSOLIDATION OF AVERSIVE LEARNING IN VISUAL
CORTEX**

L. Jack Rhodes, & Vladimir Miskovic
Binghamton University

Descriptors: aversive conditioning, steady state visual evoked potentials, just noticeable differences

Invasive recordings in experimental animals have demonstrated that aversive conditioning can produce functional neuroplasticity in sensory cortices, often with effects that strengthen over time. We know relatively little about the consolidation of aversive memories in the human brain. We addressed this gap by quantifying conditioning-induced changes in cortical orientation tuning using steady state visual evoked potentials (SSVEPs). In particular, we examined a non-linear SSVEP distortion product, sensitive to orientation, following aversive conditioning of a target sine-wave grating. The SSVEP recordings were repeated on Day 2, roughly 24 hours later, along with measures of contingency awareness and sleep quantity/quality. Overall, we observed few differences in orientation tuning for the CS+ and CS- orientations when examining within-session cortical responses. However, Day 2 SSVEP results indicated substantial broadening of the cortical orientation tuning function for the aversively conditioned target grating, consistent with fear generalization in visual cortex. These findings suggest that some time is required for generalization effects to manifest at the level of cortical populations, potentially requiring an intervening sleep period for the consolidation of aversive memories.

NIMH R03 MH105716.

Poster 1-71**CORTICAL DIFFERENTIATION OF WORDS FROM OTHER
VISUAL STIMULI PREDICTS READING ABILITY IN
INDIVIDUALS ACROSS READING DEVELOPMENT**

Elizabeth Sacchi, & Sarah Laszlo
Binghamton University

Descriptors: event-related potentials, visual word recognition, individual differences

N170 expertise effects are observed when individuals elicit larger N170s in response to items of their expertise— for example, car experts elicit larger N170s in response to cars than do non-car-experts. N170 responses to words, in particular, demonstrate clear expertise effects, with the N170 response to words becoming more left-lateralized with reading development. Here, we ask whether the extent to which N170s to words are differentiated from N170s to other visual stimulus types is related to individual reading ability, in very young (grades K-2), developing (grades 2-8) and expert (college student) readers. Results indicate that, generally, individuals who differentiate words from other item types less strongly on the N170 are also poorer readers, though the lateralization of this effect and what measures of reading ability it is observable on varies over the course of reading development, with, for example, phonological awareness being most related to N170 differentiation, bilaterally, in elementary aged readers and exposure to print being most related to N170 differentiation, especially over the right hemisphere, in adult readers. Results are considered in the context of the question of whether poor cortical differentiation of wordforms from other visual stimuli is a cause of or result of poor reading ability.

This work was supported by awards to SL from NSF CAREER-1252975 and NSF TWC SBE- 1422417. ES was supported by a Binghamton University Provost's Fellowship.

Poster 1-72**DOWNSTREAM REPETITION EFFECTS REVEAL
IMPOVERISHED REPRESENTATIONS FOR PREDICTABLE
WORDS**

Joost Rommers, & Kara D. Federmeier
University of Illinois, Urbana-Champaign

Descriptors: sentence comprehension

Predictable words may be processed more thoroughly than less predictable words, as the ease of processing frees up resources for further processing of the input. On the other hand, predictable words may be processed less thoroughly, as the system can run in a "top-down verification mode", at the expense of processing the input. We manipulated contextual predictability and probed the fate of (un)predictable words in memory by presenting the words again. Thirty participants read sentences that were weakly constraining for the critical final word ("It had been several years since they last cleaned the car"; cloze probability 0.01). The critical word had previously been strongly predictable ("Alfonso has started biking to work instead of driving his car"; cloze 0.86), not predictable ("Jason tried to make space for others by moving his car"; cloze 0.01), or it had not previously been seen. The lag between initial and repeated presentation was 3 sentences. Fillers ensured that over 70% of the final words did not constitute a repetition. Repetition was reflected in N400 decreases, LPC enhancement, and alpha/beta band power decreases. Prior predictability reduced repetition effects on the N400 (suggesting less priming) and on alpha/beta band power (possibly decreased re-activation of memory traces). In addition, prior predictability eliminated the repetition effect on the LPC, suggesting a lack of recollection of prior episodes of seeing the words. These findings converge on a top-down verification account, according to which more predictable input is processed less thoroughly.

This work was supported by a James S. McDonnell Foundation Scholar Award and NIH grant AG026308 to K.D.F.

Poster 1-73**AS FAR AS THE EYE CAN SEE: EVENT-RELATED BRAIN POTENTIALS REVEAL DYNAMICS OF VISUOSPATIAL ATTENTION ALLOCATION DURING READING**

Brennan R. Payne, & Kara D. Federmeier
University of Illinois, Urbana-Champaign

Descriptors: parafoveal processing, reading, language processing

Skilled readers obtain information not only from the currently fixated word, but also from words in parafoveal vision. However, the majority of neurolinguistic research on visual language processing has been conducted using single-word RSVP paradigms that preclude the ability to examine the role of parafoveal influences in reading. Thus, while the nature of parafoveal representations is an oft-investigated topic in the behavioral literature, little is known about the underlying neural mechanisms of visual attention allocation during reading. To bridge the gaps between these areas of research, in a series of experiments, we have utilized the RSVP paradigm with visual hemi-field flankers to examine the neural processes underlying parafoveal word processing. These experiments have probed the nature of semantic processing in parafoveal vision and the dynamic relationship between concurrent foveal load and parafoveal word processing. Results have revealed a high degree of interaction between visual attention and higher-order language comprehension systems. For example, we've shown that early aspects of semantic processing can be initiated outside of foveal vision but that other aspects of semantic processing appear to require the kind of attentional resources that may only be available when words are fixated. These experiments have highlighted that ERPs provide a unique tool for investigating real-time visuospatial attentional constraints on parafoveal processing in reading.

This work was supported by a James S. McDonnell Foundation Scholar Award and NIH grant AG026308 to Kara D. Federmeier.

Poster 1-74**COGNITIVE CONFLICT DECREASES RESPONSES TO EMOTIONAL STIMULI. THE EFFECTIVE CONNECTIVITY OF THE PREFRONTAL CORTEX**

Tomasz S. Ligeza, & Miroslaw Wyczesany
Jagiellonian University

Descriptors: cognitive conflict, emotional control, effective connectivity

The presented EEG experiment investigates the relationships between cognitive control and automatic forms of emotional control. Cognitive conflict is a condition in which a person has to rapidly change or inhibit a well-established response. Tasks evoking cognitive conflict to activate frontal brain regions; which are also recruited during emotional control conditions.

Our procedure was based on the Flanker task. Each trial consisted of a flanker followed by a standardized emotional picture.

The evoked potentials to pictorial stimuli were evaluated with the flanker congruence as an independent variable. The analysis of effective connectivity was also carried out using the Directed Transfer Function method, to infer the influences from the prefrontal cortex on the attentional and perceptual cortical areas.

It was found that the incongruent condition was associated with a lowered LPP amplitude for negative pictures, marking decreased processing of affective content following conflicting flanker trials. Moreover, a strong increase of flow from the right dorsolateral area to the ventral attentional network was observed. The left dorsolateral area increased its connectivity with the intraparietal sulci and the visual cortex. This may indicate the influences of the prefrontal cortex facilitating task-related attention during increased cognitive control. As the bottom-up attention is possibly inhibited at the same time, this could result in a decrease in emotional responsiveness to task-irrelevant content.

The study was supported by the National Science Center (UMO-2014/15/B/HS6/01943).

Poster 1-75**DIFFERENCES IN LISTENING EFFORT AMONG COCHLEAR IMPLANT USERS COMPARED TO HEARING AID USERS**

Joseph S. Baschnagel¹, Elizabeth Jackson Machmer², Katey Sackett¹, Keith Ziegler¹, & Marc Marschark²

¹Rochester Institute of Technology, ²National Technical Institute for the Deaf

Descriptors: deaf/hard of hearing, listening effort

Listening effort refers to the workload required to hear and understand speech. More difficult listening conditions, as well as an impaired auditory system, are associated with increased listening effort, which may lead to increased stress and fatigue. Emerging evidence suggests that the psychophysiological measures of heart rate variability (HRV) and skin conductance are sensitive to increased listening effort in normal hearing listeners and those with moderate hearing loss. This study assessed listening effort among individuals with severe and profound hearing losses who use cochlear implants (n=15) compared to those who use hearing aids (n=15) across three conditions: sentence recognition (SR; auditory sentences presented at 54dB), SR (54dB) with background noise (49dB), and a control sentence reading task. There was a significant increase in self-reported effort across the three conditions, with the reading condition rated the least difficult and the SR task with background noise rated the most difficult. Between the two SR tasks, both groups performed significantly better on the SR task (i.e. less errors verbally repeating the sentence) during the quiet condition compared to the noise condition. There was a marginal increase in skin conductance during the sentence reading task versus the two SR tasks. There was a significant increase in high frequency HRV power in the reading task compared to the two SR tasks. There was no effect of group in any of the analyses. Discussion will address the findings as they relate to listening effort in hearing impaired individuals.

Poster 1-76**DIFFERENTIAL EFFECTS OF A SINGLE BOUT OF PHYSICAL ACTIVITY ON ATTENTIONAL PROCESSES IN HIGH- AND LOW-ANXIOUS INDIVIDUALS**

Andrew C. Parks, Anthony G. Delli Paoli, Hans S. Schroder, Jason S. Moser, & Matthew B. Pontifex
Michigan State University

Descriptors: attention, ERP, anxiety

Research has indicated that attentional processes may be diminished in individuals with trait anxiety due to increased worry and distractibility. Although a growing body of research in young adults has suggested transient enhancements of neuroelectric indices of attention following a single bout of physical activity, the extent to which physical activity may influence attentional processes in individuals with trait anxiety is not well understood. Accordingly, the current study assessed neuroelectric indices of attention in response to a modified flanker task in young adults immediately prior to and following a single bout of physical activity or seated rest during two separate, counterbalanced sessions. Participants were bifurcated into low- and high-anxious groups based on scores obtained through the Penn State Worry Questionnaire. Findings indicated larger P3 amplitude following physical activity relative to following seated rest in the low-anxious group. However, P3 amplitude remained unchanged for both the seated rest and physical activity conditions in the high-anxious group. Such findings indicate a selective influence of physical activity on neuroelectric indices of attention, suggesting that elevated reports of worry may mitigate the effect of physical activity on attentional processes.

Support for our research was provided by Summer Renewable Research Fellowships awarded to A. Parks and A. Delli Paoli through the College of Education and the Graduate School at Michigan State University.

Poster 1-77**AN INVESTIGATION OF FULLY AUTOMATED APPROACHES FOR THE SELECTION OF EYE BLINK ICA COMPONENTS**Kathryn L. Gwizdala¹, Amanda L. McGowan¹, Vladimir Miskovic², Sarah Laszlo², & Matthew B. Pontifex¹¹Michigan State University, ²Binghamton University*Descriptors: eye blink artifacts, ICA components, EEG*

A growing number of investigators are utilizing independent component analysis (ICA) to remove eye blink artifacts from EEG signals. However, the reliance upon subjective human judgments for the identification of eye blink-related components is labor intensive and potentially fallible. Accordingly, the present investigation sought to address the critical question of whether fully automated approaches for selecting eye blink related ICA components (i.e., ADJUST, Eye-Catch, icablinkmetrics) can and should be employed to replace manual selection of the eye artifact. Utilizing a total of 3,072 simulated EEG datasets, we first assessed how robust these automated approaches were to variation in the magnitude of the eye blink artifact amid increasing levels of noise in the signal. We then utilized 92 real EEG datasets collected with varying electrode densities, to assess the generalizability of these automated approaches. For comparison, we also assessed the accuracy of trained observers visually selecting ICA components. Our findings revealed that each of the automated component selection approaches were able to accurately identify eye blink related ICA components at or above the level of trained human observers. EyeCatch appears better suited towards narrowing down potential candidate eye blink components prior to human inspection given the potential for false positive component identification. Whereas, icablinkmetrics avoided falsely identifying components suggesting it may be better suited towards a fully automated implementation.

Poster 1-78**PUPIL DILATION AND AFFECTIVE MEANING: EFFECTS OF GOAL RELEVANCE, TYPE, AND CONGRUENCE**Andero Uusberg¹, & Martin Kolnes²¹Stanford University and Tartu University, ²Tartu University*Descriptors: motivation, pupil dilation, attention*

Illumination-independent pupil dilation has been associated with attention dynamics driven by locus coeruleus norepinephrine. We investigated the sensitivity of this system to three conceptually relevant motivational contrasts that have often been confounded in prior studies - pre- and post-goal stages (phase) of succeeding or failing (outcome) to obtain approach or avoidance goals (direction). Forty four students completed a modified monetary incentive delay (MID) task where the outcome of each trial counted towards an amount of chocolate received ($M = 100$ g). Each trial began with a pre-goal cue indicating the potential outcome of the trial (may win, may lose, no change). After a binary choice, a post-goal cue announced the realized outcome (won, didn't win, lost, didn't lose, no change). All cues were simple Landot circles broken at different angles. Pupil size dynamics recorded with Eyelink1000 were analyzed in relation to each type of cue. We found that the pupil response to potential as well as realized wins did not differ from responses to neutral cues announcing no change in accumulated chocolate. By contrast, not winning, losing, and also not losing increased pupil diameter by at least 0.5 SD ($p < .001$). Anticipating to lose remained between the two levels ($p < .05$). These effects grew stronger throughout the experiment suggesting the pupil response was magnified by automatic associations. These results suggest that pupil dilation is sensitive to the goal-obstructiveness of all outcomes as well as to the motivational direction towards avoidance.

Poster 1-79**DISENTANGLING THE EFFECTS OF STIMULUS NOVELTY AND AFFECTIVE VALENCE IN THE AMYGDALA, HIPPOCAMPUS, AND BED NUCLEUS OF THE STRIA TERMINALIS**Walker Pedersen¹, Nicholas Balderston², Tara A. Miskovich¹, Emily L. Belleau¹, Fred Helmstetter¹, & Christine L. Larson¹¹University of Wisconsin - Milwaukee, ²National Institute of Mental Health*Descriptors: bed nucleus of the stria terminalis, amygdala, novelty*

The amygdala responds to stimulus novelty, which may correspond to an evaluation of novel stimuli for potential threat (Balderston, Schultz & Helmstetter, 2013). The bed nucleus of the stria terminalis (BNST) may also be sensitive to novelty as

it responds to both uncertainty (Somerville et al., 2013) and threat (Alvarez et al., 2011). To test this, we presented participants with novel and repeated negative and neutral images while measuring brain activity via fMRI. Stimulus valence was also manipulated to determine whether valence interacts with novelty. We expected to replicate past findings of hippocampal and amygdalar novelty responses that are independent of valence. We also hypothesized that the BNST would exhibit novelty sensitivity. We found evidence for novelty sensitivity in the hippocampus, amygdala and BNST. This novelty response was dependent on stimulus valence only in the BNST. These findings suggest that the BNST may play a role in the detection of novelty that is distinct from that of the amygdala, in that it responds selectively to stimuli that are both novel and negatively-valenced.

This study was funded by an NIH K01 awarded to Dr. Christine Larson (MH086809).

Poster 1-80**DISSOCIATING DISPOSITIONAL TRAITS USING ELECTROCORTICAL INDICATORS: THE HEADS-AND-FACES ODDBALL TASK**Emily R. Perkins, Sarah J. Brislin, James R. Yancey, Colin B. Bowyer, & Christopher J. Patrick
Florida State University*Descriptors: event-related potential, inhibitory control, dysaffiliative tendencies*

Infrequent, task-relevant stimuli in a 'rotated-heads' visual oddball paradigm elicit a robust P300 brain response, and this response shows a reliable negative association with inhibitory control deficits (INH-) common across externalizing psychopathology (Patrick et al., 2006). In emotion recognition tasks, fearful faces elicit augmented N170 and P200 brain responses relative to neutral faces, and both face effects correlate negatively with dysaffiliative tendencies (AFF-; Brislin et al., 2016). This study evaluated the utility of a novel visual-processing paradigm, the heads-and-faces oddball task, in eliciting P300, N170, and P200 electrocortical responses that were selectively associated with INH- and AFF-. Dispositional tendencies were measured using the Disinhibition and Meanness subscales of the Triarchic Psychopathy Measure. Task stimuli included frequent non-targets (ovals), rare targets (stylized heads), and rare novel stimuli (fearful and neutral faces). Analyses of currently available data ($N = 41$) revealed that fearful faces elicited increased P300 and P200 responses relative to neutral faces, in line with evidence that these components reflect attentional and affective processing, respectively. Contrary to prediction, fear-neutral differentiation was not significant for N170, which is associated with face detection and categorization more so than affective processing. Implications for the heads-and-faces oddball task's use in research on transdiagnostic biobehavioral traits are discussed.

Poster 1-81**DISTINCT BEHAVIORAL PERFORMANCE CORRELATES OF THE ERN AND PE IN THE FLANKER TASK**Keanan Joyner¹, Colin Bowyer¹, James R. Yancey¹, Greg Hajcak², & Christopher J. Patrick¹¹Florida State University, ²Stony Brook University*Descriptors: error-related negativity (ERN), error positivity (Pe), behavioral performance effects*

The error-related negativity (ERN), a negative deflection in the event-related brain potential peaking approximately 50ms after commission of task-performance errors, has been widely studied as an index of response monitoring. In addition to eliciting an ERN, the commission of errors also evokes an error positivity (Pe) that peaks around 200ms following their occurrence. Extant research has provided evidence that these two ERP components index separable error monitoring processes (Falkenstein et al., 2000). The current study sought to delineate performance correlates of ERN and Pe in a sample of 200 community adults. Analyses revealed that Pe amplitude was associated more strongly than ERN with reaction time and response efficiency (speed versus accuracy trade off) across the task as a whole. By contrast, ERN was found to be more predictive of post-error inefficiency, such that increased inefficiency on task trials following erroneous responses was associated with larger ERN amplitude. Additionally, ERN was associated with post-error slowing, such that larger ERN amplitude predicted slower responding on task trials that followed commission of an error. Taken together, findings from this work support the notion that the ERN and Pe index distinct error monitoring processes with differing impact on behavior. Implications for understanding mechanisms of adaptive performance and individual differences in recognizing and remedying errors will be discussed.

Poster 1-82**DO THEY LIKE ME OR NOT? DEVELOPMENT OF A LABORATORY SOCIAL REWARD PARADIGM**

Belel Ait Oumeziane, Jacqueline Schryer-Praga, & Dan Foti
Purdue University

Descriptors: ERPs, reward processing, social/monetary reward

Emphasis on the neural patterns of anticipatory and consummatory reward processing has been on the rise. However, studies have largely focused on monetary rewards while ignoring the significance of social rewards. The monetary incentive delay (MID) task has been used to investigate monetary reward dynamics using a multitude of anticipatory (cue-p3, contingent negative variation [CNV]) and consummatory (reward positivity [RewP], feedback P3 [fb-P3]) event-related potentials (ERPs). We modified the MID task in order to develop the social incentive delay (SID) task to measure social reward-related processes. In experiment 1 (N = 31), we found effects of condition (e.g., incentive versus neutral; win versus loss) across both anticipatory and consummatory reward ERPs (p 's < .05). We also found that ERPs on MID and SID within the same sample were moderately associated across tasks (r 's: .22 to .58). In experiment 2 (N = 30), we aimed to enhance the value of social feedback (i.e., experimenter feedback) for participants in order to increase the task's effectiveness in eliciting ERPs. We found similar effects of condition compared to experiment 1 (p 's < .05). Correlations across tasks were variable for anticipatory (r 's: .36 to .37) and consummatory (r 's: -.03 to -.14) ERPs. This study found supporting evidence for the ERP-adapted MID paradigm, and support for a novel method of quantifying social reward chronometry using ERPs. The SID may be a promising laboratory paradigm for comprehensively characterizing reward-related processes across different types of psychopathologies.

Poster 1-83**CONSIDERING BLOCK-WISE FLUCTUATIONS IN ERN AMPLITUDE AND RELATIONSHIPS WITH PERSONALITY: A DYNAMIC APPROACH**

Kaylin Hill, Takakuni Suzuki, Douglas Samuel, & Dan Foti
Purdue University

Descriptors: error related negativity (ERN), personality

The error related negativity (ERN) is a negative deflection in the event-related potential (ERP) waveform that occurs within 100 ms after the commission of an error on speeded tasks. The ERN is commonly quantified as a difference between the means of all available error and correct trials. The present study aims to assess fluctuations in ERN amplitude over the course of the task (10 blocks of 30 trials each) and explore the additive value of specific intervals by evaluating links with personality traits.

Seventy-six adults completed an arrow flankers task while ERP data was recorded and then completed the Five Factor Model Rating Form. The ERN difference was quantified separately for each of ten blocks. Correlations were used to relate the block-wise ERN difference scores to personality traits. Interestingly, ERN difference scores varied widely in their correlations across blocks (i.e. correlation between ERN in block 1 and block 2, etc.), ranging from $r = .08$, $p = .55$ to $r = .60$, $p < .001$. This variation seems to be meaningful as results indicated significant fluctuations in ERN-trait relationships over the course of the task. For example, the ERN and Neuroticism shared a moderately sized positive relationship ($r = .30$, $p < .01$) in the middle of the task, but smaller, non-significant relationships early ($r = .05$, $p = .70$) and late ($r = -.07$, $p = .59$) in the task.

This analytic approach offers new opportunities for the exploration of relationships between the ERN and phenomena of interest. Furthermore, this approach may offer suggestions regarding the nature of tasks used to elicit the ERN.

Poster 1-84**CROSSTALK: MONKEY ELECTROPHYSIOLOGY AND HUMAN IMAGING REVEAL COMMON NEURAL CODING FOR PROACTIVE AND REACTIVE CONTROL**

Angus MacDonald¹, Andrew Poppe¹, Matthew Chafee¹, Cameron Carter², Daniel Ragland², Steven Silverstein³, & Deanna Barch⁴
¹University of Minnesota, ²University of California, Davis, ³Rutgers, ⁴Washington University of St. Louis

Descriptors: translational research, cognitive control, executive functioning

Two models of executive control have been particularly influential over the past several decades. The first suggests prefrontal reverberating circuits maintain goal representations (Goldman-Rakic, 1995). The second hypothesizes that this proactive control system is complemented by another reactive control system with a separate architecture linking a different set of networks in the brain (Braver, 2013). We examined hypotheses derived from these models using the dot pattern expectancy (DPX) task in i) two macaques providing electrophysiological data and ii) 56 healthy adults undergoing functional MRI across 5 sites. The DPX is a variant of the expectancy AX task: proactive control is tapped when the rare B-cue must be maintained to guide appropriate non-target responses; reactive control is tapped when common A-cues are followed by invalid probes which then also require non-target responses. Monkey electrophysiological data showed a vast majority of cells in the frontoparietal network were preferentially engaged after rarer B-cues. However these cells generally did not remain active during the delay period. Instead the same cells were reactivated by AY probes. Similarly, we found the fMRI activation maps associated with greater B-cue (compared to A-cue) activity closely overlapped the activation maps associated with greater AY-probe (compared to AX-probe) activity. As with monkeys, the fMRI time course did not suggest reverberation. This translational research program sheds new light on a continuing challenge to our understanding of executive control processing.

National Institute of Mental Health.

Poster 1-85**STIMULUS-PRECEDING NEGATIVITY (SPN) PRIOR TO VOICE, BEEP, AND RHYTHMIC SOUND**

Yoshimi Ohgami¹, Yasunori Kotani¹, Nobukiyo Yoshida², Shigeru Kiryu², & Yusuke Inoue³
¹Tokyo Institute of Technology, ²The University of Tokyo, ³Kitasato University

Descriptors: stimulus-preceding negativity (SPN), anticipation, perception

Stimulus-preceding negativity (SPN) relates to anticipatory attention for an upcoming stimulus, and it shows a right hemisphere preponderance. Our previous study demonstrated that the right hemisphere preponderance of SPN was affected by the content of visual stimuli. In the present study, we investigated whether auditory stimuli also have the similar effect on the right hemisphere preponderance as visual stimuli showed. Thirty-four participants performed a time estimation task where a feedback stimulus was presented 2 s after a voluntary movement, and the stimulus content (voice, rhythm, and beep) of auditory feedback stimuli were manipulated. There were four experimental conditions: (a) voice sound, (b) beep sound, (c) rhythmic sound, and (d) no feedback conditions where the feedback stimulus was omitted. Except the no feedback condition, participants received feedback information whether their time estimation performance was correct or incorrect via earphones. The statistical analysis on the SPN demonstrated a significant interaction of condition by hemisphere that the right hemisphere preponderance was observed only in the beep condition whereas there was no right hemisphere preponderance in the voice and rhythm conditions. The increased activations at the left hemisphere by higher emotional valence of the voice and rhythm stimuli could be a reason for this result. The present results showed that the content of auditory stimuli affects the right hemisphere preponderance of SPN as visual stimuli did.

POSTER SESSION II
THURSDAY, SEPTEMBER 22, 2016

Poster 2-1

**DUTY CYCLE DETERMINES THE DIRECTION OF SSVEP
AMPLITUDE DIFFERENCES IN RESPONSE TO HEDONIC
CONTENT**

Vladimir Miskovic, & Karl Kuntzelman
Binghamton University

Descriptors: EEG, SSVEP, attention

Delivering a stimulus at a fixed frequency allows recovery of stimulus-evoked cortical activity by examining neuronal oscillations matching the pre-defined frequency of interest or its harmonics. In the visual domain this measure is referred to as the steady-state visual evoked potential, and its amplitude has been used extensively as an index of spatial and feature based attention. This approach has been extended to studies of motivated attention, by flickering complex naturalistic scenes varying in hedonic content and emotional arousal. Here, we delivered aversive and neutral scenes from the IAPS at 12 Hz using ON/OFF flicker. We systematically varied the duty cycle (the percentage of a stimulus cycle spent in the ON vs. OFF states). We replicated previously reported amplitude differences, with negative images evoking greater power at 12 Hz than neutral images – but only at the commonly used 40% active duty cycle. Amplitude reliably discriminates between negative and neutral images at all other duty cycles investigated, but in the opposite direction; there is more 12 Hz power in response to neutral rather than negative images. This finding calls into question the traditional interpretation of SSVEP amplitude in relation to affective processing. We also explore changes in the distribution of stimulus-related activity across different harmonics of the stimulus frequency as a function of duty cycle and observe that changes appear to be driven by differential loading onto onset- and offset-related peaks in the time domain waveforms.

Poster 2-2

**EMOTIONAL MODULATION OF PERCEPTUAL DECISION
MAKING**

Karl Kuntzelman, Vincent Costa, & Vladimir Miskovic
National Institute of Mental Health

Descriptors: decision making, affect, perception

Motivated attention refers to how affective stimuli influence perceptual information gathering. However, the impact of motivated attention on perceptual decision making remains underexplored. Previous studies have focused on identifying biases induced by diffuse affective states without directly quantifying the nature of the evidence base that contributes to such biases. We developed a novel variant of a standard perceptual decision making task that allowed us to examine how affective information biases decision variables relevant to inferring the relative emotionality of a complex visual array. The task required participants to view a conglomerate of emotional images, and as quickly as possible make a two-alternative forced choice as to the predominant hedonic valence of the array. On each trial the evidence base consisted of a dynamic mixture of 64 pictures that formed an array of pleasant/neutral, unpleasant/neutral, or pleasant/unpleasant images. The initial array was generated by randomly choosing the valence of each image location to be one of the two valence categories with probability q , which we defined as the affective bias. As the affective bias decreased towards chance, participants overvalued affective information and incorrectly inferred that arrays with mostly neutral pictures were predominantly pleasant or unpleasant. Ongoing work builds on these psychophysical findings to examine the computational and neural bases of how emotion modulates perceptual decision making.

Poster 2-3

**EARLY ERP RESPONSES TO EMOTIONAL FACES:
CATEGORY, INTENSITY, AND TRAIN EFFECTS**

Sarah J. Brislin, James R. Yancey, Colin B. Bowyer, & Christopher J.
Patrick
Florida State University

Descriptors: EEG/ERP, facial expression, callousness

This study examined early components of ERP response to affective faces of different types in an undergraduate sample assessed for callous-unemotionality (CU), a trait construct corresponding to (weak) affiliation/attachment in the NIMH RDoC framework. Prior research on affective-face reactivity has reported behavioral (lower accuracy; Marsh & Blair, 2008) and neural (reduced amygdala response; Jones et al., 2009) effects related to CU tendencies in adolescents. To examine these effects in adults and better understand the time-course of CU-related processing deficits, we modified a face-recognition task from the adolescent literature to include ERP assessment. In this task, faces displaying 6 emotions are presented at varying levels of expressive intensity and participants are asked to identify the affect-category of each. We recorded EEG in the task and examined face-elicited N170 and P200 ERP components for modulatory effects of affect category and intensity of expression. Associations between these early ERPs and CU-trait scores were also examined. Findings indicate that individuals high in CU tendencies show decreased N170 and P200 response to fearful faces. Results from this study provide evidence that deficits seen in child and adolescent expression of callousness extend upwards into adulthood. Work of this type, directed at identifying physiological indicators of key neurobehavioral traits, is consistent with the RDoC initiative's aim of reorienting research on psychopathology toward new conceptions of mental disorders that link more closely to biological systems.

Poster 2-4

**EEG GAMMA POWER CORRELATES OF DEVELOPMENTAL
CHANGE IN AUDIOVISUAL SYNCHRONY DETECTION**

Elizabeth Smith¹, Clay Mash¹, Audrey Thurm², & Marc Bornstein¹
¹National Institute of Child Health and Human Development, ²National
Institute of Mental Health

Descriptors: audiovisual, synchrony, children

Perception of speech relies on audition, vision, and combination of these two streams of information via audiovisual integration. Audiovisual integration of speech (when compared to auditory speech) results in speech that sounds louder and leads to increased intelligibility and comprehension. However, the role that audiovisual integration plays in social and linguistic interactions develops over infancy and childhood, and delays or deviance in this developmental process are associated with multiple developmental disabilities. While EEG gamma power has been linked to audiovisual integration, it is unknown how differences in gamma power during audiovisual speech integration change with age in children. In the present study, EEG was measured in children ages 4-10 while they watched audiovisual speech as delivered in segments from a popular children's show. The audiovisual speech was presented as perfectly synchronized or at a range of asynchronies from 500 milliseconds auditory lead (i.e., where the audio track is advanced 500 milliseconds relative to the video) to 500 milliseconds video lead. Preliminary analysis of power in the gamma frequency band showed that participant age moderated effects of condition, such that gamma increased more between the asynchronous and synchronous conditions in older children. Spatial distribution and relation of these patterns to behavioral assessment of audiovisual synchrony detection are discussed.

This work was supported by the Division of Intramural Research, NICHD/NIH.

Poster 2-5**EFFECT OF MALTREATMENT DURATION ON THE NEUROBIOLOGY OF VISUAL SELF RECOGNITION IN DEPRESSED, MALTREATED YOUTH**

Mitchell Sauder, Christine Egan, Kiry Koy, Hannah Scott, & Karina Quevedo
University of Minnesota

Descriptors: depression, maltreatment, adolescent

Depression in youth is often linked to past experiences of maltreatment. The research presented evaluates the effects of maltreatment duration on youth brain activity during emotional self-referential processing of their own self face and a stranger's face. **METHODS:** Fifty two depressed youth with history of maltreatment completed an emotional self-processing task, ESOM (Emotional Self Other Morph), while undergoing magnetic resonance scanning. Participants were asked to identify their own face versus a matched peer face across happy, sad, and neutral expressions. **RESULTS:** Youth with increased duration of maltreatment showed lessened activity in the Medial Frontal Gyrus (MFG), Superior Frontal Gyrus (SFG), and the Anterior Cingulate Cortex (ACC) while viewing their own happy face vs. a stranger's happy face as compared to participants with shorter experiences of maltreatment. Increased duration of abuse also had a negative effect on activity in Precuneus, Brodmann Area (BA10), and the Middle Temporal Gyrus (MTG) to their own neutral face vs. a stranger's face. **CONCLUSION:** Sustained experience of maltreatment causes significant alterations in activity level during self-referential processing. Adolescents with increased duration of maltreatment have diminished neurological response to their own happy face in regions dedicated to emotional response (ACC), executive functioning (MFG), and self-awareness (SFG). Increased maltreatment duration causes a decreased activation to the neutral self face across regions dedicated to self-processing (Precuneus) and memory (BA10 & MTG).

1K01MH092601: 2011-2016, QUEVEDOK (PI). The Neurobiology of Self Appraisals and Social Cognition in Depressed Adolescents. NARSAD Young Investigator Grant from the Brain & Behavior Research Foundation: 2012-2015, QUEVEDOK (PI). Identifying Neural and HPA Axis Markers of Chronic Adolescent Depression.

Poster 2-6**EFFECT OF PHYSICAL ATTRACTIVENESS OF THE OPPOSITE SEX ON P2 TO IRRELEVANT PROBE STIMULI**

Kohei Fuseda, & Jun'ichi Katayama
Kwansei Gakuin University

Descriptors: physical attractiveness, irrelevant probe technique, ERP

We investigated whether the event-related brain potential (ERP) to irrelevant probe stimuli is a useful index to measure physical attractiveness of the opposite sex. Twelve male (experiment 1) and twelve female (experiment 2) students were presented with two video clips (seven minutes each) in random order. An attractive opposite sex model was shown in one clip (high attractiveness condition), and an unattractive opposite sex model was shown in the other (low attractiveness condition). The electrical stimuli as probe stimuli were presented in an oddball sequence during the video clips: frequent standard stimuli (80%) were presented at the right (or left) wrist and infrequent deviant stimuli (20%) were presented at the left (or right) wrist. After each clip, the participants rated attractiveness, valence, and arousal with a 100 mm visual analog scale. The same pattern of results was obtained in both experiments. All the ratings in high attractiveness condition were significantly higher than those in low attractiveness condition. P2 amplitude to both probe stimuli in high attractiveness condition was significantly smaller than those in low attractiveness condition. Moreover, P2 amplitude to deviant probe stimuli was higher than standard probe stimuli in only the low attractiveness condition. These results indicate that the attentional resource to probe stimuli decreased when the attention is strongly engaged by the attractive opposite sex person. Thus, the P2 response to irrelevant probe stimuli is a useful index in measuring physical attractiveness of the opposite sex.

Poster 2-7**EFFECTS OF AN 8-WEEK MODERATE-INTENSITY AEROBIC EXERCISE INTERVENTION ON CONFLICT MONITORING PROCESSES IN MAJOR DEPRESSIVE DISORDER**

Christopher J. Brush, Ryan L. Olson, Peter J. Ehmann, & Brandon L. Alderman
Rutgers University

Descriptors: depression, cognition, event-related potentials

Major depressive disorder (MDD) is characterized by a number of behavioral, emotional, and cognitive symptoms. Cognitive impairment is a common residual side effect following antidepressant treatment, regardless of clinical outcome. Thus, there is a need to establish evidence-based alternative or adjunctive treatments for cognitive dysfunction in depression. The aim of this study was to determine the effects of an 8-week moderate-intensity aerobic exercise (AE) intervention on depressive symptoms and N2 amplitude in individuals with MDD. Forty-eight participants diagnosed with MDD were randomly assigned to either an AE or a placebo group for 8 weeks. Participants in the AE group completed three 45 min sessions/week of moderate-intensity AE while participants in the placebo group completed three sessions/week of light-intensity stretching. Depressive symptoms and N2 event-related potentials were assessed at pre-and-post intervention. Results showed significant reductions in depressive symptoms and increases in N2 amplitudes in the AE group relative to the placebo group. After controlling for demographic variables, changes in N2 amplitude significantly predicted reductions in depressive symptoms. Findings suggest that changes in depressive symptoms may be mediated by exercise-related improvements in N2 amplitude. Future research identifying neural biomarkers for MDD and whether they are modifiable through behavioral interventions is warranted.

Supported by The Charles and Johanna Busch Memorial Fund at Rutgers, The State University of New Jersey.

Poster 2-8**EFFECTS OF AUDITORY INTEGRATION TRAINING ON MISMATCH NEGATIVITY AND AUDITORY EVOKED POTENTIALS IN AUTISM**

Estate M. Sokhadze¹, Manuel F. Casanova¹, Allan Tasman², & Sally Brockett³

¹University of South Carolina School of Medicine-Greenville,

²University of Louisville, ³IDEA Training Center

Descriptors: auditory integration training, mismatch negativity in auditory oddball task, autism spectrum disorder

According to recent theories, sensory processing and integration abnormalities may play an important role in impairments of perception, cognition, and behavior in autism. Among these sensory abnormalities auditory perception distortion may contribute to many typical symptoms of autism. The study used Berard's technique of auditory integration training (AIT) to improve sound integration in children with autism spectrum disorder (ASD). It was proposed that exposure to 20 thirty min AIT sessions would result in improved behavioral evaluations and will positively affect N1, mismatch negativity (MMN) and P3 components of evoked potentials (EP) in auditory oddball task. Eighteen children with ASD completed the AIT and pre- post-AIT auditory oddball task, while 16 typical children served as a contrast group in the auditory task. Comparison of EP of children with ASD vs. typical children revealed a delayed latency of fronto-central N1 to rare and frequent stimuli, larger mismatch negativity, higher P3a to frequent stimuli, and at the same time delayed latency of P3b to rare stimuli in the autism group. Post-AIT changes in evoked potentials could be summarized as a decreased magnitude of N1 to rare stimuli, marginally lower negativity of MMN, and decrease of the P3a to frequent stimuli along with shorter latency of the P3b to rare stimuli. These evoked potential changes following completion of AIT course are in a positive direction, making them less distinct from those recorded in age-matched group of typical children, thus could be considered as changes towards normalization.

The study was supported by pilot research grant from the Autism Research Institute (San Diego, CA)

Poster 2-10**EFFECTS OF HEART RATE VARIABILITY BIOFEEDBACK ON COGNITIVE PROCESSING OF NEGATIVE STIMULI IN DEPRESSED INDIVIDUALS**

Masahito Sakakibara
Aichi Gakuin University

Descriptors: heart rate variability, cognitive processing, depression

Heart rate variability biofeedback (HRVBF), the technique used with paced breathing at a rate of 0.1 Hz, is known to have clinical utility in the treatment of depression. This study explored whether HRVBF could modify attentional bias favoring negative stimuli during cognitive processing by depressed people. College students ($N = 13$) with self-reported depression assessed by BDI-II participated in the study. Event-related potentials (ERPs) were recorded during a go/no-go task (Task-1), in which Japanese target words were neutrally, or negatively valenced. This was followed by four successive 5-min sessions of the HRVBF, or paced breathing at a rate of 0.5 Hz that was conducted for an equal period of time as a control condition. The go/no-go task (Task-2) was administered again, immediately after the breathing condition. In Task-1, the amplitudes of P300 for both negatively and neutrally valenced words were positively correlated with BDI scores, with amplitudes being larger for negatively valenced than for neutrally valenced words ($p < .05$). In participants with high-BDI scores ($N=6$), the P300 amplitude for negatively valenced words decreased from Task-1 to Task-2 during the HRVBF condition, whereas it remained unchanged during the control condition ($p < .05$). No significant changes were observed in participants with low-BDI scores ($N=7$). It is known that P300 magnitude of the ERPs reflects resource demands in cognitive processing (Wickens et al., 1983). Therefore, these results suggest that HRVBF might modify cognitive processing of negative stimuli in depressed individuals.

This work was supported by JSPS KAKENHI Grant Number 26590168.

Poster 2-11**EFFECTS OF NEUROBIKE CYCLING ON EEG BRAIN ACTIVITY AND MATHEMATICAL PERFORMANCE: AN INTERVENTION STUDY**

Alexander John, Diana Henz, & Wolfgang I. Schöllhorn
University of Mainz

Descriptors: EEG, cycling, mathematical performance

Several studies identified an influence of cycling on cognitive processes and brain activity. In the present study, we investigated effects of cycling training on a NeuroBike on spontaneous EEG brain activity and on mathematical performance. A NeuroBike is an instable system that affords balance movements similar to the cross-coat of the human due to the joint in the center of the bicycle frame. Due to high affordances of NeuroBike training on motor control, we expected effects on EEG brain activity and mathematical performance. Participants performed different trainings (NeuroBike, common bicycle, daily activity) in a two-week intervention with three 20-minute training sessions per week. Spontaneous EEG was recorded before, and after each training condition at rest as well as during the mathematical tests before and after the two-week intervention. Behavioral data show reduced mathematical performance in geometry after the NeuroBike and common bicycle intervention in comparison to daily activity. EEG data reveal increased temporal and occipital theta power, occipital alpha power, and parietal and occipital beta power after the two week intervention without acute influence of NeuroBike cycling at rest. Repeated NeuroBike training lead to increased frontal power in all frequency bands as well as temporal theta and alpha power during algebra performance. Our results demonstrate that training on a NeuroBike fosters a beneficial brain state for learning at resting state, but does not lead to an optimum brain state for active spatial processing in mathematical problem solving.

Poster 2-12**ELECTRODERMAL ACTIVITY AND ANXIETY SYMPTOMS AMONG ADOLESCENT FEMALES**

Jamie R. Pogue, Renee M. Cloutier, Matt J. Russo, Sydney A. McKinnis, & Heidemarie Blumenthal
University of North Texas

Descriptors: electrodermal activity, anxiety

Adolescence is defined by profound neurological and somatic development (e.g., Dahl, 2004). Adult work indicates that electrodermal activity (EDA) not only may be used as a physiological index of anxious states, but also that individuals with anxiety problems evidence greater EDA than those without such problems (Blechert et al., 2006); however, studies among adolescents are needed. We examined differences in EDA across 3 time points anticipatory to a social stress task among girls (12-15 years) with high ($n=20$) and low ($n=32$) anxiety symptoms. High anxiety girls were expected to evidence elevated EDA across all 3 time points whereas low anxiety girls would show a rise and decline. EDA was acquired through Biopac MP150. Mean Skin Conductance Responses (SCR) and Skin Conductance Level (SCL) were calculated using Acqknowledge 4.3. The Revised Childhood Anxiety & Depression Scale (Chorpita et al., 2000) was used to categorize girls with typical ($t < 65$) and clinical ($t \geq 70$) anxiety levels. Two 2x3 Repeated Measures ANOVAs were conducted to assess mean SCR and SCL among high and low anxiety girls across the 3 time points. Both within-subjects effects were statistically significant indicating mean differences in SCR ($F(2,49)=27.27, p < .001$) and SCL ($F(2,49)=32.14, p < .001$) across time. However, neither the between groups nor interaction effects were significant ($p > .05$) suggesting girls react to anticipatory stress in terms of EDA similarly regardless of existing anxiety status. Findings will be discussed in terms of forwarding developmentally sensitive theory and research.

Poster 2-13**EXPLORING THE RELATIONS AMONG SALIVARY CORTISOL, ALPHA AMYLASE, AND FEMALE ADOLESCENT PSYCHOPATHOLOGY**

Renee M. Cloutier, Jamie R. Pogue, Sydney A. McKinnis, Matt J. Russo, & Heidemarie Blumenthal
University of North Texas

Descriptors: salivary cortisol, salivary alpha amylase, anxiety/depression

Adolescence is a key period in terms of psychobiological risk and opportunity (Dahl, 2004). Prior adult research links markers of physiological processes (e.g., cortisol) with anxiety; however, work with youth is limited and findings inconsistent (El-Sheikh et al., 2008; Turner et al., 2005). This may be due to differing method, age range, and/or small mixed-sex samples. In the present study we examined basal and stress reactive salivary cortisol (sC) and alpha amylase (sAA) in relation to current and 3-month anxiety and depressive symptoms. Participants were 71 girls (age 12-15) who completed an in-lab speech task and 3-month follow-up interview. At both times the well-established RCADS (Chorpita et al., 2000) indexed typical anxiety and depression. State anxiety, sC, and sAA were assessed prior to the task (baseline), and immediately (anxiety), 5 min (sAA), 20 min (sC), and 40 min (recovery) after. Baseline and recovery values were averaged to create basal scores; change scores reflect response. Repeated measures ANOVAs indicated efficacy of the stress task across all indices ($ps < .05$). Neither sC nor sAA were related to state anxiety or anxiety or depression symptoms. Conversely, self-reported anxious responding was significantly related to 3-month anxiety ($r = .36$) and depression ($r = .25$). Post-hoc calculations (e.g., AUCg) were explored to mirror studies reporting links between sC, sAA, and anxiety/depression; yet, regardless of calculation, neither sC nor sAA evidenced a significant, unique relation. Future directions in terms of methodology and theory will be discussed.

Poster 2-14**ELECTROPHYSIOLOGICAL CORRELATES OF ANXIOUS APPREHENSION**

Ema Tanovic, & Jutta Joormann
Yale University

Descriptors: anticipation, uncertainty, anxiety

Most everyday situations are characterized by some degree of uncertainty, and individuals vary in their ability to tolerate this. Uncertainty is especially distressing for anxious individuals, and the emotional experience of anticipating uncertainty, anxious apprehension, has been highlighted in models of anxiety disorders. The goals of the current study were to (1) characterize brain activity associated with anticipating uncertain threat, and (2) examine the relation to risk factors for anxiety and depression, including intolerance of uncertainty. In a community sample, we examined the stimulus preceding negativity (SPN), an event-related potential component elicited when anticipating outcomes. Participants completed a card game task in which losses were associated with uncertain shocks, and the probability of losing was based on the value of the card they drew. SPN amplitude while participants waited to learn whether they won or lost in high uncertainty conditions was associated with checking behavior and, at a trend level, intolerance of uncertainty, such that individuals higher in these traits had blunted SPNs. Depression was associated with more negative SPNs while anticipating safe outcomes. These results provide preliminary evidence that individuals who have difficulty tolerating uncertainty show blunted neural responding when anticipating uncertain, potentially threatening outcomes. In contrast, depressed individuals seem to exhibit enhanced neural responding when anticipating safety.

Poster 2-15**ELECTROPHYSIOLOGICAL CORRELATES OF RESPONSE TIME VARIABILITY IN THE SUSTAINED ATTENTION TO RESPONSE TASK**

Keitaro Machida, & Katherine Johnson
University of Melbourne

Descriptors: response time variability, EEG

Individuals with Attention Deficit Hyperactivity Disorder (ADHD) perform multiple cognitive tasks with greater Response Time Variability (RTV). Greater RTV in ADHD may be due to inefficient functional connectivity of the brain. This study aimed to investigate the relationship between brain connectivity, RTV, and levels of ADHD symptoms. Children and adolescents performed the Sustained Attention to Response Task (SART) while EEG was recorded. The participants' levels of inattention and impulsivity were measured using the Conners 3 Parental Questionnaire. The Fast Fourier Transform was applied to measure the strength of RTV. Functional connectivity between 64 electrodes was computed by the weighted Phase Lag Index and treated as a weighted network. There was a positive association between RTV and the level of ADHD symptoms, where participants with higher levels of ADHD symptoms showed greater RTV. The graph analysis of EEG functional connectivity showed that more efficient brain network measured by global efficiency was associated with reduced RTV. Children showed greater RTV and less efficient brain networks compared with the adolescents. These findings support the view that stable responses are achieved with more efficient brain connectivity. Individuals with high levels of ADHD symptoms have relatively inefficient brain networks and make more variable responses during the task. Adolescents demonstrated lower RTV compared with children – this could be a result of a more developed, efficient brain network.

Poster 2-16**ELECTROPHYSIOLOGICAL EVIDENCE OF TRIAL-BY-TRIAL ATTENTION SHIFT IN DIFFERENT TRIAL HISTORIES**

Eunsam Shin, & Sang Chul Chong
Yonsei University

Descriptors: visual attention, selection bias, trial history

In visual oddball search tasks, viewing a no-target display leads to the facilitation or delay of the search time for a target in a subsequent trial. Presumably, failing to select a target in the no-target display leads to shift attention away from stimulus features that were seen in the no-target display. The current study varied trial history and tracked the resultant course of attention shift using attention-related ERP components. Participants performed a color oddball search task, in which four identically colored items (red or green) were shown in no-target displays and one uniquely colored target (e.g., green) with three identically colored distractors (e.g., red) in target displays. Here, the number of no-target displays preceding the target display was increased from 0 to 2 to reinforce attentional shift toward a particular color. Also, colors shown in two successive no-target displays were repeated or changed in order to systematically shift attention toward specific colors. Results showed that during the no-target presentations, the second display elicited a larger frontal selection positivity for changed colors and a larger anterior N450 for repeated colors. During the target presentations, the N2pc arose earlier for the target colors that were unseen or remotely seen. Moreover, the anterior N2 and N450 were largest when the target display was preceded by repeated no-target displays with repeated colors. These results demonstrate attentional inhibition and selection of specific colors, in turn suggesting that our attentional set is updated on a trial basis.

This work was supported by the National Research Foundation (NRF) of Korea grant funded by the Korean government [NRF-2011-354-H00011] and also by the Brain Research Program through the National Research Foundation of Korea funded by the Ministry of Science, ICT & Future Planning (2006-2005108).

Poster 2-17**ELEVATED EMOTION SUPPRESSION PREDICTS GREATER REWARD ANTICIPATION: EVIDENCE FROM THE STIMULUS-PRECEDING NEGATIVITY**

Nicholas J. Kelley¹, James Glazer¹, Narun Pornpattananangkul², & Robin Nusslock¹

¹Northwestern University, ²National University of Singapore

Descriptors: emotion regulation, stimulus-preceding negativity, reward anticipation

Most electroencephalography (EEG) studies of emotion regulation have examined outcome-related electro-cortical activity. Specifically, cognitive reappraisal consistently attenuates the late-positive potential (LPP; Foti & Hajcak, 2008, Dennis & Hajcak, 2009) with mixed results for emotion suppression (Moser et al., 2006, Bernat et al., 2011, Murata et al., 2012). To our knowledge, no studies have investigated how anticipatory processes preceding emotional events relate to individual differences in emotion regulation strategies. The current study fills this gap by investigating how individual differences in emotion regulation strategies relate to anticipatory processing indexed by the stimulus-preceding negativity (SPN) prior to reward feedback. Forty-two participants completed a measure of emotion-regulation strategies and a reward time-estimation task (Kotani et al., 2003) while EEG was recorded. Results revealed that individual differences in cognitive reappraisal were unrelated to the SPN while elevated emotion suppression significantly related to larger SPN amplitudes, indicating greater anticipation of rewarding feedback. Although neither strategy related to the LPP, exploratory analyses indicated that among high suppressors, greater SPN amplitude related to larger LPP amplitude, indicating that greater reward anticipation related to greater emotional responses to loss (relative to win). These results suggest that the study of the electrophysiological underpinnings of emotion regulation could benefit from a consideration of anticipatory emotional processing.

Poster 2-18**FEEDBACK-EVOKED EVENT-RELATED POTENTIAL IS SENSITIVE TO UNCERTAINTY IN RISK/REWARD EXPECTATION**

Joseph A. Rosansky, Brian A. Coffman, Sarah M. Haigh, Timothy K. Murphy, Kayla L. Ward, Simona Graur, Henry Chase, Erika E. Forbes, Mary L. Phillips, & Dean F. Salisbury
University of Pittsburgh School of Medicine

Descriptors: ERP, gambling task, feedback

Previous studies have identified specific event-related potentials (ERPs) in response to feedback in gambling tasks, including N1, P2, and feedback-related negativity (FRN). Here we compared these ERPs at different levels of risk/reward expectation and outcome uncertainty in healthy participants. Twenty participants (age range = 18-25; 11 female) predicted whether a single-digit number would be greater or less than 5. After a variable interval, one of 4 outcome scenarios was indicated: Win scenarios, where correct choices were awarded \$0.10 and incorrect choices broke even; Lose scenarios, where correct choices broke even and incorrect choices lost \$0.08; Win/Lose scenarios that awarded \$0.10 or lost \$0.08, and Neutral scenarios that broke even regardless of guess accuracy. After a variable interval (1.5, 2, or 3s), feedback was presented. We compared ERPs in response to win feedback in Win scenarios vs Win/Loss scenarios and ERPs to loss feedback in Loss scenarios vs Win/Loss scenarios. There were 75 trials for each feedback and scenario pair per subject. Our results indicate significantly larger N1 ($t(19)=-4.84$; $p < 0.05$) and P2 ($t(19)=6.07$; $p < 0.05$) when outcomes were more ambiguous (i.e. Win/Lose scenarios). These results demonstrate that the feedback-evoked ERP is sensitive to risk/reward expectation, where greater uncertainty evoked larger ERP amplitudes. This is similar to recent work showing a relationship between N1 and learning from prediction errors, and may be related to greater information content in ambiguous outcome scenarios.

Poster 2-19**EMITTED P3A AND P3B IN CHRONIC AND FIRST-EPISEDE SCHIZOPHRENIA**

Alexis G. McCathern, Brian A. Coffman, Sarah M. Haigh, Timothy K. Murphy, Kayla L. Ward, & Dean F. Salisbury
University of Pittsburgh School of Medicine

Descriptors: schizophrenia, first-episode, P3

Cognitive impairments are a hallmark of schizophrenia. Biomarkers of these impairments may be useful for identifying those at-risk for developing schizophrenia. For example, the P3 ERP to an oddball stimulus is reduced in individuals with schizophrenia. The P3 is biphasic, with the earlier peak (P3a) reflecting automatic orienting and processing and the later peak (P3b) reflecting cognitive and memory processing. Here we examined the "emitted" P3 to absent stimuli on a counting task. Seventeen individuals with long-term schizophrenia (minimum 5 years diagnosis; Sz), 20 individuals within 6 months of their first psychotic episode within the schizophrenia-spectrum (FESz), and 26 healthy controls (HC) were presented with standard sets of four identical tones (1 kHz, 50 ms long, presented 330 ms apart with a 750 ms interval between sets). For one in seven sets, the fourth tone was missing. Participants counted the number of tones within each set. Sz showed reduced emitted P3a and P3b compared to HC ($p < .05$). FESz showed a healthy P3a ($p = .133$) but significant reduction in P3b ($p = .013$) compared to HC. Sz were impaired in both automatic and controlled aspects of deviance detection within the focus of selective attention. By contrast, FESz showed intact automatic but impaired controlled detection of deviance during selective attention to stimuli. The emitted P3 shows promise as a biomarker to (1) help diagnose schizophrenia before first episode by identifying an impaired P3b and (2) to track disease progression of schizophrenia by observing a diminishing P3a with disease course.

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Poster 2-20**EVENT-RELATED POTENTIALS DEMONSTRATE DEFICITS IN ACOUSTIC SEGMENTATION IN SCHIZOPHRENIA**

Dean F. Salisbury, Sarah M. Haigh, Timothy K. Murphy, Kayla L. Ward, & Brian A. Coffman
University of Pittsburgh School of Medicine

Descriptors: schizophrenia, auditory perception, sustained potential

Grouping of auditory percepts is necessary for making sense of the auditory scene. Schizophrenia patients have blunted responses to auditory change, such as reduced mismatch negativity (MMN), which may reflect deficits in forming perceptual groupings. Here we examined event-related potentials in response to groups of tones to measure schizophrenia-related differences in acoustic segmentation. In two separate experiments, we identified a sustained potential in HC that begins with group initiation and ends with the last tone of the group. In experiment 1, ERPs were measured in an auditory pattern in which 6 tones increased in pitch in 500 Hz steps, from 1.5 – 4 kHz. In experiment 2, the first 6 tones increased in pitch from 1.5 – 4 kHz, and the last 6 tones decreased in pitch (4 – 1.5 kHz). All other stimulus parameters were identical between experiments (50 ms duration; SOA = 330 ms; ITI = 800 ms). Sustained potentials were reduced in schizophrenia patients compared to matched controls. We additionally found that N2 response was greater for initial and final tones in the group for healthy controls, but not schizophrenia patients, and that this correlated with sustained potential amplitude. Importantly, reductions in sustained potentials in schizophrenia patients were associated with greater negative symptoms, and impaired IQ, working memory, learning, and social cognition. These results suggest that deficits in auditory pattern segmentation occurs in schizophrenia early in sensory perception, and may compound deficits in many higher-order facets of the disorder.

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Poster 2-21**EMOTION REGULATION STRATEGIES AND PHYSIOLOGICAL EFFECTS ON THE BODY, AS SEEN IN HAND TEMPERATURE**

Gabriella G.N. Robinson, Annabelle Scott, Treva Van Cleave, & Wendy D'Andrea
The New School for Social Research

Descriptors: emotion

Emotion regulation strategies are critical in managing emotion-eliciting events, contributing to overall health. Greater awareness of bodily sensations has been associated with successful emotion regulation. The Rubber Hand Illusion (RHI) task has been used to assess the way an individual perceives bodily sensations; unlike heartbeat detection, it examines body ownership rather than perception of viscera. Physiologically, during RHI the temperature of one's hand indicates body ownership. The task involves the stroking of a rubber hand on a table next to one of the participants' hands, while the participants' other hand is not on the table (the out-hand). This study utilized RHI ($N=67$) to examine the temperature of participants' hand, as it corresponds to psychological strategies of emotion regulation (suppression and reappraisal effectiveness and frequency). Suppression amount was significantly correlated with temperature of the out-hand, $r(49)=0.33$ $p < .05$. Suppression effectiveness was significantly correlated with temperature change of the out-hand, $r(46)=-0.38$ $p < .05$. Trait suppressors reported losing conscious sensation of their out-hand, but no temperature change was seen, $r(59)=0.248$, $p = .058$. This suggests perceived effectiveness of suppression is correlated with poor body awareness, despite self-reported loss of consciousness of the hand, which may be further validation of self-reported dysregulation. Results support the idea that psychological strategy of emotional suppression plays a critical role in eliciting body's physiological autonomic response and dysregulation.

Poster 2-22**EMOTION REGULATION TO IDIOGRAPHIC STIMULI:
TESTING A NOVEL ERP PARADIGM**

Brittany C. Speed¹, James J. Gross², Dimitris N. Kiosses³, & Greg Hajcak¹
¹Stony Brook University, ²Stanford University, ³Weill Cornell Medicine

Descriptors: emotion regulation, idiographic stimuli, late positive potential (LPP)

Difficulties with emotion regulation have been associated with many forms of psychopathology. Event-related potential (ERP) studies have found that one promising biomarker of such difficulties is the late positive potential (LPP), which is potentiated for emotional stimuli and can be reduced using various emotion regulation strategies. A limitation of prior LPP studies, however, is that they have relied on standardized emotional picture sets, which have not allowed for the examination of regulation to personally-relevant stimuli and memories. The current study utilized a novel paradigm designed to investigate the neural correlates of emotional reactivity and regulation to idiographic information in 49 young adults. The Autobiographical Affective Regulation Task (AART) is a word-viewing task in which participants identify 2 neutral and 2 negative autobiographical situations and generate 10 key words unique to each situation. First, participants are instructed to simply view the words. Then, participants are presented with words from negative situations and are either instructed to react normally (react condition) or to use cognitive reappraisal to decrease negative affect (reappraise condition). Results indicate that the LPP was potentiated when initially viewing negative compared to neutral words. Furthermore, the LPP was reduced during reappraise compared to react trials, demonstrating successful down-regulation of neural activity to negative idiographic stimuli. These findings suggest the AART is a feasible and effective probe of emotion regulation to idiographic stimuli.

Poster 2-23**EMOTIONAL ABUSE AND ATTACHMENT SECURITY AS
PREDICTORS OF ABNORMAL PROCESSING OF
POSITIVELY-VALENCE STIMULI**

Trisha M. Karsten¹, Kelly K. Bost², Glenn I. Roisman³, Wendy Heller²,
 Gregory A. Miller², & Stacie L. Warren¹
¹Palo Alto University, ²University of Illinois, Urbana-Champaign, ³University of Minnesota

Descriptors: attachment and trauma, fMRI, cognitive control

Childhood emotional trauma (ET) and attachment insecurity affect mental health outcomes and are associated with psychopathology and cognitive dysfunction. However, these phenomena are often studied independently in parallel literatures and frequently focus on negatively-valenced stimuli. Failure to engage in, or abnormal processing of positive stimuli could contribute to the development of psychopathology. The degree to which ET and attachment style involve overlapping or distinct brain regions may elucidate the nature of the relationship between and interaction of these constructs. The present study examined effects of childhood ET, attachment insecurity, and their interaction on brain activity in 43 adults during an emotion-word Stroop task. Hierarchical linear regressions revealed no significant effect of ET on brain activity during the processing of positive words. Attachment insecurity predicted greater right DLPFC activity for positive words than for neutral words, and the interaction of ET and attachment security predicted greater activity in regions involved in emotion regulation and cognitive control (e.g., left IFG, ACC, OFC). Additionally, increased brain activity associated with regions supporting cognitive control (ACC, superior frontal gyrus) was associated with more errors for positive words and not neutral words. Behavioral and neuroimaging results suggest that positive words require more resources to process. However, these resources fail as indexed by increased error rates, indicating inefficient processing of positive stimuli.

National Institute of Mental Health (P50 MH079485, R01 MH61358) and by the University of Illinois Beckman Institute and Department of Psychology.

Poster 2-24**EMOTIONAL IMAGES REDUCE THE N1 TO AUDITORY
DISTRACTORS**

Daniel B.K. Gabriel, Lauren A.-M. Dahlke, James W. Rogers, Jamonté D. Wilson, & Jeffrey J. Sable
 Christian Brothers University

Descriptors: attention, emotion, event-related potential

In order to determine the effect of emotional stimuli on attention and distractibility, we examined event-related potentials (ERPs) to background sounds while participants viewed emotion-inducing slideshows. The N1 component of ERPs reflects attention to a stimulus, even if participants are not consciously attending to the stimulus. Participants watched three separate slideshows, each consisting of negative, neutral, or positive images from the International Affective Picture System (IAPS). Trains of five, identical, 50-ms tones (with 400-ms inter-tone intervals) were played with either 1 or 5 s between trains. N1 responses to the tones were significantly larger when participants were viewing the neutral slides than when they were viewing the emotion inducing slides (positive or negative). These results confirmed our hypothesis that emotion would affect attention, indicating that the tones drew less attention, or distracted the participant less, during emotional slides than during neutral slides.

This research was supported in part by NSF MRI award 1429263.

Poster 2-25**DYSFUNCTION IN ANIMACY INFORMATION PROCESSING
IN ADOLESCENTS WITH DISRUPTIVE BEHAVIOR
DISORDERS AND CALLOUS-UNEMOTIONAL TRAITS**

Laura C. Thornton¹, Elizabeth Penner¹, Zachary Nolan², Christopher Adalio³, Soonjo Hwang⁴, Harma Meffert¹, James Blair⁵, & Stuart White¹
¹Boys Town National Research Hospital, ²Pennsylvania State College of Medicine, ³University of California at Berkeley, ⁴University of Nebraska Medical Center, ⁵National Institute of Mental Health

Descriptors: amygdala dysfunction, animacy information processing, disruptive behavior disorders, callous-unemotional traits

Amygdala dysfunction during emotion processing has been implicated in youth with Disruptive Behavior Disorders (DBD; Conduct Disorder/Oppositional Defiant Disorder). Youth with DBDs and high levels of callous-unemotional (CU) traits show reduced amygdala response to fear/distress stimuli, while youth with DBDs and low levels of CU traits show increased amygdala response to fear/distress stimuli. Critically, the amygdala is responsive to emotional (including fear/distress) relative to neutral stimuli, but also to animate relative to inanimate stimuli. It is not known whether youth with DBD show amygdala impairment when processing animacy information. 29 youth with DBD and 20 TD youth, matched for IQ, age (Mage=14.45, SD=2.052) and gender, completed a dot probe task during fMRI. Stimuli consisted of threatening/animate, threatening/inanimate, neutral/animate and neutral/inanimate images. Youth with DBDs failed to increase amygdala activation to animate relative to inanimate stimuli. Moreover, within youth with DBDs, CU traits were inversely associated with activation to animate relative to inanimate stimuli within the amygdala. These data suggest that youth with DBDs and high levels of CU traits exhibit dysfunction in animacy processing in the amygdala. This suggests that amygdala dysfunction in these youth extends beyond emotional processing with implications for theory, assessment and intervention.

This work was supported by the Intramural Research Program of the National Institute of Mental Health, National Institutes of Health (1-ZIA-MH002860), J.R.B principle investigator.

Poster 2-26**EMOTIONAL PERCEPTION: SEX DIFFERENCES IN LPP MODULATION?**

Timothy Wanger, & Dean Sabatinelli
University of Georgia

Descriptors: emotion, perception, LPP

The late positive potential (LPP) is enhanced during highly arousing pleasant and unpleasant scene perception in both men and women. However, women rate erotic scenes as significantly less pleasant and less arousing than do men, though sex differences in LPP enhancement have not been identified. Here we examine the relationship between participant sex, scene ratings, and LPP modulation in a sample of 144 (72 women) participants as they viewed a series of 120 emotional and neutral scenes. No gender by scene content interactions were found in LPP amplitude. Consistent with past studies, women rated scenes depicting erotic couples as much less pleasant (3.6 of 8) than did men (6.0). To explore the relationship between individual ratings and LPP modulation by erotic scenes, a comparison of LPP amplitude was conducted among the top and bottom quartiles of male and female participants according to their pleasantness ratings of erotic scenes. Here we identified a marginal interaction ($F(1,68)=3.82, p=.055$), such that those men who rated erotica as more pleasant showed greater LPP amplitude than did men who rated erotica as less pleasant, while the reverse relationship was evident in women. No other scene category was associated with a similar interaction. These data suggest that sex-specific processes may contribute to emotional modulation of the LPP in erotic scene perception.

Poster 2-27**EMOTIONAL PROCESSING OF LOVED FAMILIAR FACES AND PROPER NAMES: AN FMRI STUDY**

Ignacio Lucas¹, Pedro Guerra¹, Cristina Morato¹, Maria Antonieta Bobes², & Jaime Vila¹

¹University of Granada, ²Cuban Neurosciences Center

Descriptors: identity recognition, positive emotions, fMRI

Previous research on emotion-from-identity processes has been characterized by the use of faces and the simultaneous recording of a broad set of central and peripheral measures to unravel the neurophysiological mechanisms involved in identity recognition of loved familiar people. However, accessing the identity of others can be also dependent on their names, and yet the number of studies exploring whether these stimuli share a common network in the brain remains scant. Here, we tried to fill this gap by presenting both faces and proper names of close others in a single experiment. Ten female participants took part in this study. They were presented with pictures and names belonging to two categories (loved familiar/unknown). Stimuli were delivered in a pseudorandom manner, with the restriction that the same face/name couldn't appear more than twice in a row. The final sequence comprised a total of 180 trials, out of which 160 belonged to the stimuli of interest and 20 consisted of a baby picture to which participants were required to respond. Results revealed that both faces and names of close others engaged a similar network, with areas involved in retrieving factual knowledge about those individuals (precuneus, posterior-cingulate) and other areas related to emotion (insula, and medial orbitofrontal cortex). Differences between loved faces and loved names were mainly located in areas of the visual cortex. These data support the view that a similar set of areas in the brain are engaged when processing stimuli referring to relevant individuals, regardless of their modality.

This research was funded by a grant from the Spanish Ministry of Economy and Competitiveness (ref. PSI2011-28530).

Poster 2-29**EXERCISE-INDUCED MODULATIONS OF ERROR-SURROUNDING BRAIN ACTIVITY IN FEMALES WITH HIGH AND LOW LEVELS OF WORRY**

Anthony G. Delli Paoli, Andrew C. Parks, Hans S. Schroder, Jason S. Moser, & Matthew B. Pontifex
Michigan State University

Descriptors: exercise, anxiety, error monitoring

Emerging evidence has demonstrated that individuals high in anxious apprehension/worry exhibit suppressed error-preceding positivity (EPP) and exaggerated error-related negativity (ERN), compared to individuals low in anxious apprehension/worry. Although single bouts of exercise have been shown to reduce symptoms associated with anxious apprehension/worry, the neurophysiological mechanisms of these reductions are not well understood. Accordingly, the present investigation sought to examine the effect of a bout of aerobic exercise on attentional decline preceding errors (EPP) and performance monitoring following errors (ERN) in both high and low anxious apprehension/worry female college-aged adults. Using a within-participants design, event-related brain potentials and task performance were assessed in response to a letter-based flanker task immediately prior to and following a bout of exercise or seated rest during two separate counterbalanced sessions. Differential effects of exercise compared to rest were observed for EPP and ERN amplitudes across worry groups. Following exercise, high worriers demonstrated a smaller EPP amplitude than low worriers. ERN amplitude and post-error accuracy generally increased following exercise, however, the modulation of ERN amplitude following exercise was greater for low than for high worriers. These findings suggest that exercise has differential effects on error-surrounding brain activity in females with high, compared to low, levels of worry.

Support for our research was provided by Summer Renewable Research Fellowships awarded to A. Delli Paoli and A. Parks through the College of Education and the Graduate School at Michigan State University.

Poster 2-30**ENHANCED ERROR RELATED NEGATIVITY UNDER THREAT OF SHOCK: EVIDENCE FROM A TASK SWITCHING PARADIGM**

Colin B. Bowyer, Isabella Palumbo, James R. Yancey, Sarah Sowards, Jens Foell, & Christopher J. Patrick
Florida State University

Descriptors: ERN, threat, defensive-reactivity

It has been widely documented in the event-related potential literature that the commission of an error while performing a cognitive task elicits an error related negativity (ERN), maximal over fronto-central recording sites (Miltner, Braun, & Coles, 1997) and believed to originate from the anterior cingulate cortex (Agam et al., 2011). Furthermore, Hajcak & Olvet (2008) found that commission of errors was associated with enhanced activation of the defensive motivational system as indexed by increased corrugator activity, heart rate, and startle potentiation during the period following incorrect responses. The implication is that error recognition involves activation of threat-system circuitry, and that the ERN partly reflects this activation. Based on this, we hypothesized that the ERN would be augmented under conditions of physical threat. Utilizing an undergraduate student sample, the current study tested this hypothesis by evaluating the impact of a threat manipulation on the ERN in a novel task switching paradigm. Analyses revealed a robust ERN following erroneous responses that was reliably enhanced during trial blocks in which participants anticipated receiving intermittent electric shocks relative to 'safe' (no shock) blocks. These findings suggest that error-monitoring circuitry may be more activated under threatening relative to non-threatening conditions. Associations with other physiological indices of enhanced defensive reactivity will be discussed, as well as implications for interpretation of the ERN as an index of threat sensitivity.

Poster 2-31**ERN AND THETA DYNAMICS: LINKS WITH ANXIETY RISK IN PRESCHOOLERS**

Mara J. Canen, & Rebecca J. Brooker
Montana State University

Descriptors: ERN, anxiety, theta

The Error Related Negativity is a neural marker for error monitoring (Botnivick et al., 2001) that has been linked to anxiety risk in children (Torpey, Hajcak, & Klein, 2009) and adults (Olvet & Hajcak, 2008). Findings linking the ERN to anxiety in children are inconsistent. For example, more negative ERN amplitudes are related with increased anxiety in children over age 12, but not under age 12 (Meyer et al., 2012). The neural dynamics underlying childhood ERN are also unknown. In this study, we investigate interactions between ERN and the Theta frequency band, which is associated with attentional control (Jensen & Tesche, 2002) as contributors to childhood anxiety risk.

We recorded EEG from 59 3.5 year old children ($M=3.56$, $SD=0.35$) during a modified Go-No-Go task. A repeated measures ANOVA and follow-up tests revealed a significant ERN at Fz, FCz, and Cz, but not Pz ($F(3,168)=2.93$, $p=.04$). Theta power was visible for both correct and incorrect trials ($F(4,54)=20.798$, $p<.05$). Parents reported on children's anxious behaviors such as social inhibition and withdrawal and asocial behaviors with peers. Greater Theta power during incorrect trials predicted greater anxiety risk ($B=1.31$, $p<.05$); however, this association was moderated by ERN ($B=.11$, $p=.04$) such that when ERN was small, theta negatively predicted anxious behaviors ($B=1.19$, $p=.04$). Theta and anxious behaviors were unrelated when ERN was large ($B=-.87$, $p>.05$). The current study provides evidence that ERN and theta may jointly contribute to anxiety risk in early childhood.

Poster 2-32**ERPS ARE SENSITIVE TO EMOTIONAL-NEUTRAL COMPETITION IN BINOCULAR RIVALRY**

Maria Hernández-Lorca, Dominique Kessel, María José García-Rubio, Tamara Giménez-Fernández, Almudena Capilla, José Ángel Martínez-Huertas, & Luis Carretié
Universidad Autónoma de Madrid

Descriptors: binocular rivalry, emotion, ERPs

Binocular Rivalry (BR) consists of the conscious perception of one of the competing images presented to each eye. This phenomenon has been used with pairs of neutral-emotional images and a BR bias towards emotional images has been shown. However, information on the neural mechanisms underlying this bias has not been provided yet. We combined neutral-neutral and neutral-emotional (positive and negative) scenes within a BR paradigm during 600 ms. We controlled participants' sight preference as measured with the hole-in-the-card test. Behavioral responses and event-related potentials (ERPs) were recorded. Scenes were presented at the temporal hemifields to detect the Emotion x Eye dominance interaction in ERPs. To control dominance gaining, participants ($n=35$; 16 with right eye preference, 19 with left eye preference) reported the orientation of a line placed in the center of each image. Our behavioral results showed that emotional images were more likely to gain conscious perception. At the neural level, NP2, a component peaking at 260 ms after stimulus onset that showed both negative and positive peaks depending on conditions, showed significantly greater positivity at parietoccipital areas contralateral to the emotional presentation compared to the homologues in the other hemisphere. This effect was only observed in the individuals with left sight preference. Results suggest that the emotional influence on BR takes place at an early stage and that sight preference is an important modulating factor.

Work supported by the Ministerio de Economía y Competitividad of Spain (PSI2014-54853-P).

Poster 2-33**ERROR MONITORING ACROSS THE SCHIZOPHRENIA SPECTRUM: THE IMPACT OF DIAGNOSIS AND MOOD SYMPTOMS**

Keisha Novak¹, Amanda Bolbecker², Lisa A. Bartolomeo³, Brian F. O'Donnell³, William P. Hetrick³, & Dan Foti¹
¹Purdue University, ²Indiana University, ³Indiana University
Bloomington

Descriptors: ERN, ERP, schizophrenia

Extant literature has reliably shown deficits in error-monitoring among individuals diagnosed with schizophrenia, as well as longer response time and commitment of more errors compared to healthy controls. Additionally, research suggests that individuals with current depression, as well as history of depression, also show impaired error-monitoring. However, no study to date has considered the interplay between psychotic and mood dimensions as it relates to error processing. In the current study, we examined differences in the error-related negativity (ERN) elicited by a flankers task among a heterogeneous sample of individuals diagnosed with schizophrenia-spectrum disorders (schizophrenia, schizoaffective disorder, schizotypal personality disorder; $N=67$) and healthy controls. Additionally, within this clinical sample, we were also interested in the impact of mood symptoms on the ERN. Across the full sample and controlling for age and gender, there was a significant main effect of diagnosis ($F(3, 61)=3.68$, $p=.017$), with the ERN blunted in schizophrenia and schizoaffective disorder, but not schizotypal. Separate from this effect of psychotic illness, a blunted ERN was also associated with history of past depression among patients ($F(1, 47)=4.53$, $p=.039$); history of mania did not predict ERN amplitude. Taken together, these data show effects of both psychotic illness and depressive symptoms on error monitoring.

Poster 2-34**INDIVIDUAL DIFFERENCES IN LINGUISTIC AND NON-LINGUISTIC SKILLS MODULATE NEURAL PROCESSING OF WORDS IN CONTEXT**

Edward Wlotko¹, & Gina Kuperberg²
¹Tufts University, ²Tufts University and Massachusetts General Hospital

Descriptors: language comprehension, prediction

Language comprehenders use context to generate probabilistic predictions at multiple levels of representation. However, individuals vary in how efficiently they can use context information to influence these predictions during ongoing language processing. Using event-related brain potentials (ERPs), we asked how individual differences in reading experience and working memory modulate brain responses to incoming words in context. Healthy college aged participants read sentences containing a critical word that either fulfilled predictions or strongly violated semantic constraints set up by the context [Joan fed her baby some warm MILK/OFFICES], and judged acceptability while ERPs were recorded. We used the author and magazine recognition test as a measure of exposure to text and the reading span task to measure working memory. As expected, words that violated semantic constraints of the context elicited a larger N400 compared to predictable words. The size of this effect (300-500 ms at Cz) increased with higher reading span scores, corroborating past findings. In contrast to prior studies, these violations did not produce a post-N400 positivity effect overall. However, some comprehenders did appear to show such a late posterior positivity/P600 effect (600-900 ms at Pz), and the size of the effect was positively associated with reading experience scores. These findings demonstrate that both availability of online processing resources (working memory) and accumulated past language experience (exposure to text) can affect the neural responses engaged during comprehension.

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Poster 2-35**ESTRADIOL MODERATES THE RELATIONSHIP BETWEEN ERN AND PERFORMANCE**

Chelsea Kneip, & Jason S. Moser
Michigan State University

Descriptors: estradiol, ERN, errors

Endogenous levels of estradiol have been linked with cognitive control function. For example, higher levels of estradiol are related to enhanced dopamine activity, which is involved in ACC-mediated cognitive control processes such as error monitoring. The error-related negativity (ERN) is an event-related potential proposed to reflect such dopaminergic ACC activity, however, it is unclear how estradiol relates to ERN and associated performance. To address this gap, the current study utilized a longitudinal design wherein naturally cycling women of childbearing age provided hormone assays and ERN measurements across a full menstrual cycle. Multilevel modeling results showed that ERN and estradiol interacted to predict performance on a flanker task such that ERN related to performance only in the presence of high estradiol levels. That is, a larger ERN was associated with better performance whereas a smaller ERN was associated with poorer performance when estradiol was high but not when estradiol was low. It may be the case that increased estradiol levels "activate" the functionality of dopaminergic cognitive control processes. Future research would do well to consider hormone levels when making inferences regarding the nature of relationships between error monitoring brain activity and behavioral performance.

Poster 2-36**ETIOLOGICAL OVERLAP BETWEEN SUICIDAL BEHAVIORS AND PSYCHONEUROMETRIC MEASURES OF DISINHIBITION AND THREAT SENSITIVITY**

Noah C. Venables¹, James R. Yancey¹, Brian Hicks², Mark Kramer³, Thomas Joiner¹, Robert Krueger⁴, William Iacono⁴, & Christopher J. Patrick¹

¹Florida State University, ²University of Michigan, ³Minneapolis VA Medical Center, ⁴University of Minnesota

Descriptors: psychoneurometric, suicidal behavior, disinhibition; threat sensitivity

Disinhibition (DIS) and threat sensitivity (THT) are neurobehavioral constructs hypothesized to confer risk for suicidal behavior. However, little is known about the etiologic basis of relations between these variables, operationalized as psychoneurometric variables (i.e., conjointly through scale-report and task-physiology), and suicidal behavior. The current work addressed this important question in a sample of adult twins (N=444). DIS was operationalized through scores on scale measures of disinhibitory and aggressive tendencies combined with P3 brain response indicators from two lab tasks. THT was operationalized using a scale measure of dispositional fear together with physiological (i.e., startle, facial EMG, heart rate) indicators of reactivity to aversive visual stimuli. We found appreciable heritabilities for suicidal behavior (.52) and psychoneurometric indices of DIS (.68) and THT (.45). Bivariate biometric analyses revealed robust genetic correlations for both DIS and THT with suicidality (.41 and .46, respectively). Further, disinhibition and suicidality exhibited a significant nonshared environmental association (.19). The present study extends previous work by highlighting that psychoneurometric indices of DIS and THT tap core biobehavioral processes associated with diverse maladaptive outcomes, including risk for suicide. Findings will be discussed in the context of initiatives directed at incorporating psychophysiological measures into assessments of mental health problems.

Poster 2-37**EVENT RELATED POTENTIALS OF CHILDREN WITH DYSLEXIA REVEAL VISUAL STATISTICAL LEARNING IMPAIRMENT**

Sonia Singh¹, Anne Walk², & Christopher M. Conway¹

¹Georgia State University, ²University of Illinois at Urbana-Champaign

Descriptors: sequence processing, reading ability, language impairment

Current behavioral findings suggest that task performance involving the learning and encoding of statistical-sequential patterns is worse for children with developmental dyslexia compared to typically developing children. However, few studies have examined the neural mechanisms associated with such impairments. The

focus of the present study was to investigate the event related potential (ERP) correlates of statistical learning in a sample of English speaking children diagnosed with dyslexia using a visual learning paradigm comprised of covert statistical regularities (Jost et al., 2015). Findings showed that whereas, age-matched typically developing children (n=12) showed learning in task performance as well as response times, the children with dyslexia (n=8) showed no effects of learning. Moreover, the ERPs of the typically developing children showed a P300-like response indicative of learning in this paradigm (Jost et al., 2015), whereas the children diagnosed with a reading disorder showed no such ERP effects. These findings are consistent with the idea that disturbances to general purpose statistical learning abilities might underlie reading deficits observed in developmental dyslexia.

Poster 2-38**EMOTION PROCESSING FOR MULTIPLE FACES DEMANDS AS MUCH ATTENTION AS SINGLE FACE**

Luyan Ji, & Gilles Pourtois
Ghent University

Descriptors: emotion processing, multiple facial expressions, attention

This study investigated the role of attention in the processing for multiple facial expressions and directly compared it with the processing for a single face. Event-related potentials were recorded from 24 participants judging the valence of the (average) emotion in the target face set. The target, either one happy or angry face, or four faces with different amount of happy and angry expressions, was presented with the distractor (one neutral or four neutral faces) for 250 ms, in the left or the right visual field respectively, following a central cue with 75% chances pointing to target location. Behavioral results showed no differences when the target was one single face or multiple faces. For both tasks, when attention was directed away from the target (i.e., unattended condition), the performance significantly dropped. Electrophysiological data revealed differences in the single and multiple face tasks in three main time windows. Firstly, the N170 (150-180 ms) was larger for multiple faces compared with one single face. In addition, the mean amplitude at posterior temporal sites during 240-300 ms was more positive for single faces; while that during 330-375 ms was more positive for multiple faces. All these differences were not modulated by attention. However, a contralateral negativity was present only in the attended condition, similarly for both tasks during the three periods. The results suggest that emotion processing for multiple faces and a single might recruit different neural routes, but was dependent on attention in a similar way.

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Poster 2-39**EVENT-RELATED POTENTIALS DURING FACE PROCESSING OF INTERPERSONAL PSYCHOPATHY FACTORS**

Mary C. Baggio, & Stephen D. Benning
University of Nevada, Las Vegas

Descriptors: psychopathy, facial processing, event-related potentials

Psychopathy is a disorder characterized by antisocial behavior, emotional impairment, and unstable interpersonal functioning. There is substantial amount of evidence to support deficits in psychopaths' processing of faces. No prior research has investigated the relationship between specific interpersonal psychopathy factors as measured by the Interpersonal Measure of Psychopathy (IM-P) and facial processing. The aim of the current study was to investigate aspects of psychopathy related particularly to interpersonal factors (Grandiosity, Boundary Violations, Dominance) assessed with the IM-P. A sample of 71 community participants from the emergency room completed the IM-P and viewed a variety of faces for 2-3 seconds each while EEG was recorded from electrodes placed according to the 10-20 system. Event-related potential amplitudes to a total of all faces were correlated with IM-P factors. Results showed that Grandiosity was negatively correlated with VPP amplitude to faces at F8, suggesting that those higher in grandiosity have reduced processing of facial stimuli. Boundary Violations was positively correlated with higher P3 and LPP amplitudes at center-right across the head. This suggests that higher boundary violations are associated with greater contextual processing of human faces. Overall, the results suggest different interpersonal factors of psychopathy correlate in opposite directions with facial processing. Further research investigating this relationship is needed.

Poster 2-40**EVENT-RELATED-POTENTIAL CORRELATES OF THE CONGRUENCE-SEQUENCE EFFECT IN A CONFOUND-MINIMIZED TASK**

Julia L. Feldman, & Antonio L. Freitas
Stony Brook University

Descriptors: N2 event related potential, congruence-sequence effect, information-processing conflict

According to conflict-monitoring theory (Botvinick et al., 2001), sequential adjustments in cognitive control indicate that encountering information-processing conflict engages cognitive-control mechanisms, which then are applied to newly encountered information-processing demands. Resulting decreases in activation of the anterior cingulate cortex (ACC) during the second of two high-conflict events is termed a congruence-sequence effect (CSE). Research on CSEs has been controversial, as researchers have interpreted earlier brain-imaging effects in terms of numerous methodological confounds (Mayr & Awh, 2009), indicating a need for new methods. To investigate behavioral and neural CSEs with a confound-minimized task, we used the Stroop-trajectory task (Freitas & Clark, 2015). With twenty participants in an event-related-potential (ERP) experiment, we found significant CSEs for behavioral measures and for amplitude of the fronto-central N2, an ERP component established in previous work to be related to cognitive control and to ACC activation. This study is the first to identify fronto-central N2 amplitude as a neural correlate of the CSE in a confound-minimized task. Accordingly, these results support conflict-monitoring theory while also validating the Stroop-trajectory task as a confound-minimized means of assessing CSEs.

Poster 2-41**EXAMINING CORRESPONDENCE BETWEEN TRADITIONAL AND NOVEL MEASURES OF ELECTRODERMAL ACTIVITY**

Rachel Tomko¹, Russell Clayton², & Timothy Trull³
¹Medical University of South Carolina, ²Florida State University, ³University of Missouri

Descriptors: skin conductance, electrodermal activity, ambulatory assessment
Electrodermal activity (EDA) has traditionally been measured within laboratory settings. New advances in technology allow for ambulatory monitoring of EDA. The Q Sensor (Affectiva) is a wrist-worn device designed for long-term EDA monitoring in individuals' natural environments. This has significant potential clinical utility, such as alerting individuals of a potential seizure or detecting real-time drug use. However, little is known about how the Q Sensor relates to traditional EDA measurement conducted in a laboratory setting. The goal of this study was to compare skin conductance level (SCL) and skin conductance responses (SCRs) recorded via the Q Sensor and traditional laboratory-based EDA recording (Biopac). Adult participants (N=30), over-sampled for emotional dysregulation, were exposed to videos known to produce emotional responses within a laboratory setting. Q Sensor and Biopac recordings were compared using correlational analysis. Results suggest that the Q Sensor data correlate positively and significantly with traditional, laboratory-based (Biopac) measures of SCR. Associations are largest when the index of interest is number of SCRs per minute. The correlation is attenuated when the index of interest is SCL. Of note, the Q Sensor produced higher average SCL and lower average SCRs per minute than the Biopac-based measurement. When adjusting for participant use of medications with anticholinergic properties, the pattern of results remained unchanged. These data indicate that the Q Sensor may be most useful in detecting change in EDA, rather than absolute level.

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Poster 2-42**EXAMINING THE ROLE OF CARDIOVASCULAR FEEDBACK IN EMOTIONAL STARTLE POTENTIATION**

Chris M. Fiacconi, & Adrian Owen
University of Western Ontario

Descriptors: startle eyeblink reflex, cardiac feedback
Previous research has demonstrated that the magnitude of the acoustic startle eyeblink reflex is subject to a number of modulating influences. For example, negative affect has been reported to increase startle magnitude, whereas baroreceptor-mediated cardiovascular feedback has been shown to decrease startle magnitude.

Here, we examined the joint influence of these two factors to probe whether startle potentiation induced by negative affect is reduced in the presence of cardiovascular feedback. Participants viewed neutral and negative pictures during which time startle probes (50 millisecond noise burst, 105 decibels) were presented and muscle activity from the orbicularis oculi was recorded. Critically, startle probes were presented either during cardiac systole, during which time baroreceptor feedback is most pronounced, or during cardiac diastole, during which time baroreceptor feedback is minimal. In line with previous research, we found that startle probes presented during cardiac systole as compared to cardiac diastole produced a relatively smaller startle eyeblink response, and that the magnitude of this effect was related to mean heart rate. Interestingly, across multiple experiments, we found no evidence that startle magnitude was reliably influenced by the content of the foreground picture. Our results point to a complex interplay between the mechanisms responsible for affective modulation of the startle response and visceral cardiovascular feedback.

Poster 2-43**EXAMINING VISUAL SPATIAL ATTENTION USING RESPONSE-LOCKED EVENT RELATED POTENTIALS SHOWS DIFFERENCES IN POST-ATTENTIONAL PROCESSING**

Brandi Lee Drisdelle, Gregory West, & Pierre Jolicoeur
Universite de Montreal

Descriptors: event-related potentials, visual spatial attention

Our visual system is often subjected to a high-density stream of stimulation that overloads the capacity of downstream processing systems. Visual spatial attention therefore responds to a need to be selective and distribute resources based on importance. In electrophysiology, the N2pc is an event-related potential (ERP) with a posterior negative and contralateral scalp distribution relative to the side of the visual field where attention is deployed. Most N2pc research segments data by time-locking to the onset of a search array. The goal of the present study was to observe the disengagement of visual spatial attention as well as the subsequent mechanisms by instead time-locking segmentation to the motor response. The task was a simple visual search where subjects identified a lateralised pop-out target amongst distractors, allowing us to compare the N2pc time-locked to stimulus onset (S-N2pc) and to the motor response (R-N2pc). We demonstrate that it is possible to observe neuronal activity following the engagement of attention using the R-N2pc. Indeed, the scalp distributions of both the S-N2pc and the R-N2pc demonstrate a similar pattern of activity at posterior sites. We also separated trials by long and short response times (RT) and observed a shorter delay between the onset of the R-N2pc for short RTs and the motor response, which likely reflects the duration of post-visual spatial attention cognitive processes.

Poster 2-44**EXAMINING WOMENS' COGNITIVE AND EMOTIONAL PROCESSING OF THIN, AVERAGE, AND PLUS SIZE FASHION MODELS DEPICTED IN THE MEDIA**

Joshua Hendrickse, Rachel Secharan, & Russell Clayton
Florida State University

Descriptors: attention, emotion, eating disorders

This experiment examined how women cognitively and emotionally process thin, average, and plus size female fashion models depicted in the media. A 3 (body shape: thin/average/plus size) x 4 (images) x 15 (time) repeated measures experiment was conducted. Participants (N = 49 women) viewed 15 images, consisting of five images in each body shape condition for 15-seconds each. All images were pretested prior to the experiment for body shape type and level of attractiveness. Cardiac activity and skin conductance were collected for a 5-second baseline period and time-locked during image exposure. Participants competed a visual recognition task at the end of the experiment. Data analysis revealed a main effect for body shape on cardiac activity change from baseline, $F(1, 48) = 4.26, p = .018, \eta^2 = .15$, such that cardiac deceleration was greatest for plus size models followed by average and thin size models. There was a significant body shape x time interaction on skin conductance change from baseline, $F(1, 48) = 2.96, p < .011, \eta^2 = .05$, such that skin conductance was greatest for plus size models followed by average and thin size models. Data analysis also revealed a main effect for body shape on visual recognition accuracy, $F(1, 48) = 9.20, p < .001, \eta^2 = .16$, such that plus size models resulted in greater recognition memory than average and thin size models. The results from this experiment suggest that depicting plus size models in the media might have cognitive and emotional advantages over depicting thin size fashion models.

Poster 2-45**ENERGY DENSITY DIFFERENTIALLY ALTERS EMOTIONAL RESPONSES TO HEALTH HALO AND NON HEALTH HALO FOODS**

Rachel Bailey, Jiawei Liu, Tianjiao Wang, Adrienne Muldrow, & C. Kit Kaiser
Washington State University

Descriptors: energy density, primary motivation, emotional response

Though food is a primary biological motivator, emotional reactions to different types of foods are highly differentiated. Individuals prefer energy dense foods owing to biological optimal energy drives and palatability preferences, but in the current climate of increasing obesity and obesity related illness, these types of foods also present risks. This means these types of foods create coactive motivational activation. This has been supported in previous research with high food knowledge individuals likely to be aware of such risks. This study investigated how individuals emotionally responded to food stimuli that were classified as health halos, or foods that enjoy better health perceptions than they actually deliver, compared to other foods. 97 undergraduate students viewed still pictures of food varying in health halo status and energy density level. During exposure, orbicularis oculi (OO) and corrugator supercilli (CS) facial electromyographic activation was collected. An interaction of energy density, halo status x time of exposure was found on OO ($F(3,288)=2.77$, $p<.05$, $\eta^2=.03$) and CS ($F(3,288)=3.40$, $p<.03$, $\eta^2=.03$). The non-health halo items elicited similar patterns of positivity, with the higher energy density foods showing more positive response than the lower energy density foods, as expected. The halo items elicited patterns of coactivity for both low and high energy density, especially later in the response curve. Interestingly, the higher energy density items elicited stronger negative responses across exposure compared to the lower energy density items.

Poster 2-46**EXPANDING OUR UNDERSTANDING OF SENSORY GATING IN AUTISM SPECTRUM DISORDERS**

Jewel E. Crasta, William J. Gavin, & Patricia L. Davies
Colorado State University

Descriptors: sensory gating, autism spectrum disorders, EEG/ERP

Sensory gating is a neural process that filters out irrelevant stimuli, and prevents sensory overload of higher brain functions. Research examining gating in autism is mixed. Gating is typically examined at the P50 ERP component and rarely at mid- and late-latency ERP components. Sensory gating was examined in 20 children with high functioning autism (HFA; 5–12yrs) and 20 typically developing children (TD) using the paired-click EEG/ERP paradigm. Using the Short Sensory Profile (SSP), the associations between sensory processing behaviors and gating were also tested. Gating was assessed using Test/Conditioning click (T/C) ratios and difference scores (C-T) of P50, N1, P2, and N2 ERP amplitudes. Using difference scores and T/C ratios, TD showed significant gating at all components while HFA showed gating only at P2 and N2. Whereas, the HFA group showed reduced gating at P50 ($t [38] = -3.37$, $p = .002$), N1 ($t [38] = -4.58$, $p < .0005$), and P2 ($t [38] = -2.2$, $p = .03$) compared to TD. No significant group differences were found at N2, suggesting typical gating in the HFA group at N2. P50 and P2 T/C ratios significant correlated with SSP scores. Results show that children with HFA have deficits in orientation and filtering of auditory stimuli. However, HFA group exhibited gating at P2 and N2 suggesting that children with HFA use different neural mechanisms for gating compared to TD. Moreover, neural measures of gating correlated with behavioral measures of sensory processing suggesting that unusual sensory behaviors observed in children with HFA may relate to atypical gating.

NICHD (R03HD049532).

Poster 2-47**EXPLORING RELATIONSHIPS BETWEEN ELECTROENCEPHALOGRAM (EEG) THETA/BETA RATIOS, EMPATHY, REWARD SENSITIVITY AND ANXIETY**

Sherona Garrett-Ruffin, & Elizabeth Herring
Bowling Green State University

Descriptors: EEG slow wave/fast wave ratios, empathy, reward sensitivity

A well-established finding is increased resting electroencephalogram (EEG) theta/beta (T/B) ratios among people with attention deficit hyperactivity disorder (ADHD). The purpose of this study was to extend research on T/B ratios to affective traits. Given that larger T/B ratios are thought to reflect cortical under arousal, we made the following predictions:

1. T/B ratios would be positively correlated with empathy deficits.
2. T/B ratios would be positively correlated with reward sensitivity.
3. T/B ratios would be negatively correlated with anxiety, with larger T/B ratios linked to less anxiety

We will discuss our composite T/B ratio calculation and the challenges with assessment of T/B ratios in a non-clinical sample. While there is some research linking excessive slow wave activity with antisocial personality disorder, there is limited research on non-clinical samples. Future research will involve exploring relationships between empathy manipulations and T/B ratios.

Poster 2-48**EXPLORING THE EFFERENCE COPY/COROLLARY DISCHARGE MECHANISM OF PREDICTIVE CODING IN RESPONSE TO CUED ACTION**

Jerilyn Kent¹, Abraham Van Voorhis¹, Seung Suk Kang², & Scott R. Sponheim²

¹Minneapolis VA Health Care System, ²Minneapolis VA Health Care System; University of Minnesota

Descriptors: action, efference copy, corollary discharge

The efference copy (EC)/corollary discharge (CD) predictive coding mechanism is believed to function as a neural indication that an action is self-generated. It has been hypothesized that performing an action generates an EC (a duplicate of the motor command) which results in a CD, a representation of the expected sensory consequences of that action that suppresses sensory cortical activity in response to the action. There is some evidence that the CD is preserved when the action and resulting sensory consequences are different modalities (pushing a button to hear a tone), indicating that the EC carries additional information related to agency, and that the EC indicates self-initiation as well as self-generation of movement. We investigated whether CD is preserved in the motor domain in response to cued action. Participants ($n=56$) completed a Stop Signal Task while EEGs were recorded. Go Only trials (no chance of stop signal), in which a stimulus prompted a left or right response, were analyzed. Others have measured CD as the degree to which the somatosensory ERP (0-50ms post-response) evoked contralaterally from the sensation of responses is suppressed. Analysis of this ERP at electrodes C3 and C4 in response to right-handed responses showed a robust contralateral ERP (C3 peak amplitude significantly higher than C4, $p=.004$). CD is not evidenced in response to cued action, potentially because these movements, while self-generated, were initiated by task cues. In previous work showing evidence of CD in response to button presses, action was self-paced rather than cued.

This research was supported by a Merit Review grant received by Dr. Scott Sponheim from the Veterans Health Administration Clinical Science Research and Development Program (grant number ICX000227A).

Poster 2-49**EXPLORING THE ELECTROPHYSIOLOGICAL CORRELATES OF DEVELOPING INTELLIGENCE**George Spanoudis¹, Anna Tourva¹, Norbert Jausovec², & Andreas Demetriou³¹University of Cyprus, ²University of Maribor, ³University of Nicosia*Descriptors: neural correlates of intelligence, developing intelligence*

The psychology of intelligence has steadily connected elementary operations with intelligence over the last three decades. We studied the relationship between three elementary cognitive operations, that is, speed of processing, attentional control, and working memory, and intelligence by measuring event-related potentials. 68 children performed four tasks: (1) a visual Inspection Time Task to measure speed of processing; (2) the Attentional Network Task to evaluate attentional control; (3) the Sternberg Working Memory Task to assess working memory; and (4) the Wechsler Abbreviated Scales of Intelligence to assess intelligence. The children ranged in age from 6:5 to 18:10 years and were divided into three age groups: group 1 (77-144 months) n=24; group 2 (145-182 months) n=22; and group 3 (183-226 months) n=22. They were also divided into high ability (HA) and low ability (LA) groups based on their WASI scores. The results showed that older children (group 3) displayed lower P1 amplitudes compared to the adolescents (group 2) and young children (group 1) in frontal, central, and parietal locations. Further, group 2 exhibited lower N1 amplitudes compared to younger children in frontal, central and parietal locations and across all three tasks assessing elementary operations. The younger HA children (group 1) demonstrated higher P3 parietal amplitudes and lower P3 frontal amplitudes in comparison to the older HA children (groups 2 and 3). This research extends our knowledge of the complex relationship between elementary cognitive operations and intelligence.

This research was supported by a grant from the Cyprus Research Promotion Foundation (Grant No ERYNE/0506/04).

Poster 2-50**ELECTROPHYSIOLOGICAL ABNORMALITIES DURING SPATIAL WORKING MEMORY IN PEOPLE WITH SCHIZOPHRENIA AND THEIR RELATIVES**Peter A. Lynn, & Scott R. Sponheim
Minneapolis VA Health Care System; University of Minnesota*Descriptors: schizophrenia, working memory, EEG*

Spatial working memory (SWM) ability is compromised in both people with schizophrenia (PSZ) as well as their unaffected first-degree relatives (REL), and abnormal electrophysiological correlates of SWM processes have been found in both groups using ERP analysis. We recorded EEG from 23 PSZ, 30 REL, and 37 CTRL during performance of a delayed-response spatial working memory task. Participants were sequentially presented two or three test stimuli in one of 16 locations, after which a probe stimulus appeared; in half of the trials, one of these stimuli was an irrelevant "distractor" stimulus. Participants indicated whether the probe appeared in the location of a previous target stimulus. Task performance was impaired in PSZ relative to CTRL, while performance in REL was preserved. PSZ and REL demonstrated abnormalities in posterior N1 responses to probe stimuli: whereas CTRL showed increased N1 amplitudes to probes in the position of relevant encoding stimuli, PSZ showed no such modulation, and REL N1 responses showed differentiation between probes at previous targets vs. probes at distractor locations. Furthermore, amplitude indices during retrieval were predictive of behavioral performance for PSZ and REL, but not CTRL. These results suggest that processes during retrieval may represent a compensatory mechanism in REL, and that abnormal retrieval processes may be a particularly important piece to understanding SWM ability in both PSZ and REL alike. Time-frequency analyses of SWM retrieval processes in PSZ and REL may help to elaborate aberrances observed in the time domain.

This research was supported by a Merit Review grant received by Dr. Scott Sponheim from the Veterans Health Administration Clinical Science Research and Development Program (grant number ICX000227A).

Poster 2-51**EXTEREOCEPTIVE STIMULUS OVERRIDES INTEROCEPTIVE STATE IN CONTROL OF REACTION SPEED**Xiao Yang¹, J. Richard Jennings², Bruce H. Friedman¹, Laura Braunstein¹, Hanna Vohra³, Olivia Garcia³, & Alisa Huskey³¹Virginia Polytechnic Institute & State University, ²University of Pittsburgh, ³Virginia Tech*Descriptors: accessory stimulus effect, cardiac timing effect, interoceptive sensitivity*

An irrelevant sensory stimulus speeds reaction time (RT) when it accompanies a cue to react in another sensory modality, which is known as the accessory stimulus effect (ASE, Hackley, 2006). Cross-modality facilitation has been proposed to explain the ASE (Lipp et al., 2006). RT sensory processing is also modulated by cardiac phase (Jennings et al., 1992). The cardiac modulation is related to stimulus valence and interoceptive sensitivity (IS; Garfinkel et al., 2015). However, it is unclear whether cardiac modulation interacts with the ASE. In the present study, the relationship of the ASE, cardiac timing, stimulus valence, and IS was examined. Forty-nine subjects performed 400 trials of a simple RT task. Images of neutral and fear face served as visual accessory stimuli; the RT stimulus was a 75-dB, 400-Hz tone. Electrocardiography (ECG) and respiration were recorded. Visual and auditory stimuli were presented at cardiac systolic phase or diastolic phase. The stimulus onset asynchrony was either 0 or 75 ms. IS was assessed by a mental tracking task (Katkin et al., 1982). RT data was submitted to four-way repeated-measures analyses of variance (ANOVA). Results showed that cardiac timing modulated RT, $F(1, 48)=6.03$, $p < .05$, but only when accessory stimuli were absent. Onset asynchrony did modulate the ASE, $F(2, 48)=134.52$, $p < .001$, but valence of the facial accessory did not, $p=.13$. Also, IS was unrelated to valence or cardiac modulation of RT, $ps > .019$. The results indicate that the ASE overrides cardiac timing effects and is not influenced by affective processing.

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Poster 2-52**EXTERNALIZING PRONENESS AND BRAIN RESPONSE IN A MONETARY INCENTIVE DELAY TASK: RESULTS FROM A LARGE-SCALE FMRI STUDY**Jens Foell¹, Christopher J. Patrick¹, Angela Heinrich², Isabella Palumbo¹, Emily R. Perkins¹, & Herta Flor²¹Florida State University, ²Central Institute of Mental Health*Descriptors: fMRI, externalizing*

The European IMAGEN Consortium project includes behavioral, self-report, clinical-interview, neuroimaging, and genomic data for over 2,000 adolescents within a longitudinal design. The overarching project aim is to understand biobehavioral mechanisms contributing to substance use disorders (SUDs). Prior work has established externalizing proneness as a genetically-based liability to impulse control problems including SUDs (Krueger et al., JAP, 2002). We applied a scale construction approach to self-report data from this project to create and validate an item-based measure of trait disinhibition (Patrick et al., JAP, 2013) as a construct-anchor for identifying neural and behavioral correlates of externalizing proneness. Here, we report on relations of this trait disinhibition scale and an interview-based index of impulse-control problems with behavioral and brain data, respectively, from two tasks—a delay discounting (DD) task and an fMRI-based monetary incentive delay (MID) task—presumed to index processes associated with externalizing proneness. Performance in the DD task was significantly related to both trait disinhibition and impulse problems in this large project sample, and both showed associations with brain activation in performance-relevant regions (e.g., ventral striatum, supplementary motor area) within the MID task. Along with discussing implications of findings for understanding neural mechanisms of externalizing process, we also consider key issues in analyzing large-N fMRI data, including statistical correction and the identification of regions of interest.

Poster 2-53**EXTERNALIZING PSYCHOPATHOLOGY AND PERFORMANCE MONITORING: DIFFERENCES IN RESPONSE PATTERNS ACROSS DISORDERS**

Melanie Bozzay¹, Konrad Bresin², & Edelyn Verona¹
¹University of South Florida, ²University of Illinois at Urbana-Champaign

Descriptors: externalizing psychopathology, cognition, response monitoring
 A prominent characteristic of individuals with externalizing disorders is insensitivity to negative consequences incurred by harmful behaviors. This tendency may reflect neurocognitive deficits in monitoring responses for errors. While these deficits have been found among those high on the externalizing spectrum (Hall, Bernat, & Patrick, 2007), whether there are differences in error monitoring across specific externalizing diagnoses is not well understood. This study investigated whether patterns of error-related negativity (ERN), error positivity (Pe), and reaction time (RT) differed across externalizing diagnoses on a flanker task. Participants (n=55) were grouped by presence/absence of lifetime Antisocial Personality Disorder (APD), Conduct Disorder (CD), Alcohol Dependence (AD), and Drug Dependence (DD). The biggest difference in ERN for all disorders was for central sites relative to parietal sites. However, while individuals with APD/CD had decreased ERN, those with AD/DD displayed an increased ERN in response to both correct and error trials. RTs for individuals with APD and AD/DD were slower following errors, but RTs were slower for AD across all trials. Pe was not related to the disorders. Individuals with AD/DD may be more sensitive to decision-making processes due to cognitive deficits or negative affect, while decreased sensitivity among APD/CD may reflect a stronger association with externalizing tendencies (Krueger et al., 1999; Lu, Collins, & Tucker, 2000). These findings indicate that patterns of response monitoring differ across externalizing disorders.

Poster 2-54**EMBODY YOUR POWER: THE PHYSIOLOGICAL IMPACT OF PERSONALIZED VS. STANDARDIZED 'POWER POSES' IN WOMEN WHO HAVE EXPERIENCED INTERPERSONAL VIOLENCE**

Isabelle Bachrach¹, Andrea Fortunato¹, & Wendy D'Andrea²
¹The New School, ²The New School for Social Research

Descriptors: power pose, interpersonal violence, agency
 The resilience literature suggests that individuals who have promotive personality traits such as personal agency often have positive health outcomes in the face of adversity (Elder & Hitlin 2007; Masten et al. 2009; Secombe, 2002). The present study aims to study female agency through the lens of the body, physiology, and power. A group of women with experiences of interpersonal violence (N = 64) were asked to embody a standardized high power pose, as well as their own, ideographic version of a high pose. RSA and EDA were measured during the poses. Results show that there was a significant difference in RSA and EDA for participants during the standardized high power pose versus ideographic high power pose, $F(1, 61) = 5.699, p = .020$; $F(1, 61) = 50.916, p < .001$, respectively. Additionally, RSA and EDA was significantly higher when participants came up with their own power pose than when they used the standardized high power pose, (Mdiff = .259, $p = .020$, 95% CI[.477, .042]; (Mdiff = 1.464, $p = .000$, 95% CI[1.941, .986]). These findings indicate that when women were given agency to choose a power pose that reflected how they feel they communicate "high power" socially, their parasympathetic activity is higher than when they use a prescribed pose. These findings support the resilience literature, in reflecting that when women are given agency to chose a power pose that reflected how they feel, their parasympathetic nervous system reflects a state of positive health as evidenced by higher RSA and EDA in each ideographic pose.

This project was funded by The Gender and Sexuality Studies research grant at The New School for Social Research.

Poster 2-55**FEELING SOCIAL? CARDIOVASCULAR REACTIVITY AND INTERPERSONAL DISTRESS IN READING THE MIND IN THE EYES**

Nicholas Fehertoi¹, Andria Schmid¹, & Wendy D'Andrea²
¹The New School, ²The New School for Social Research

Descriptors: reading the mind in the eyes, cardiovascular reactivity, interpersonal distress

Existence in a social world demands the navigation of individual emotions, and physiology may support this process. Past research in on Theory of Mind (ToM) has focused on Borderline Personality Disorder, but yielded paradoxical findings. The present study used the IIP, the ERQ, and the Reading the Mind in the Eyes Test (RMET) to investigate how accurately individuals with interpersonal difficulty could employ ToM as well as their use of trait emotion regulation. We hypothesized that ToM and interpersonal difficulties would be related to Using Harkness et al.'s (2005) separation of the RMET by valence, we found that more interpersonal problems were related to lower heart rate reactivity to positive trials: domineering, $r = -.41, p = .044$, vindictive, $r = -.60, p = .004$, and cold, $r = -.51, p = .012$. Some interpersonal problems (cold; avoidant) were also related to less reactivity to negative trials. Findings held when accounting for baseline heart rate. Taken together, these findings suggest that viewing interpersonal stimuli elicits less cardiovascular reactivity among individuals with interpersonal distress, consistent with conceptualizations of blunted reactivity to stressors and inflexible adaptations to potential distress.

Poster 2-56**FEELING THE (B)ERN? EXAMINING THE RELATIONSHIP BETWEEN ERROR MONITORING AND EMOTION PROCESSING**

Yanli Lin, Ling Peng, Sean Roberts, Courtney Callahan, & Jason S. Moser
 Michigan State University

Descriptors: error monitoring, emotion processing

Recent theories speculate that emotional processes are involved in early error monitoring, indexed by the error-related negativity (ERN) of the human event-related potential (ERP). However, evidence for this notion is mixed and further investigation is warranted. In the present study, we sought to clarify the role of emotion in error monitoring by examining the relationships among early and late indices of error monitoring—the ERN and error positivity (Pe)—with likewise early and late indices of emotion processing—the N1 and late positive potential (LPP).

Within-subject correlations showed that the Pe was significantly correlated with both the N1 ($r = .43, p = .02$) and LPP ($r = .54, p < .01$) elicited by negative images. The ERN, however, was not correlated with either emotion processing measure ($r_s < |.05|, p_s > .78$).

The robust Pe-N1 and Pe-LPP correlations suggest that late, but not early, stages of error monitoring are linked with emotion processing. Indeed, the Pe, N1, and LPP all reflect functional similarities in that these components involve attentional responding to the occurrence of negative (e.g., unpleasant pictures) or aversive events (e.g., errors). To the extent that the N1 and LPP serve as proxies for emotional processing, our findings are inconsistent with the notion that the ERN reflects an emotional reaction to errors. Nonetheless, these results support the more general hypothesis that emotional processes are involved in error monitoring, and narrow the relationship to later attentional mechanisms.

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Poster 2-57**FINDINGS FROM MODELING PEAKS IN ELECTRODERMAL ACTIVITY DURING SLEEP AS A POINT PROCESS**

Sara Taylor, Akane Sano, & Rosalind Picard
Massachusetts Institute of Technology

Descriptors: electrodermal activity, sleep

We collected nearly continuous electrodermal activity (EDA) from a wrist sensor worn 30 days by each of 62 undergraduate students as part of the study SNAP-SHOT (Sleep, Networks, Affect, Performance, Stress, and Health using Objective Techniques). The students filled out an online survey each morning to report their sleep timing and energy level. Sleep EDA was modeled as a point process by first making the raw EDA signal binary. This signal was then downsampled to 1Hz. We found that the median number of peaks detected per night was 74. Then we modeled this signal for each participant as a point-process by fitting a generalized linear model with a poisson distribution and log link. The rate function of this model depended on the time since sleep start and the history of peaking for up to 180 seconds in the past. We fit several models to each participant by varying the number of seconds the history component considered. The optimal model for each participant was found by minimizing the Akaike Information Criterion (AIC). We found that the median required peaking history is 60 seconds. We also found that the rate of peaking in the first 3 hours of sleep is significantly higher than during the last 3 hours ($p < 0.001$). There is a suppression in the rate of peaking 1-2 seconds after a peak, while 3-4 seconds after a peak there is an average 4.9 fold increase in rate of peaking ($p < 0.01$). Finally, there is a correlation of -0.38 between the expected first peak time of the EDA during the night's sleep and the average energy reported the following morning ($p < 0.01$).

This work was supported by the MIT Media Lab Consortium and NIH Grant R01GM105018.

Poster 2-58**FOSTERING EFFORTFUL CONTROL IN YOUNG CHILDREN WITH A BRIEF GROUP TRAINING: A NEUROBEHAVIORAL APPROACH**

Sharon Lo, C. Emily Durbin, & Jason S. Moser
Michigan State University

Descriptors: effortful control, error-related negativity, children

Effortful Control (EC) develops most rapidly during early childhood and is a robust predictor of major life outcomes related to physical and mental health, financial status, and academic achievement, even after controlling for IQ and social class. The brain processes involved in EC development are understudied in young children, however. An event-related potential (ERP) known as the Error-Related Negativity (ERN) is a prime candidate marker of EC-related processes, but the nature and function of the ERN in young children is not well understood. The proposed study uses a short-term training targeting behavioral EC skills as an experimental manipulation to test whether neural (i.e., ERN) and/or behavioral manifestations of EC can be readily fostered in young children.

Twenty children rated by their parents as exhibiting low-to-moderate behavioral EC skills were randomized into training (5-day, 3-hour per day) and no-training groups. Results suggested that the short-term training group exhibited improvements in behavioral tasks such as Tower of Hanoi ($d = 1.63$) and Simon Says ($d = 0.87$), and, importantly, a larger ERN ($d = 1.18$) compared to the no-training group. Parents reported significantly fewer problem behaviors 3 months following training in attention ($d = 1.47$), rule breaking ($d = 1.34$), anxiety ($d = 1.62$), and depression ($d = 1.59$), in the training group compared to no-training. These results suggest that the ERN may be a valid marker of EC-related process in children and that increases in EC may accompany decreases in social-emotional adjustment problems.

Poster 2-59**FUNCTIONAL CONNECTIVITY OF THE VENTRAL STRIATUM IN REMITTED DEPRESSED INDIVIDUALS WITH AND WITHOUT SUBSTANCE ABUSE HISTORY**

Sophie DelDonno¹, Lisanne Jenkins¹, Natania Crane¹, Alyssa Barba¹,
Catherine Dion¹, Kelly Ryan², & Scott Langenecker¹
¹University of Illinois at Chicago, ²University of Michigan

Descriptors: depression, substance use, connectivity

Major depressive disorder (MDD) and substance use disorders (SUD) may share a common neurobiological vulnerability. Studying these disorders in the remitted state may reveal neural risk factors without the potentially confounding effects of active symptoms and substances. The present study explored functional connectivity (FC) of the reward network in individuals with remitted MDD (rMDD) and HSUD in relation to trait reward responsiveness. Participants were rMDD ($n=27$), rMDD with HSUD ($n=15$), and healthy controls (HC; $n=26$). Participants completed the Behavioral Activation Reward Responsiveness Scale (BASRR) to assess trait reward responsiveness. FC data were acquired during an 8-minute resting state scan at 3T. Left inferior ventral striatum (LVSi) was the seed of interest. Group activation differed in FC of the left orbitofrontal cortex (rMDD with HSUD > rMDD, HC), right putamen (HC > rMDD, rMDD with HSUD), inferior temporal gyrus (rMDD > rMDD, HC). In regions where LVSi connectivity was positively related to the BASRR, the rMDD with HSUD group had increased connectivity to the lingual gyrus relative to rMDD. LVSi connectivity differed between rMDD individuals with and without HSUD. The rMDD with HSUD group had greater connectivity from the ventral striatum to orbitofrontal regions important in motivation, reward, and value-driven behavior, as well as to temporal regions involved with substance cravings. These differences highlight the need to control for history of MDD and SUD when studying each disorder.

This research was supported by the National Institute of Mental Health (T32MH067631, SD; R01 MH091811, SL).

Poster 2-60**GREATER SENSORY AROUSAL IMPEDES AFFECT RECOGNITION: EVIDENCE ACROSS OLFACTORY AND AUDITORY DOMAINS**

Ashley Culoso, Cara Keifer, Anthony Burns, Elliot Keenan, & Matthew D. Lerner
Stony Brook University

Descriptors: affect, electrophysiology, olfaction

Research shows that odors have the capacity to evoke powerful emotional responses and also suggests a close relationship between both olfactory and affective information processing (Kadohisa, 2013; Soundry et al., 2011; Novak et al., 2015). However, the relationship between odor sensitivity and affect processing remains elusive. We aimed to clarify the link between odor sensitivity and decoding of affective voice cues across behavioral and perceptual levels of analysis via 1) an affect recognition task, and 2) concurrently recorded N100, an early ERP component implicated in the automatic processing of prosodic stimuli (Niznikiewicz, 2013). Data were collected from 27 adults (9 male, $M(\text{age}) = 20.92$). Odor sensitivity was assessed with an olfactory rating task in which participants rated intensity and arousal for a set of positive, neutral, and negative scents (Jin et al., 2015). Number of errors made in identifying high intensity vocal affect correlated with greater arousal ratings for positive ($r = .39$, $p = .02$), neutral ($r = -.23$, $p = .17$) and (marginally) negative ($r = -.30$, $p = .07$) odors. Greater N100 amplitude in response to only high intensity voices correlated with negative arousal ratings ($r = -.58$, $p < .01$). Those rating odors as more arousing showed greater performance error in the vocal affect recognition task and greater N100 amplitude, indicating that high sensitivity to sensory stimuli may impede affect perception. These results have implications for understanding how broad cross-modality sensory sensitivity may interfere with social affect processing.

Poster 2-61**HAND MOTOR TASK: LATERALIZED READINESS POTENTIALS AND HEMISPHERIC ASYMMETRY**

Adithya Chandregowda¹, Yael Arbel², & Emanuel Donchin¹
¹University of South Florida, ²Massachusetts General Hospital Institute of Health Professions

Descriptors: motor praxis, LRPs, hemispheric dominance

We employed a spatial-temporal principal component analysis (PCA) to study the componential structure of lateralized readiness potentials (LRPs). Participants pressed a button with the right index finger and another button using the left index finger based on the color of a stimulus frame displayed on a computer screen. Data from twenty-one right handed participants (11 females) were subjected to interhemispheric difference wave analysis (Kutas & Donchin, 1980) and a spatial-temporal PCA. Interhemispheric difference wave analysis, in line with previous studies, showed that right hand movements were preceded by the LRP that was larger over the left hemisphere. The LRP that preceded left hand movements, however, showed right hemisphere lateralization to a lesser degree. Results of the PCA revealed left hemisphere lateralized activity for right hand movements and bihemispheric lateralized activity for left hand movements. Further research is required to confirm if this left hemisphere activity for both right hand and left hand movements indicates left hemisphere dominance for motor praxis regardless of the responding hand (e.g., Kimura, 1993).

Poster 2-62**HANDGRIP STRENGTH DEGRADATION AS A PHYSIOLOGICAL CORRELATE OF NARRATIVE ENGAGEMENT**

Brandon H. Nutting¹, Travis Loof², Collin K. Berke², & Charlie A. Dalldorf³

¹University of Nebraska-Lincoln, ²Texas Tech University, ³University of South Dakota

Descriptors: narrative engagement, flow, media

Recent research has attempted to connect self-reported narrative engagement with physiological measures. Narrative engagement is described as a flow-like state induced by media narratives. Past research found correlates through heart rate and skin conductance measures. Handgrip strength has been shown to be a predictor of general body strength, postoperative complications, mortality, and functional decline. 66 participants were recruited for a secondary task style experiment. Participants were told that the primary task was to squeeze a trigger as hard as possible while watching a 3-minute narrative. A median split was performed after a pretest of the 12-item narrative engagement scale on 16 total clips resulting in 8 high NE clips and 8 low NE clips. Participants were assigned to one of two orders and viewed 8 clips each (4 high and 4 low). The results indicate that handgrip strength degradation does not accurately predict overall narrative engagement. However, handgrip strength does correlate with narrative engagement subscales. Those clips rated as high narrative understanding and high attentional focus experienced significantly quicker degradation of handgrip strength compared to low. Clips rated as low narrative presence and emotional engagement experienced significantly quicker handgrip strength degradation when compared to high.

Poster 2-63**HEART RATE AND SUBJECTIVE DISCOMFORT AS INDEXES OF CHANGE IN MIRROR EXPOSURE**

Sandra Díaz-Ferrer¹, Blanca Ortega-Roldán¹, M. Carmen Pastor², Jose Luis Mata-Martín¹, Sonia Rodríguez-Ruiz¹, M. Carmen Fernández-Santaella¹, & Jaime Vila¹

¹University of Granada, ²Jaume I University of Castellón

Descriptors: emotional reactions, heart rate, mirror exposure

Previous research has demonstrated that pure and guided mirror exposures have different patterns of emotional activation. However, physiological activation to

own bodies is still unclear. The aim of this study was to examine the psychophysiological responses to one's own body before and after two body mirror exposure treatments. Thirty-five university women with body dissatisfaction and subclinical eating disorders symptoms were randomly assigned to one of two exposure groups: Pure Exposure (n=17) or Guided Exposure (n=18). Participants were exposed to their body in a full-length mirror before and after treatment. All participants received six exposure sessions. Subjective discomfort and heart rate were recorded. Before treatment, both groups exhibited similar subjective discomfort and heart rate responses during confrontation with their own bodies. After treatment, both groups showed habituation of subjective discomfort. However, pure exposure group showed a greater heart rate response compared with guided exposure group. This finding suggests that pure exposure produces greater heart rate activation than guided exposure after treatment due to the continuous attentional focus on more conflicting body parts, accompanied by the verbalization of emotions and thoughts. Nevertheless, guided exposure requires focusing attention on the cognitive neutral reprocessing of all body parts. In accordance with the inhibitory learning model, pure exposure could be a more effective tool because it directs the attentional focus on the negative body parts and the free emotional expression.

This study has been funded by two research projects of the Spanish Ministry of Economy and Competitiveness (MINECO) [PSI2012-31395], the Spanish Ministry of Education [FPU grant Ref. AP2009-3078] and University of Granada [University Research Plan 2015-2016].

Poster 2-64**HEART RATE VARIABILITY DURING BASELINE AND SOCIAL TASKS DIFFERENTIATES INDIVIDUALS WITH SOCIAL ANXIETY DISORDER, SHYNESS, AND HEALTHY CONTROLS**

Christina Sheerin, Shaina Gulin, Roxann Roberson-Nay, & Scott Vrana
 Virginia Commonwealth University

Descriptors: heart rate variability, social anxiety, shyness

Anxiety disorders are characterized by reduced baseline heart rate variability (HRV). Limited studies exist on social anxiety disorder (SAD) specifically and examining changes in vagal activity during tasks. The present study aimed to examine baseline and task-related HRV differences in individuals with SAD, high in shyness, and healthy controls.

The sample (N=59, 50% female, Mage=20.2) consisted of individuals diagnosed with SAD (n=12), highly shy but without SAD (n=25), and healthy controls (n=22). HRV was assessed continuously through a 5-min baseline, 3-min conversations with a confederate (same sex and opposite sex), and a 5-min speech. Subjective Units of Distress (SUDS) were assessed after each task.

No group differences in baseline HRV were found (ps >.50), but greater SUDS was found in the SAD and shy groups compared to controls (ps=.004). Repeated measures ANOVA interaction (p=.002) was found: The SAD group showed an HRV decrease from baseline to conversation and an increase during the speech, whereas the other groups showed an opposite, though less pronounced, pattern. Correlations between SUDS and HRV at baseline differed across groups, with a negative correlation for controls (r=-.45) and positive correlation for SAD (r=.58).

Though the expected lower HRV for the SAD group was not found, those with SAD exhibited a unique pattern of HRV change in SAD during social tasks and a different relationship between baseline HRV and subjective distress. This suggests differences in underlying parasympathetic processes in social anxiety disorder.

Poster 2-65**HEART RATE VARIABILITY DURING LIGHT EXPOSURE AND SUBSEQUENT NETWORK CONNECTIVITY PATTERNS**

John R. Vanuk, John J.B. Allen, & William D.S. Killgore
University of Arizona

Descriptors: connectivity, HRV, light exposure

Heart rate variability (HRV) reflects, in part, parasympathetic control and may relate to alertness, as preliminary data suggest that lower HRV is associated with enhanced psychomotor vigilance (PV). The present study examined the association between changes in HRV following exposure to bright light and the strength of functional connectivity of brain networks that are normally anticorrelated in resting individuals (i.e., internally focused default mode network or DMN; externally focused task positive network or TPN). This investigation was motivated by the assumption that good PV performance requires efficient network switching between DMN and TPN. Twenty healthy young adults received 30 minutes of morning bright light; resting HRV was recorded for 5 minutes before and at the halfway point during light exposure. Six minutes of resting state fMRI were then obtained for functional connectivity analysis. Increases in HRV in response to light predicted greater connectivity between frontal regions of the TPN and posterior DMN regions (posterior cingulate cortex; left angular gyrus). Increased HRV in response to light exposure was associated with reduced vigilance, and aberrant functional connectivity between frontal TPN and posterior DMN. Thus, an increase in HRV in response to light may index a propensity towards reduced vigilance that results from increased coupling and inefficient task-related switching of the DMN and the TPN.

USAMRMC/CDMRP.

Poster 2-66**HEART RATE VARIABILITY'S ASSOCIATION WITH BEHAVIORAL MEASURES OF EMOTION REGULATION**

Jackson M. Gray, Sarah E. Garcia, & Erin C. Tully
Georgia State University

Descriptors: heart rate variability, emotion regulation

Heart rate variability (HRV) has been conceptualized as a physiological indicator of one's capacity for flexible emotion regulation. Although many studies support associations between resting HRV and emotion regulation, effect sizes vary substantially across studies in magnitude and direction. Recent research indicates that associations between HRV and regulation measures may be nonlinear, which may help explain these mixed findings. The current study sought to replicate and extend this research by examining both linear and quadratic associations between HRV and four behavioral measures of emotion regulation, broadly defined. We hypothesized that resting HRV would be positively associated with adaptive regulation tendencies (i.e., positive affect (PA), psychological flexibility, and cognitive reappraisal) and negatively associated with maladaptive regulation tendencies (i.e., negative affect, suppression, rumination, and a latent variable representing emotion dysregulation). Electrocardiograms were recorded at rest for 248 young adults (77% female; Mean=19.7 years) who then completed self-report rating scales assessing emotion regulation. Multiple nonlinear regression was used to test HRV's linear and quadratic associations with emotion regulation. As expected, higher HRV was linearly associated with higher PA. Contrary to predictions, HRV had no significant linear or quadratic associations with any other regulation variable. These findings suggest that HRV may not be a good marker of emotion regulation at the trait behavioral level or their association may be complicated.

Poster 2-68**HIGH AND LOW HEART RATE VARIABILITY ARE ASSOCIATED WITH NEGATIVE ATTRIBUTIONAL STYLE**

Sarah E. Vogt, Jackson M. Gray, Meghan R. Donohue, & Erin C. Tully
Georgia State University

Descriptors: heart rate variability, risk factors for depression, young children

Heart rate variability (HRV) is an index of an individual's capacity for physiological regulation. Investigations of linear associations between HRV and risk factors for depression have revealed mixed findings and generally small effect sizes. Recent research suggests HRV may be a marker of maladaptive processes at

extreme high and low levels and that the association between HRV and risk factors for depression may be nonlinear. One early risk factor for depression is the tendency to make negative attributions (i.e., internal, stable, and global) for negative interpersonal events. The purpose of this study is to test the hypothesis that children with very low and very high HRV have the most negative attributions for interpersonal negative events. Young children (N=80, Mage=5.5 years; 50% female) completed the Children's Attributional Style Interview to assess attributional style for negative interpersonal events. Electrocardiograms were recorded during a 5-minute resting period and HRV within the high-frequency band (HF-HRV) was used as an index of physiological regulation. Multiple nonlinear regression revealed a significant positive quadratic association with very low and extremely high levels of HRV associated with more negative attributional styles. These findings suggest HF-HRV may be an early physiological marker of cognitive risk for depression but its relation to early risk may more complicated than previously conceived.

Poster 2-69**HIGH SOCIAL COMPETITIVENESS AND N2 ACTIVATION: AN ARGUMENT FOR REDUCED NEURAL RESOURCE UTILIZATION**

Andrea M. Tountas¹, Farah Alkhafaf¹, Jena Michel¹, Shannin Moody²,
Yoojin Lee², Elizabeth Shirtcliff², & Connie Lamm¹
¹University of New Orleans, ²Iowa State University

Descriptors: competition, electrophysiology, N200

Social competition can be a highly motivating factor in understanding human behavior. However, few event-related potential (ERP) studies have examined the neural mechanisms involved in social competition. Furthermore, no studies that we are aware of have analyzed the association between social competition and N2 activation, which is a purported measure of cognitive resource utilization and executive control. We used a competition-modification to the Monetary-Incentive-Delay task to assess how the brain may respond to the same task based on the perception of playing alone versus against another participant (competition). We used a sample of 52 undergraduate students. Results revealed a significant relationship between higher competition scores and less (more positive) N2 activation, Beta = .31, t (48) = 2.41, p = .02, F (3, 48) = 4.25, p = .01; however, this effect was found only in the context of competition. Thus, in the context of high social conflict, highly competitive people may show more efficient neural processing than less competitive people.

Poster 2-70**HIGH TRAIT FEAR IS ASSOCIATED WITH OVER-GENERALIZATION AND IMPAIRED INHIBITION OF CLASSICALLY CONDITIONED FEAR**

Ashley L.T. Wright, Madeline R. Jefferson, Nikki C. Degeneffe,
Melissa P. Hartnell, Samuel E. Cooper, & Shmuel Lissek
University of Minnesota - Twin Cities Campus

Descriptors: trait fear, fear generalization, fear-potentiated startle

Trait fear (TF) is a dimension of personality reflecting individual differences in fearful reactivity to the threat of danger. Though measures of TF have only recently been developed, such measures have already been linked to virtually every DSM-based anxiety disorder, implicating trait fear as a promising, transdiagnostic dimension of clinical anxiety. Here, we test associations between TF and both generalization and inhibition of conditioned fear, two important conditioning abnormalities found across anxiety disorders. We used a novel conditioning paradigm including rings of different sizes with extreme sizes serving as conditioned danger (CS+: paired with shock) and safety cues (CS-), and intermediaries, referred to as generalization stimuli (GS), forming a continuum of size between CS+ and CS-. CSs and GSs were presented in the presence of additional occasion-setting (OS) shapes indicating whether the CS+ would (OS+: 50% of trials) or would not be paired with shock (OS-: 50% of trials). Outcome variables included online risk-ratings and fear-potentiated startle (EMG) during CSs and GSs across the OS+ and OS- conditions. During OS+, those high versus low on TF displayed less steep gradients of behavioral and psychophysiological generalization indicative of over-generalization. During OS-, when no shocks were possible, neither group showed generalization, but those high on TF reported elevated shock expectancy across stimuli. Such results implicate TF as a personality factor that might drive over-generalization and impaired fear-inhibition across the anxiety disorders.

Poster 2-71**HOW HIGHLY ORIGINAL PEOPLE SOLVE NON-CREATIVE TASKS: AN EEG STUDY**

Yuri G. Pavlov, Dmitry I. Shiryaev, & Nadezhda V. Tulenina
Ural Federal University

Descriptors: cognition, creativity, EEG

The main aim of the current study was to reveal differences between electrophysiological patterns during solving non-creative tasks by high and low creative subjects. At the first stage of the experiment creative potential of 110 students was assessed by the Torrance test. After the creativity test 27 subjects (10 women, mean age = 19.9 ± 0.4 years) with the lowest and the highest creative potential were selected to the final sample. EEG of these subjects was recorded at 19 standard sites according to 10-20 system. The statistical analysis was applied to the EEG power in the rest state and during the verbal, imaginative, spatial cognitive tasks (visually pre-sented) solving. There were no differences in performance of task solving between two groups. ANOVA RM showed no influence of creativity potential on power of EEG in non-creative tasks. However comparison of participants with the most prominent results in originality subscale (high-originality (HO) subjects) and low-originality (LO) subjects showed differences in EEG characteristics. Transition from the rest state to the task solving induced decreasing of alpha1 activity in the posterior area, widespread activation of beta2 in the HO group. At the same time LO group demonstrated suppressing of alpha1 activity in the frontal areas and decreasing of beta2. We assume that HO subjects choose insight way for solving non-creative tasks and their frontal cortex is not engaged in that process but have to maintain more widespread activation of small neural networks. The opposite is probably correct for LO subjects.

Poster 2-72**HOW LONG IS LONG ENOUGH? HEART RATE VARIABILITY, HEART RATE, AND BLOOD PRESSURE RESPONSES FOLLOWING A SIX HOUR CAFFEINE ABSTENTION**

Shara S. Grant¹, Bruce H. Friedman¹, Alisa Huskey¹, Justin B. White², & Kye Kim³

¹Virginia Polytechnic Institute and State University, ²Carilion Clinic,

³Virginia Tech Carilion School of Medicine; Carilion Clinic

Descriptors: cardiovascular, caffeine, methodology

Caffeine exerts effects on cardiovascular reactivity (CVR), yet there exists wide variability in control of caffeine's acute and withdrawal effects in CVR research. The aim of this study was to identify a minimal abstinence time in regular coffee drinkers whereby CVR is unconfounded by caffeine; Six hours was the hypothesized time, based on caffeine's average half-life. Thirty nine subjects (mean age=20.9; SD=1.9; 51% female) completed a study involving a series of tasks (cold pressor (CP) and a memory task), ingestion of caffeinated coffee (230 mg caffeine) on one day and decaffeinated coffee (5 mg) on a second day. High frequency heart rate variability (hfHRV), heart rate (HR) and systolic/diastolic blood pressure (SBP, DBP) were acquired during baseline, task, and recovery epochs prior to coffee intake, 30 minutes-, and six hours post-intake. Three-factor (Condition, Phase, Task) repeated measures MANOVA's assessed task reactivity. Acute hfHRV reactivity was significantly greater on the caffeinated day versus the decaffeinated day ($p < .005$). Consistent with literature suggesting vagally mediated increases in hfHRV with moderate doses. For HR reactivity, a significant Phase x Task interaction showed lowest reactivity at phase 2 for the memory task and greatest at phase 2 for the CP ($p < .05$). Pairwise comparisons revealed differences in mean SBP between phases 1 and 2 ($p < .00$), and 2 and 3 ($p < .00$), but no differences between phases 1 and 3 ($p = .30$). Results indicate that a six-hour abstinence is adequate to control caffeine-elicited changes in CVR.

Carilion Clinic Research Acceleration Program (RAP) Grant.

Poster 2-73**IF OR WHEN? UNCERTAINTY AND ANXIETY**

Ken P. Bennett, Christine L. Larson, & Jacqueline Dickmann
University of Wisconsin-Milwaukee

Descriptors: uncertainty, threat-of-shock, anxiety

A key component of anxiety is the misinterpretation of uncertain future events (Gray, 1985). Uncertainty, or the inability to predict the valence, intensity, likelihood or type of future stimulus, is often associated with increased anticipatory physiological reactivity (Grillon et al., 2004; Grupe & Nitschke, 2013). The current study compared modulation of the startle blink response associated with temporal uncertainty (TU), or not knowing when a shock will occur, and occurrence uncertainty (OU), or not knowing if a shock will occur. Participants completed a modified threat-of-shock task (Grillon et al., 2004) consisting of 4 conditions: TU, OU, Certain Threat (C), and Safe (S). Results showed that OU startle magnitude was significantly larger than C and S, and that TU, C, and S startle magnitudes were not significantly different from each other. These findings suggest that not knowing if threat will occur is more anxiety-provoking than either knowing or not knowing when it will occur. This may indicate that anxiety is most robustly produced in situations in which it is uncertain whether or not a threat will actually occur. Overall, this may provide insight into uncertainty's role in the development of anxiety.

Poster 2-74**IMMEDIATE AND LONG-TERM EFFECTS OF EMOTION REGULATION: A BEHAVIORAL AND EYE-TRACKING INVESTIGATION OF FOCUSED ATTENTION**

Margaret M. O'Brien¹, Alexandru D. Iordan², Anna Madison¹, Yuta Katsumi², Zachary Bertels¹, Christine Richards¹, Simona Buetti¹, Alejandro Lleras¹, Sanda Dolcos², & Florin Dolcos³

¹University of Illinois, Urbana Champaign, ²University of Illinois, Urbana-Champaign & Beckman Institute for Advanced Science & Technology

Descriptors: emotion regulation, memory, eye-tracking

Emotional information often shows a retrieval advantage, but there is a downside: negative information is remembered with fewer contextual details, possibly because of initial narrowing of attentional focus. In extreme circumstances, this may lead to gist-based retrieval of traumatic memories, as observed in PTSD. Here, we investigated the immediate and long-term impact of focused attention (FA) as an emotion regulation strategy, in healthy participants. The immediate impact of FA was assessed (N=18) by recording ratings of emotional experiences, following instructions to focus on emotional (Emotion Focus) or non-emotional contextual (Context Focus) aspects of negative pictures. Eye-movements were also recorded (N=5) to elucidate the mechanisms of FA. One week later, the long-term impact was assessed in a subset of participants by a surprise memory task for the pictures. First, Context Focus resulted in lower emotion ratings and was associated with longer fixations on non-emotional aspects of the pictures, compared to Emotion Focus; these findings were also confirmed when compared to a Free-Viewing condition (N=10). The long-term memory data showed a recognition advantage for images encoded in the Context Focus, compared to those from the Emotion Focus condition, suggesting that FA may combat the attention-narrowing effect of negative emotions. Overall, these findings demonstrate the effectiveness of FA as an emotion regulation strategy, both in reducing the immediate negative experiences and in enhancing long-term memory for non-emotional contextual details.

Poster 2-75**IMPACT OF PANIC ON PSYCHOPHYSIOLOGICAL AND NEURAL REACTIVITY TO UNPREDICTABLE THREAT IN DEPRESSION AND ANXIETY**

Lynne Lieberman, Stephanie Gorke, Stewart A. Shankman, & K. Luan Phan
University of Illinois at Chicago

Descriptors: panic disorder, anticipatory anxiety, unpredictable threat
Exaggerated anxious responding to unpredictable threat (U-threat) has been implicated as a core dysfunction in panic disorder (PD). However, it is unknown whether this abnormality is specific to the categorical diagnosis of PD or would manifest along a continuum of panic symptoms (PS). Additionally, little is known about the neural processes underlying this abnormality among those high in PS. Finally, no studies have tested whether startle potentiation and limbic neural reactivity - commonly used indices of responding to U-threat - are associated. It is therefore unknown whether these indices capture the same abnormality. These questions were investigated in 42 adults with a range of PS. Participants completed two variants of the NPU-threat task to probe responses to U-threat, once during assessment of startle potentiation and another during functional magnetic resonance imaging (fMRI). Panic symptoms were measured using the Inventory for Depression and Anxiety Symptoms (IDAS-II). As hypothesized, PS positively predicted startle potentiation, $\beta = .51$, $t(38) = 3.05$, $p < .05$. Whole-brain analyses indicated that greater PS was associated with greater dorsal ACC activation during U-threat (MNI peak [2, 16, 42], $Z = 4.80$, $k = 252\text{mm}^3$, $p < 0.05$, corrected). Startle potentiation and dACC activation to U-threat were positively associated, $\beta = .41$, $t(38) = 2.75$, $p < .05$. These results suggest a biobehavioral profile of aberrant responding to U-threat associated with PS.

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Poster 2-76**IMPULSIVITY MODERATES THE PROSPECTIVE RELATIONSHIP BETWEEN SYMPATHETIC NERVOUS SYSTEM AROUSAL AND SELF-INJURIOUS THOUGHTS AND BEHAVIORS**

Jaclyn Aldrich, Madeline Wielgus, Lauren Hammond, & Amy Mezulis
Seattle Pacific University

Descriptors: self-injurious thoughts and behaviors, sympathetic nervous system, adolescence

Self-injurious thoughts and behaviors (SITBs) are a major mental health issue among adolescents, and include suicidal ideation, suicide attempts, gestures, or threats, and non-suicidal self-injury. Low sympathetic nervous system (SNS) arousal, indexed by electrodermal responding (EDR; Beauchaine, 2001), may be a risk factor for engagement in SITBs (Crowell et al., 2005). This relationship may be exacerbated by trait vulnerabilities such as impulsivity, which has been shown to predict engagement in SITBs (Claes et al., 2015). Adolescents with low arousal to stress and high levels of trait impulsivity may be at risk due to the inability to inhibit SITBs. The present study assessed whether trait impulsivity moderated the prospective relationship between arousal to a stressor and engagement in SITBs among 108 adolescents ($M_{age} = 12.88$, $SD = .85$, 52.5% female). SNS arousal was assessed using EDR during a 4-minute resting baseline and 5-minute stressor task. Adolescents completed self-report measures at baseline that assessed SITB engagement, depressive symptoms and impulsivity; parents and adolescents were interviewed regarding SITB engagement at baseline and 6-months. Controlling for history of SITB engagement, depressive symptoms, and baseline arousal, results showed that impulsivity moderated the predictive relationship between arousal to a stressor and SITB engagement at the 6-month follow-up ($\beta = -1.46$ (.71), $Wald = 4.23$, $p = .04$). At high levels of trait impulsivity, adolescents with low arousal during stress were more likely to engage in SITBs over a 6-month period.

R15MH098294-01A1 (PI: Mezulis).

Poster 2-77**INCREASED EEG BETA-2 ACTIVITY IN ATTENTIONAL AND VIGILANCE TASKS DURING DYNAMIC POSTURAL CONTROL**

Diana Henz, Johanna Maus, & Wolfgang I. Schöllhorn
University of Mainz

Descriptors: EEG, attention, posture control

Current research demonstrates a close interrelation between the cognitive and postural control system. In the present study, we tested whether manipulation of sedentary postural control affordances has an effect on performance on short-term attention and vigilance on cortical brain activation patterns. Subjects performed a five-minute short-term attentional task and a twenty-minute vigilance task in two different sedentary conditions (static, dynamic) in a randomized within-subjects design. Spontaneous resting EEG was recorded before, during, and immediately after the short-term attentional task and vigilance task. Results indicate positive effects of dynamic postural control on attentional performance. Behavioral data show improved attentional performance in the dynamic postural control condition. Lower error ratios are obtained in short-term attentional tasks, and lower reaction times in the vigilance task. EEG-data show increased beta-2 activity in frontal regions during sustained attentional tasks in the dynamic postural control condition. Further, increased beta-2 activity was obtained in resting conditions in parietal regions. Post-hoc analyses show higher beta-2 activity in resting conditions in the dynamic postural control condition compared to the static postural control condition. The obtained results indicate that stimulation of the postural control system leads to enhanced attentional performance which is indicated by an increase in EEG beta-2 activity.

Poster 2-78**INCREASED RESPIRATORY SINUS ARRHYTHMIA DURING RECOVERY PREDICTS SOCIAL AWARENESS DEFICITS**

Emma E. Condy, & Bruce H. Friedman
Virginia Polytechnic Institute & State University

Descriptors: respiratory sinus arrhythmia, autism, social awareness

Social stressors, such as a child's mother leaving the lab, are often used to assess psychophysiological responses in children. Autism spectrum disorder (ASD) is characterized by social deficits, making the social nature of this 'absence' stressor salient. Respiratory sinus arrhythmia reactivity (RSA-R) is often used to study response to stress and has been related to social deficits in children. The present study evaluated RSA-R to the 'absence' stressor and its relation to social deficits in typically developing (TD) children and children with ASD. Electrocardiogram (ECG) was recorded in TD children ($n = 16$) and children with ASD ($n = 11$) during a baseline, 'absence' task, and recovery period while their mother filled out the Social Responsiveness Scale-2 (SRS-2). Two RSA-R scores were calculated: the first by subtracting baseline RSA from task RSA (T-B), and the other by subtracting baseline RSA from recovery RSA (R-B). These were then compared to subscale scores on the SRS-2. While the T-B change score did not significantly predict social awareness deficits, regression analyses revealed that the R-B change score predicted social awareness deficits when controlling for diagnosis ($B = 0.175$, $p < .01$). The results show a transdiagnostic relationship between social awareness deficits and RSA overshoot after mom returns. It has been posited that lack of reactivity to stress coupled with increasing baseline RSA is an alternative recovery mechanism. This aberrant response to change in the social environment should be further investigated in relation to social awareness deficits.

The Virginia Tech Center for Autism Research graduate student award & the Virginia Tech graduate research development program.

Poster 2-79**INDIVIDUAL DIFFERENCES IN INTEROCEPTIVE SENSITIVITY AND ERROR MONITORING**Yuya Maruo¹, Werner Sommer², & Hiroaki Masaki³¹Waseda University, Matsuyama University, ²Humboldt-Universitaet at Berlin, ³Waseda University*Descriptors: error-related negativity, error positivity, interoceptive sensitivity*

We investigated the relationship between interoceptive sensitivity and error monitoring by recording the error-related negativity (ERN) and the error positivity (Pe). Both the ERN and the Pe are thought to reflect affective-motivational aspects of response evaluation. Because affective sensation is associated with interoceptive sensitivity, we predicted correlations between error-related potentials and interoceptive sensitivity as assessed in a heartbeat counting task (HCT). Twenty-four participants performed a spatial Stroop task in three conditions. In different conditions, correct responses were rewarded (10 yen every 4 accumulated corrects), error responses were penalized (10 yen per error), or participants neither lost nor earned money (control condition). Each condition involved 4 blocks of 72 trials. Error rates were significantly lower in the punishment than in the control condition. Although ERN did not differ among conditions, Pe was significantly larger in the punishment condition than in the control condition. In addition, we found negative correlations between the HCT scores and ERN amplitudes in both the reward and the punishment conditions, suggesting that participants higher in HCT scores showed larger ERN amplitudes in both the reward and the punishment conditions. These findings suggest that the Pe reflects motivational evaluation of errors. In addition, interoceptive sensitivity seems to be relevant for error monitoring when inhibition of errors becomes more important.

This study was supported by a Grant-in-Aid for Scientific Research (C) 15K12657 from Japan Society for the Promotion of Science to HM and by Waseda University Grant for Special Research Projects (2015K-280).

Poster 2-80**ERROR-RELATED NEGATIVITY PREDICTS IMPROVEMENT OF A SEQUENCE MOTOR LEARNING**Takuto Matsuhashi¹, Sidney Segalowitz², Yuichiro Nagano³, & Hiroaki Masaki¹¹Waseda University, ²Brock University, ³Faculty of Human Studies, Bunkyo Gakuin University*Descriptors: motor learning, error-related negativity, basal ganglia*

We investigated whether the error-related negativity (ERN) amplitude can predict improvement of performance in two motor learning (ML) paradigms, a sequence-learning and an adaptation task. In both tasks the ERN is difficult to directly record during execution. It has been reported that the striatum is more involved in sequence learning whereas cerebellum is more involved in adaptation. Based on previous reports that the basal ganglia is a major contributor to the ERN, we predicted that a trait-level ERN amplitude (measured on a separate standard task) would predict improvement in the sequence-learning task more than in the adaptation task. Prior to ML experiments, we recorded ERNs in a monetary reward/punishment condition (8 blocks of 72 trials). In the sequence learning task, participants were required to press buttons with four fingers in a pre-required sequence (8 button presses). In the adaptation task they were instructed to move a cursor to a target that randomly appeared at a location among eight possible locations. In both tasks, participants performed 10 blocks of 16 trials and both speed and accuracy were emphasized. Performance improved with practice in both ML tasks. We found correlations between the ERN amplitudes and performance improvements from block 2 to block 10 in the sequence learning ($r = -.472, p = .035$) but not in the adaptation task ($r = -.105, n.s.$), and remained for sequence learning ($p = .044$) and not adaptation ($p = .82$) when regressed together. Our results suggest that the ERN predicts improvement in tasks dependent on the striatum.

This study was supported by a Grant-in-Aid for Scientific Research (C) 15K12657 from Japan Society for the Promotion of Science to HM.

Poster 2-81**INDIVIDUAL DIFFERENCES IN THE PROPENSITY TO ATTRIBUTE INCENTIVE SALIENCE TO FOOD-RELATED CUES PREDICT EATING BEHAVIOR IN HUMANS**Francesco Versace¹, Menton M. Deweese², Jeffrey Engelmann², Kimberly N. Claiborne², Jennifer Ng², Hannah L. Stewart², Danika Dirba², & Susan Schembre²¹Stephenson Cancer Center, University of Oklahoma Health Sciences Center, ²University of Texas MD Anderson Cancer Center*Descriptors: reward, emotion, event-related potentials*

Preclinical models show that reward-predicting cues (e.g., food-related cues, drug-related cues) activate affective states, become attractive, and motivate behaviors (e.g., compulsive eating, drug-seeking) only for a subset of animals (i.e., "sign-trackers"). Here, we tested whether individual differences in the propensity to attribute incentive salience to food-related cues predict human eating behavior. We collected event-related potentials (ERPs) evoked by pleasant (erotic, romantic), unpleasant (mutilation, violence), neutral, and food-related (sweet, savory) images. At the beginning of the session, we informed participants (N=49) that after each "food-predictive" image, they would receive a candy. The participant had to decide whether to eat or deposit the candy in a box. A total of 60 candies were delivered during the session. We estimated the level of incentive salience attributed to the images by measuring the amplitude of the late positive potential (LPP) recorded between 400 and 800 ms after picture onset. We labelled "sign-trackers" (N=19) individuals with larger LPPs to food-predictive images than to erotic ones and "goal-trackers" (N=30) individuals with the opposite brain response pattern. On average, sign-trackers ate almost 3 times as many candies as goal-trackers (21 vs 8; $p < .01$). Neither body mass index nor appetite at the beginning of the session moderated this effect. By clarifying some of the neural underpinnings of cue-induced eating behavior in humans, these findings will contribute to improved neurobiological models of impulse control disorders.

This work was supported in part by NIH-NIDA award R01DA032581 to Francesco Versace.

Poster 2-82**INFLUENCE OF ACUTE STRESS ON INHIBITORY CONTROL - DOES AGE MATTER? AN ERP STUDY**Angelika M. Dierolf¹, Daniela Schoofs¹, Eve Hesses¹, Marcus Paul¹, Boris Suchan¹, Michael Falkenstein², & Oliver T. Wolf¹¹Ruhr-University Bochum, ²Institut für Arbeiten Lernen Altern GmbH*Descriptors: inhibitory control, aging, stress*

Prefrontal cortex (PFC) based cognitive functions have been shown to be impaired with increasing age. Furthermore, the PFC has been found to be highly sensitive to stress and the stress hormone cortisol, which are assumed to influence executive functions. Although stress, allegorical for the life in the 21st century, concerns and affects both the young and the elderly in work life, little is known about the mutual impact of stress and aging on executive functioning. The present EEG study investigated the impact of acute stress on the core executive function inhibitory control in young and older males. Forty-nine participants were either stressed via the Trier Social Stress Test or underwent a control condition. Subsequently, they performed a Go Nogo task while EEG, reaction times, errors and salivary cortisol were measured. Though older participants reacted slower to Go stimuli relative to young participants, both groups showed the same accuracy rate for Go and Nogo stimuli. Surprisingly, stress improved accuracy compared to the control group. The similar pattern was found in the EEG data with an enhanced error-related negativity (Ne/ERN) in the stress group. Beside this, elderly showed a reduced Ne compared to the young. No interaction between stress and age was observed. The present results suggest that stress may have beneficial effects on inhibitory control and error monitoring, irrespectively of the age. However, further research is needed to clarify if this is valid for other executive functions and under which circumstances negative impacts manifest.

Poster 2-83**INHIBITORY CONTROL ERPS PREDICT FORGIVENESS OF INTERPERSONAL BETRAYAL: EVIDENCE FROM A STOP-SIGNAL REACTION TIME TASK**

Erin N. Burdwood, Emilio A. Valadez, & Robert F. Simons
University of Delaware

Descriptors: couples, inhibitory control, EEG

Interpersonal betrayal is highly prevalent in romantic relationships and is a common presenting problem for couples therapy. However, little is known about factors that help or hinder an individual's ability to forgive these transgressions. The purpose of this study was to examine inhibitory control as a predictor of forgiveness in the context of romantic relationship betrayals. Recent victims of betrayal completed a SSRT task that involved inhibiting responses to negative and neutral photos while EEG data were recorded. Results indicated that larger N2 and P3 amplitudes in response to negative relative to neutral photos during successful stop trials were associated with more forgiveness of the betrayer at a 3-month follow up. This suggests that the tendency to recruit more attentional resources in order to successfully inhibit a prepotent response to negatively-valenced stimuli is associated with more progress in forgiving interpersonal betrayals. Findings are in line with previous work (Worthington & Scherer, 2002) conceptualizing forgiveness as a purposeful, emotion-focused action that requires overriding negative emotions in order to move beyond a transgression, as well as research highlighting inhibitory control, conflict monitoring, and broad executive functioning ability as crucial to the forgiveness process (e.g., Pronk et al., 2010). These findings have implications for interventions related to interpersonal betrayal, as therapists may need to directly target emotional processing of unpleasant stimuli in helping an individual work through these incidents.

Poster 2-84**THE ROLE OF PRIOR BRAND EXPERIENCE IN PROCESSING ADVERTISING**

Lucy Simmonds, Steven Bellman, Rachel Kennedy, Svetlana Bogomolova,
& Magda Nenycz-Thiel
University of South Australia

Descriptors: HRV, mass media, marketing applications

Psychophysiological measures have enormous scope to examine important, yet largely untested assumptions in the marketing literature. We tested one such assumption, arising from well-documented survey findings that respondents with prior brand experience (users of a brand) have better memory for that brand's advertising than those without such brand experience. From this, marketers have surmised that respondents with prior brand experience pay greater attention to advertising for their brand. Contextualizing this assumption within the limited capacity model of mediated message processing, we test the hypothesis that greater attention and arousal induces additional resources to be automatically allocated to encoding and storage. This study empirically assesses the link between brand usage, attention and arousal by measuring heart rate variability and electrodermal activity in 99 adults (20-79 yrs) with or without prior brand experience during viewing of ten recent advertisements contained in an episode of a popular television program. The results indicate attention and arousal does not differ between participants with or without prior brand experience. Accordingly, and contrary to common belief in marketing, this research suggests that respondents with prior brand experience do not pay greater attention to branded advertising, and demonstrates the benefits of applying psychophysiological methods and theory to marketing.

POSTER SESSION III

FRIDAY, SEPTEMBER 23, 2016

Poster 3-1
INITIAL-LETTER POSITION MODULATES SPATIAL ATTENTION TOWARDS JAPANESE HIRAGANA STRINGS

 Yasuko Okumura¹, Tetsuko Kasai², Ryuji Takeya², & Harumitsu Murohashi²
¹National Center of Neurology and Psychiatry, ²Hokkaido University

Descriptors: visual word processing, spatial attention, event-related potentials

While roles of spatial attention in visual word processing are of increasing interest, it is rather unclear how words' attributes constrain spatial attention toward them. The present study examined early spatial attention effects in event-related potentials (ERPs) for Japanese Hiragana words, nonwords, and reversed words (i.e., words written from right to left) to clarify influences of lexicality and the position of initial letter. ERPs were recorded from 19 native Japanese speakers, all of whom were expert adult readers. Stimuli consisted of four Japanese Hiragana letters that were aligned horizontally across the left and right hemifields. Participants attend to either the left or right end of the rapidly and randomly presented stimuli, and detected target letters that appeared infrequently at the attended hemifield. In ERPs to the standard stimuli (i.e., stimuli without a target), P1 peak amplitude at the right occipito-temporal electrode (PO8) was more positive in the attend-left than in the attend-right condition for words and nonwords; however, this attention effect was absent for reversed words. The result indicates that the deployment of early visual spatial attention to Hiragana letter strings depends on the position of an initial letter, which may reflect rapid formation of biased letter-string representation toward an initial letter based on learned lexical knowledge and reading direction. Such an early interaction between reading-related learning and spatial attention towards letter strings may contribute to rapid and fluent word processing in expert readers.

This work was supported by a grant from the Japan Society for the Promotion of Science (#23 4188).

Poster 3-2
INTEGRATIVE BODY-MIND TRAINING IMPROVES BRAIN ACTIVITY IN SELF-CONTROL NETWORK AND REDUCES DEPRESSION

 Yi-Yuan Tang¹, & Rongxiang Tang²
¹Texas Tech University, ²Washington University in St. Louis

Descriptors: mindfulness intervention, brain activity, self-control

Patients with depression show deficits in attention, emotion and self-control. Mindfulness intervention has shown the improvement of emotion regulation and self-control ability. However, whether brief mindfulness could serve as a psychotherapy for dysregulated affective states and symptom reduction remains unclear. Here we used Integrative Body-Mind Training (IBMT) to examine the efficacy of IBMT in college students with first episode of depression and its possible brain mechanism. Thirty-three patients (via DSM-IV depression diagnosis) and 33 matched healthy students participated. Subjects received 30 min IBMT each session with 10 hours in total. Before and after intervention, subjects underwent a widely used Attention and Mood tests to assess changes in attention and self-control. Brain measurement of cerebral blood flow (CBF) was applied to detect brain activity. Before intervention, compared to healthy control, depression group showed deficit in executive attention and more negative moods. After intervention, all of these attention and mood indexes showed significant improvements. Before intervention, regional CBF indicated the global reduction especially in anterior cingulate and adjacent prefrontal cortex, insula and striatum associated with self-control of attention and emotion, reward and self-awareness, but the rCBF of these regions significantly increased after intervention. Our results suggest that a brief mindfulness intervention has the potential to help mood disorders through regulation of self-control and reward networks in the brain.

The Office of Naval Research.

Poster 3-3
INTEGRATIVE BODY-MIND TRAINING IMPROVES IMMUNOLOGY AND PHYSIOLOGICAL FUNCTIONS IN AGING POPULATION

 Rongxiang Tang
 Washington University in St. Louis

Descriptors: IBMT, immune function, mindfulness

Previous studies have shown that integrative body-mind training (IBMT) reduces stress, improves immune function, attention and cognitive performance, as well as neuroplasticity in young adults following few weeks of practice. However, it is unknown the long-term IBMT on changes in physiology. We randomly chose 55 healthy Chinese elders (mean age=64 years old), who has 10 years of IBMT or physical exercise (29 in IBMT group) to study their effects on physiology. Physiological indexes are important biomarkers for aging. Heart rate, heart rate variability (HRV), skin conductance response (SCR) were used to assess autonomic nervous system (ANS) activity. Secretory Immunoglobulin A (sIgA) is an antibody that plays a critical role in mucosal immunity. More sIgA is produced in mucosal linings than all other types of antibody combined. The secretory immune system of the upper respiratory tract's mucosal tissues is considered the body's first line of defense against pathogens. Therefore, we chose sIgA and ANS activity as physiological indexes following 10 years of practice. We found significantly lower SCR, greater high-frequency HRV in the IBMT group than in the PE group. In contrast, the PE group showed significantly lower resting heart rate and greater chest respiratory amplitude than the IBMT group. Moreover, IBMT group showed higher basal sIgA level compared to PE group. Our results suggest that long-term meditation practice has positive effects on health in elders, and IBMT and PE may involve in different but interrelated mechanisms.

The Office of Naval Research.

Poster 3-4
IRRITABILITY IN YOUNG ADULTS IS ASSOCIATED WITH REDUCED REWARD RESPONSIVITY

 Christen Deveney
 Wellesley College

Descriptors: ERP, irritability

Severe and persistent irritability is a pressing clinical problem, yet little research has examined its underlying pathophysiology. Research on irritability in young adults is conspicuously lacking, despite associations between childhood irritability and disorders that emerge during early adulthood. Therefore, we examined the relationship between irritability and the feedback related negativity (FRN) in 39 young adults who completed a spatial cued attention task under frustrating conditions (~60% of correct responses received rigged negative feedback which resulted in a small monetary loss). Because irritability increases risk for depression, and risk for depression is associated with reduced FRN amplitudes, we hypothesized that higher irritability scores would correlate with lower FRN amplitudes. Results indicated that the frustration manipulation increased self-reported frustration and decreased task accuracy, especially on trials requiring shifts in special attention. Higher self-reported trait irritability, but not depression or anxiety, was associated with reduced FRN amplitudes. These findings suggest that irritability may be associated with reduced reward responsivity in young adults, reflecting a possible common reward deficit in populations with irritability and depressed mood. In addition, because the behavioral performance of these young adults is similar to what has been observed in children, this task may be a useful promising tool for probing irritability across the developmental spectrum.

This research was supported by institutional funds from Wellesley College.

Poster 3-5**IS AUDITORY MISMATCH NEGATIVITY IMPAIRED IN CHILDREN WITH AUTISM SPECTRUM DISORDER? A META-ANALYSIS INVESTIGATION**

Wen-Pin Chang
Creighton University

Descriptors: autism spectrum disorder, mismatch negativity, meta-analysis
The auditory mismatch negativity (MMN) is an electrophysiological signature of sensory memory and pre-attentive, automatic processing of auditory stimuli that reflects an index of the human ability to detect change during repetitive auditory stimulation. As children with autism spectrum disorder (ASD) show difficulties in processing and interpreting auditory information, the MMN is deemed to be a suitable measure to study in this population. Yet, evidence of atypical MMN remains inconsistent in the literature. This study sought to further determine if impaired MMN exists in children with ASD using meta-analysis. A search from PubMed, PsycINFO, and Web of Science yielded 10 qualified articles that compared the MMN at Fz between healthy controls and children with ASD. The results of random-effects model showed no differences in amplitude (27 investigations), Hedges' g (g) = -0.13, 95% confidence interval (CI) = -0.32-0.05, nor in latency (23 investigations), g = -0.06, 95% CI = -0.27-0.15. When examining the MMN from speech sound stimuli, there were no differences in amplitude (17 investigations), g = -0.11, 95% CI = -0.36-0.14, nor in latency (13 investigations), g = 0.08, 95% CI = -0.18-0.33. Nonsignificant results were also obtained in non-speech sound or tone stimuli. The findings suggest that regardless of whether they are speech or non-speech stimuli, children with ASD do not show impaired MMN at Fz compared to health controls, which overturn the idea that abnormal auditory processing in children with ASD is more likely severe for speech than non-speech stimuli.

Poster 3-6**MENTAL TASK FULFILLMENT UNDER MODERATE EXPERIMENTAL HYPOXIA**

Natalia V. Shemyakina, Zhanna V. Nagornova, Eduard A. Burykh, &
Svyatoslav I. Soroko
Russian Academy of Sciences (IEPhB RAS)

Descriptors: hypoxia, cognitive tasks, EEG
The experimental hypoxia is a model to explore adaptive potential of the brain to the lack of the oxygen & to evaluate border states causes behavioral changes. The study aimed to explore EEG spectral power changes at mental tasks under experimental hypoxia (breathing with oxygen-nitrogen gas mixture with 11.5% oxygen content). 14 men aged 25 ± 1.8 [SD] had to make descriptions (D) & generate stories (St): before (Normoxia) & after Hypoxia, at the beginning & the end of 1/2 hour hypoxic influence during EEG registrations. Spectral power analysis was carried out on EEGs at D, ST & REST. By means of ANOVA were separately analyzed EEG spectra at D, REST & ST. For mentioned states was obtained gradual increase of slow activity during different stages of Hypoxia(beginning, end), that reflected growing cortex deactivation in comparison with D, REST & ST in Normoxia. Also were compared EEG spectra in ST & REST in D(1.5-3.5Hz), T(4-7.5) A1(7.5-10), A2(10-13), B1(13-18), B2 (18-30) bands before, after & during hypoxia. ST task vs REST was accompanied by decrease of T & A2 power in Normoxia, decrease of A2 power in beginning of Hypoxia. There were no differences for ST vs REST at the end of Hypoxia influence & no difficulty changes of tasks' fulfillment. While hypoxia influence was removed there were obtained power differences for ST vs REST in D, T, A1,2 bands (TASK-ZONE) with higher spectral power during ST in most number of zones in D & T bands, in B1,2 bands & in frontal lobes in A1,2 bands, that might reflect compensation hypoxia state for successful cognitive tasks fulfillment.

Supported by I.19P Program.

Poster 3-7**IS CONFLICT AVERSIVE? AN ERP INVESTIGATION INTO THE INTRINSIC COSTS OF COGNITIVE CONTROL**

Curtis Von Gunten, & Bruce D. Bartholow
University of Missouri

Descriptors: cognitive control, conflict monitoring, cognitive effort
It is regularly assumed that the engagement of cognitive control is costly. These hypothetical costs are routinely appealed to in order to explain why mental effort is avoided when less effortful alternatives are available. This explanation applies to both behavioral economic approaches (e.g. cost-benefit analysis) and social psychological approaches (e.g. limited resource management). Moreover, recent work suggests that conflict is a necessary antecedent for the recruitment of control and that this conflict is imbued with motivational significance through its aversive nature. This aversive quality could underlie the apparent costly nature of control. The current study examined whether the activation of an ERP component associated with conflict monitoring could be registered as a neurocognitive decision cost. Participants completed a cognitive conflict task (flanker) during which individual differences in N2 were measured. Next, participants completed a behavioral measure of mental effort avoidance. This measure operationalized avoidance as the number of low conflict trials participants voluntarily chose. If conflict as measured by the N2 is aversive, participants with a greater N2 should be more likely to avoid high conflict trials. Contrary to this prediction, N2 amplitude was not correlated with mental effort avoidance. This is consistent with past fMRI evidence suggesting that the activation of the control network (LPFC) is registered as a decision cost while the activation of the monitoring network (ACC) is not.

Poster 3-8**IS NEGATIVITY BIAS REDUCED BY VIOLENT GAME EXPOSURE? EXAMINING ERP AFFECTIVE MODULATION THROUGH EMOTIONAL PICTURE PROCESSING.**

Satoko Kurita¹, Shunya Omori², Jun'ichi Katayama², & Annie Lang³
¹Mie University, ²Kwansei Gakuin University, ³Indiana University,
Bloomington

Descriptors: event related potentials, violent game exposure, affective picture processing
This study attempts to expand our understanding of cognitive and emotional processing of pictures as a function of prior exposure to violent games. Recent research has focused on decreased physiological responses (i.e. desensitization) caused by repeated exposure to violent games. In general, unpleasant stimuli produce stronger/faster emotional responses than pleasant stimuli. This so-called negativity bias has been linked to evolutionarily adaptive nature of attentional processing. Recent studies have shown smaller ERP components (e.g. LPP) for high compared to low violent game exposure (VGE) participants when looking at unpleasant pictures. This study recorded ERPs while showing IAPS pictures (neutral vs. highly pleasant vs. highly unpleasant) for 2 seconds each to 26 Japanese college students (low VGE $n=14$, high VGE $n=12$) and investigated whether the negativity bias of relatively late ERP components (200-1000ms) elicited by the pictures would be reduced in the high VGE group. Results showed smaller P200 amplitudes in response to highly unpleasant pictures compared to the neutral and highly pleasant pictures among the high VGE group while P200 was equally large for highly pleasant and unpleasant pictures among the low VGE group. Habituation also varied as a function of VGE with the low VGE group exhibiting significant habituation to highly pleasant pictures and the high VGE group habituating to highly unpleasant pictures- again suggesting that the adaptive negativity bias may be reduced by long term VGE.

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Poster 3-9**IS THERE A COGNITIVE COST TO COGNITIVE REAPPRAISAL?**

Andrew D. Wiese, Melody Roberts, Catlin Pearson, Seung-Lark Lim, & Diane L. Filion
University of Missouri - Kansas City

Descriptors: emotion regulation, LPP, reaction time

The aim of this study is to examine the cognitive demand associated with cognitive reappraisal. Participants were instructed to view IAPS negative and neutral valence images, and cognitively reappraise a subset of the negative images. Reaction time (RT) to a brief auditory stimulus served as an index of cognitive demand while LPP served as an index of emotional reactivity and modulation. We hypothesized that if cognitive reappraisal is cognitively demanding then RT would be slower in the reappraisal condition compared to the viewing conditions. Images were presented in random order for 6 seconds. On each trial, the RT tone was presented at an SOA of either 1, 2, 3, 4, or 5 seconds. A Trial Type x SOA repeated measures ANOVA indicates a significant effect of Trial Type on RT, but only for the 1-second SOA. Post-hoc tests on the 1-second SOA reveal significant differences between all three conditions, with cognitive reappraisal associated with the longest RT, followed by viewing negative and neutral images, respectively. These data suggest that cognitive reappraisal is more demanding than viewing images, but only early in the reappraisal process, with differences disappearing after the 1-second SOA. The cognitive demand subsides after individuals have more time to process images and modulate affective responses. LPP patterns are expected to confirm that cognitive reappraisal effectively modulated emotional reactivity relative to viewing negative images. LPP results and the relationship between LPP and RT by SOA will also be presented.

Poster 3-10**JUST BEAT IT: BINAURAL BEATS IN THE BETA FREQUENCY**

Kyle Woisard, Wayne Stafford, Phillip Klineberger, Kelly Harrison, & David Harrison
Virginia Tech

Descriptors: binaural beats, EEG, brain entrainment

Binaural beats is a phenomenon that arises when two auditory tones of differing frequencies, one to each ear, are presented. This results in the perception of a third tone with a frequency which is the difference of the two presented tones. Research has suggested that presentation of binaural beats can result in brain entrainment when the frequency occurs in a physiologically relevant range to the human EEG. The current experiment investigated binaural beats induced brain entrainment in the beta frequency (14-32 Hz), a frequency range associated with active concentration. Participants performed the Controlled Oral Word Association Test (COWAT), a verbal fluency task, before and after receiving binaural beats treatment in the beta frequency range or a placebo tone. This allowed us to assess the utility of binaural beats in improving cognitive functioning. Preliminary analyses indicate that in the binaural beats group, beta activity increased across a 6 minute recording period while no such changes were observed in the placebo group. Our results support previous findings indicating brain entrainment following presentation of binaural beats.

Poster 3-11**LATE POSITIVE POTENTIAL AND POSTERIOR ALPHA IN LONG-TERM FEAR CONDITIONING - ASSOCIATIONS WITH COMT VAL158MET POLYMORPHISM**

Christian Panitz¹, Christiane Hermann², Jürgen Hennig², Tim Klucken², Andreas Keil³, & Erik M. Mueller¹
¹Marburg University, ²Justus Liebig University Giessen, ³Justus Liebig University Giessen, ³University of Florida

Descriptors: fear conditioning, EEG, comt val158met

Motivationally salient stimuli prompt late responses in the EEG at posterior sites, reflected in time (e.g. Late Positive Potential; LPP) and frequency domain (e.g. alpha power reduction). Our study leverages the ability of fear conditioning paradigms to investigate saliency-related responses, using conditioned threat (CS+) and safety cues (CS-). Dynamics and extent of fear conditioning vary interindividually. Specifically the Val allele of the dopamine-related catechol-O-methyltransferase (COMT) Val158Met polymorphism has been associated with better CS+/CS- discrimination. Here, we investigated (a) if long-term fear conditioning and extinction modulate LPP and posterior alpha power and (b) if COMT Val158Met polymorphism modulates these responses.

N = 91 male participants (N = 32 Val/Val, 30 Val/Met, 29 Met/Met) underwent differential fear conditioning with two neutral faces as CS+, two other faces as CS- and aversive noise bursts as US. Subsequently, one CS+ and one CS- were presented during an extinction phase, the other two CS not. In a critical recall test 24h later, all CS were presented again.

In the recall test, LPP amplitude was higher for CS+ vs. CS-, specifically in Val/Val carriers. Wavelet analysis revealed a strong and widespread relative alpha reduction for CS+ vs. CS-. This effect had a shorter duration in Met/Met carriers.

Our results show for the first time evoked alpha power reduction to conditioned stimuli. Moreover, Val carriers showed stronger differentiation for CS+ vs. CS- in LPP and alpha power. Potential mechanisms of the COMT effects are discussed.

This study was supported by a grant of the Deutsche Forschungsgemeinschaft to E.M. Mueller (DFG MU3535/2-1).

Poster 3-12**LIE TO ME – OR NOT? AN EXPERIMENTAL INVESTIGATION OF SELF-CHOSEN DECEPTION**

Kristina Suchotzki, & Matthias Gamer
University of Würzburg

Descriptors: lying, deception

Previous research revealed that instructed lying usually comes with costs, both in behavioral as well as autonomic responses. Little is known, however, whether this also holds for self-chosen lies and to what degree the context in which the lie takes place (i.e., a confrontation or a cooperation context) influences this cost. In the current study, 31 participants played an interactive game with another player, in which they could win money by truthfully or deceitfully communicating the results of a coin toss they observed on a computer screen. In the confrontation condition, participants were told that money could be won if the other player did not guess the correct result of the coin toss. In the cooperation condition, participants were told that money could be won if the other player did guess the correct result of the coin toss. On some trials, participants received a cue instructing them whether to lie or tell the truth. On other trials, they could choose freely. By telling participants that the other player would not always believe what they told them and that sometimes it would be advantageous to lie also in the cooperation condition (e.g., because the other player would be suspicious), we ensured a sufficiently large number of lie trials in all conditions. Results revealed a dissociation between measures. Whereas lying resulted in longer reaction time and stronger skin conductance responses compared to truth telling, context and choice only modulated behavioral responses. Possible explanations of this dissociation will be discussed.

Poster 3-13**LINGUISTIC HEMISPHERIC LATERALIZATION IN PATIENTS WITH MAJOR DEPRESSIVE DISORDER: EVIDENCE FROM HIGH-FREQUENCY BETA EEG BAND**Zaira Romeo, Alessandro Angrilli, & Chiara Spironelli
University of Padova*Descriptors: language laterality, qEEG, depression*

Although an impaired language lateralization was found in psychotic disorders with brain imaging methods, no clear altered language asymmetry has been described in Major Depressive Disorder (MDD) so far. To this aim, EEG was recorded in 11 MDD patients and 17 healthy controls and beta band (20-35 Hz) amplitude was measured while participants performed two linguistic tasks, i.e., rhyming and semantic judgment, compared with a baseline resting state control condition. All right-handed patients (7 females) were suffering from MDD (euthymic phase: HAM-D=9.0 ± 5.3; PANAS Positive Affect [PA]=27.4 ± 6.8, and Negative Affect [NA]=23.6 ± 8.5). Patients had higher error rates (5%) than healthy controls (2.7%; $F(1,26)=8.02$, $p < 0.01$). Considering beta EEG amplitude, regardless of the task, controls showed significantly greater left vs. right frontal activity ($p < 0.05$), whereas patients showed an inverted asymmetry, i.e., greater right vs. left frontal activity ($p < 0.01$). Concerning group differences, patients showed significantly lower beta activity than controls on frontal left sites only ($p < 0.001$). Pearson's correlations between beta left frontal activity and patients' PANAS subscales revealed that higher frontal activation was positively associated with PA and negatively associated with NA. Beta EEG activity is a quantitative index of neuron recruitment engaged in specific cognitive processes, that was able to reveal both the alteration of language lateralization in MDD patients, and a correlation between left frontal hypoactivation and higher levels of negative affect.

Poster 3-14**LINKING SOCIAL ANXIETY AND AUTONOMIC RESPONSES TO SOCIAL STRESS IN PREADOLESCENCE**Alexander Kaeppeler, & Stephen Erath
Auburn University*Descriptors: autonomic responses, social anxiety*

A substantial body of theoretical literature suggests that social anxiety may be related to abnormal or inflexible autonomic nervous system activity. In recent years, this notion has been corroborated by some empirical studies, though evidence has been inconsistent. Modest and inconsistent associations between social anxiety and psychophysiology may reflect discordance across subjective and physiological dimensions of emotion, or limitations and differences in the methods or analyses used across studies. To address these limitations, the physiological responses (heart rate, HR; respiratory sinus arrhythmia, RSA; skin conductance level, SCL; and pre-ejection period, PEP) of 123 preadolescents (Mage = 12.03 years; 50% females; 42% ethnic minorities) were measured continuously during a lab protocol designed to simulate common peer evaluation experiences. Preadolescents provided reports of global social anxiety on a well-validated questionnaire as well as context-specific anxiety during the peer evaluation protocol. Latent growth model analyses indicated that context-specific anxiety was related to greater heart rate reactivity to and recovery from social stress, as well as greater RSA recovery. Furthermore, global social anxiety was related to blunted SCL recovery. SCL results are more consistent with an autonomic inflexibility model, whereas HR and RSA results are more consistent with an autonomic hyperarousal model. Findings demonstrate the complexity of the relationship between psychophysiology and social anxiety, and may reflect specificity among physiological parameters.

Poster 3-15**LISTENING TO EMOTION ON DIFFERENT CHANNELS: PHYSIOLOGICAL AND BEHAVIOURAL RESPONSES TO CONSISTENT AND INCONSISTENT COMMUNICATION**Hedwig Eisenbarth
University of Southampton*Descriptors: emotion, personality, multimodality*

Social interactions are composed of several communication modalities, such as prosody, facial expression or verbal content. Partly muting those modalities can reduce the emotional reaction. As highly psychopathic individuals have difficulties in categorizing emotional facial expressions and show reduced emotional arousal, muting different modalities in every-day communication should have less impact on emotional reactivity in highly psychopathic individuals. We presented short video clips to 37 undergraduate students, showing actors talking about disgusting, fear-provoking, happy and sad situations, with either neutral prosody, neutral facial expression or neutral verbal content, or with all modalities expressing emotion, but in foreign language. Ratings of emotional intensity and own emotional responses were obtained, as well as psychopathic traits and skin conductance responses (SCR). Videos with unknown language and muted prosody reduced intensity ratings for disgust and sad videos significantly. Similarly, ratings for participants' own emotional reactions were reduced by muted prosody and unknown language in disgust and happy videos, but increased in sad videos. The Boldness aspect of psychopathy was associated with overall lower emotional intensity ratings. SCR varied based on modality muting and emotion category. Meanness and Disinhibition aspects of psychopathy were significantly related to higher overall SCR, and high Meanness scores to higher SCR variation. Implications of this dissociation between physiological and subjective responses will be discussed.

Poster 3-16**LONGITUDINAL CHANGES IN CEREBROVASCULAR HEALTH ON WHITE MATTER MICROSTRUCTURE AND COGNITIVE PERFORMANCE**Alexander Conley¹, Todd Jolly¹, Jaime Rennie¹, Patrick Cooper¹, Grant Bateman¹, Mark Parsons¹, Chris Levi¹, Natalie Phillips², Patricia Michie¹, & Frini Karayanidis²¹University of Newcastle, Australia, ²Concordia University*Descriptors: cerebrovascular risk factors, executive function, aging*

The presence of cardiovascular risk factors is a strong predictor of age-related cognitive decline, as well as the development of both vascular dementia and Alzheimer's disease. Cerebral white matter is particularly vulnerable to damage associated with cardiovascular risk factors. In a cross-sectional study, reduced white matter microstructural organisation was associated with increased cerebral arterial pulsatility (Jolly et al., 2013) and poorer performance on the Montreal Cognitive Assessment (MoCA, Jolly et al., 2016). Both effects were stronger for participants who reported the presence of at least one cardiovascular risk factor. Yet, arterial pulsatility, a measure of cerebrovascular health, was not related to cognitive performance and did not mediate the effect of decreased white matter integrity on cognition. Jolly et al. (2016) argued that increased arterial pulsatility may have a delayed effect on cognition and white matter integrity. The present study uses a longitudinal design to examine whether arterial pulsatility (measured at Time1) predicts decline in white matter microstructural organisation and cognitive functioning over a 2 year period. A subset of Jolly's original cohort were retested at two years using an identical procedure. Preliminary results indicate that arterial pulsatility at time 1, while not related to MoCA performance at time 1, were strongly related to decline in cognitive performance over time. These results indicate that cerebrovascular factors can have medium to long-term impact on cognitive functioning in the healthy aged.

Poster 3-17**LOW PURSUIT FOR HIGHLY-EXPECTED REWARDS**

Kellie Ann Lee¹, Brandon Joachim¹, Vivian Khedari¹, & Wendy D'Andrea²
¹The New School, ²The New School for Social Research

Descriptors: children, decision making, trauma

Interpersonal functioning and decision-making impinge on an individual's ability to regulate their behaviors in prescribed contexts, and these problems are particularly salient among trauma-exposed youth. We assessed risk-taking behavior, perspective-taking abilities, well-being, and vagal tone using behavioral and physiological assessments. Our sample was a of youth group with severe trauma exposure (e.g., removed from family custody) consisting of 53 children and adolescents between the ages of 12 and 19. We find that baseline values of RSA (respiratory sinus arrhythmia) negatively covaried with and predicted expectancies of reward in a modified dictator task ($M = 4.30$, $SD = 2.03$), $r(43) = -0.33$, $p < 0.03$. Performance on a risk and reward task, the BART (balloon analogue risk task; Lejuez et al., 2002), yielded lower scores ($M = 21$, $SD = 11$) relative to a comparison sample of at-risk youth ($M = 36$, $SD = 14$). Our findings suggest that at-risk youth are risk averse, high on the expectancy of reward but low in the pursuit of encountering risk for such rewards; and that these behavioral adaptations are related to low vagal tone. These data may suggest that trauma-exposed youth are unable to regulate their expectations in the face of such tasks, further exacerbating pursuit of reward and avoidance of risk.

Poster 3-18**MAJOR DEPRESSION REDUCES ATTENTIONAL ALLOCATION TO WORD STIMULI INVOLVING PEOPLE AS INDICATED BY THE P3B**

Erik Benau¹, Aminda O'Hare², Linzi Gibson³, Stephen Ilardi¹, & Ruth Ann Atchley¹
¹University of Kansas, ²University of Massachusetts at Dartmouth, ³Washburn University

Descriptors: depression, P3b, EEG

Individuals with major depression show less sensitivity to interpersonal stimuli, which may contribute to their social isolation. The present study explored how attentional allocation in major depression may be involved in the blunted process of recognizing interpersonal stimuli. Adults with major depression and healthy controls completed two oddball tasks using lexical stimuli while EEG was recorded. They were asked to identify positive and negative words, respectively. Half of the target stimuli referred to people ("pretty," "loser"), and half did not ("sunshine" "gloom"). Filler stimuli were neither affective nor person-referent ("leaf," "tire"). The results showed that healthy controls were faster and more accurate at responding to positive, person-referent stimuli than were the depressed individuals. The depressed group was faster and more accurate at identifying the negative person-referent stimuli than the health controls. The healthy controls' largest amplitudes were for person-referent target stimuli in the positive task, and their smallest P3b amplitudes were to negative non-person referent stimuli. The depressed individuals elicited a larger P3b to target stimuli; however, there were no other main effects or interactions for this group. We conclude that individuals with major depression not only have blunted attention to affective stimuli, but also to stimuli pertaining to people.

Poster 3-19**MATTERS OF THE HEART: CHILDHOOD TRAUMA EXPOSURE AND SYMPTOMS AFFECT AUTONOMIC AROUSAL AND HEALTH**

Vivian Khedari¹, Erin Stafford¹, Steven Freed¹, Jonathan DePiero¹, Ashley Doukas¹, Reese Minshew², Catherine McGreevy³, Greg Siegle⁴, & Wendy D'Andrea⁵
¹The New School, ²Hamilton College, ³Teachers College Columbia University, ⁴University of Pittsburgh, ⁵The New School for Social Research

Descriptors: trauma, health

Previous literature has established a link between cumulative trauma exposure and negative health outcomes. This link might be partially explained by low levels of heart rate variability resulting from a reduction in parasympathetic tone. The present study examined differences in resting physiology of individuals with and without trauma exposure across six studies. As part of their protocol, each study collected self-report data, including the Brief Symptom Inventory (BSI),

PTSD Checklist (PCL-5) and the Childhood Trauma Questionnaire (CTQ), and a two-minute resting baseline measure of HR, HRV (RSA, SDNN, and RMSSD), and EDA. The combined data resulted in a community sample $N = 362$ (mean age = 32, $SD = 10.94$) of racially diverse (Caucasians = 28.4%; African Americans = 27%) individuals. Results show that PCL mean score and CTQ total score were positively correlated with sympathetic indicators: resting HR ($r_s = .13-.14$, $p < .05$) and EDA ($r_s = .10-.14$, $p < .05$). However, only CTQ total score significantly negatively correlated to measures of HRV (RSA, $r(360) = -.151$, $p < .01$). Individuals with low RSA did not have more psychiatric symptoms, but did have more physical health conditions ($r = -.15$, $p < .05$). The findings suggest that while both early trauma exposure and posttraumatic stress reactions are associated with an increase in sympathetic activity, only early trauma exposure is associated with decreased parasympathetic activity, and may have important consequences for physical health.

Poster 3-20**IS AUDITORY REPETITION SUPPRESSION INTACT IN SCHIZOPHRENIA?**

Christian A. Andreaggi, Brian A. Coffman, Sarah M. Haigh, Timothy K. Murphy, & Dean F. Salisbury
 University of Pittsburgh School of Medicine

Descriptors: schizophrenia, auditory perception, repetition suppression

Schizophrenia is associated with smaller auditory evoked potentials, reduced detection of auditory novelty (smaller mismatch negativity), and poor click pair sensory-gating (reduced P50 suppression). Here we examined repetition suppression (the reduction of sensory responses with repeated presentations) to repeated tones in 15 individuals with chronic schizophrenia (Sz), 23 individuals at their first psychotic episode within the schizophrenia-spectrum (FESz), and 32 healthy controls (HC, 15 age matched to Sz and 23 age matched to FESz). Participants heard sets of 4 identical tones (1.0 kHz, 80 dB, 50 ms) while watching a silent movie. Tones were separated by 330 ms with an inter-set interval of 750 ms. Deviant sets of 3 identical tones were also presented, but only responses to standard sets are discussed here. For Sz and matched HC, P1, N1 and P2 amplitudes were reduced with repeated presentations ($p < 0.05$) Of primary importance, this repetition suppression did not differ between groups. Similarly, for FESz and matched HC, P1, N1 and P2 amplitudes were reduced with repeated presentations ($p < 0.05$), and repetition suppression was unimpaired in FESz. These data suggest that local inhibition of sensory responses may be intact in schizophrenia, and does not contribute to other deficits in early auditory processing such as MMN deficits.

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Poster 3-21**MISMATCH NEGATIVITY TO PAIRED-TONES IN FIRST-EPISODE SCHIZOPHRENIA**

Alexis G. McCathern, Sarah M. Haigh, Brian A. Coffman, Timothy K. Murphy, Kayla L. Ward, & Dean F. Salisbury
 University of Pittsburgh School of Medicine

Descriptors: mismatch negativity, schizophrenia, first-episode

Mismatch negativity is a negative event-related potential evoked by a deviant stimulus outside the focus of attention. MMN to infrequent pitch deviants amongst repeated standard tones is reduced in long-term schizophrenia (Sz, illness duration over 5 years), but not as robustly, if at all, in the first episode schizophrenia spectrum (FESz). Because more neural processing resources are likely needed for detection of pattern deviants, complex pattern MMN may reveal abnormalities earlier in disease course by taxing a less impaired system. Here, tone pairs were used to measure complex MMN. Twenty-one FESz, 23 Sz, and 37 healthy controls (19 age-matched to FE, HCFE; 18 age-matched to Sz, HCSz) watched a silent movie while ignoring a stream of paired tones (50 ms duration, 200 ms SOA, 1000 ms ITT). The standard tone pair was played 87.5% of the time, with the second tone three semitones higher than the first. The deviant tone pair was played 12.5% of the time, with the second tone three semitones lower than the first. All deviant second tones were also used as standard second tones. Complex tone-pair MMN was significantly reduced in Sz ($p = .026$), but not in FESz ($p = .808$). These preliminary results suggest that FESz, unlike Sz, do not show deficits in tone-pair complex MMN. It is unclear if tone-pair complex MMN deficits develop with disease duration. The two-tone pattern is relatively simple; further research with more complex patterns is underway to examine whether complex MMN may detect deviance-related processing abnormalities at first episode.

NIH MH094328.

Poster 3-22**MISMATCH NEGATIVITY TO VIOLATIONS OF CATEGORICAL PERCEPTION OF SYLLABLES IN LONG-TERM AND FIRST-EPIISODE SCHIZOPHRENIA**

Rebecca M. Laher, Timothy K. Murphy, Sarah M. Haigh, Brian A. Coffman, Kayla L. Ward, & Dean F. Salisbury
University of Pittsburgh School of Medicine

Descriptors: first-episode schizophrenia, mismatch negativity, syllable deviant
Patients with long-term schizophrenia (Sz) typically have reduced mismatch negativity (MMN) to deviant syllables. It is unclear whether this deficit is present early in the disease course. Twenty-four first psychotic episode schizophrenia-spectrum participants (FESz), 19 SZ, and 37 healthy controls (HC; 19 age-matched to FESz, 18 age-matched to Sz) watched a silent film while passively hearing auditory stimuli through headphones. Subjects were presented with four artificial syllables varying in voice-onset time (VOT) along the Ba-Pa continuum. A standard syllable sounding strongly like a “Ba” (VOT=0ms) comprised 70% of the stimuli and deviant syllables with VOT at either 15ms (weak “Ba”), 25ms (weak “Pa”), or 40ms (strong “Pa”) each comprised 10% of the remaining stimuli. No MMN at FCz was apparent for the 15ms or 25ms VOT syllables in any group. There was a significant reduction in MMN for the 40ms VOT in Sz compared to matched HC ($p=.034$), but no significant difference between FESz and matched HC ($p=.447$). These findings suggest that the mechanisms for syllable processing may be intact at first schizophrenic episode, and that MMN amplitude reduction at FCz reflecting the automatic detection of syllable change may not be a useful biomarker of the presence of schizophrenia early in disease course. Currently we are analyzing MMN topography to determine if more subtle deficits may exist at first break.

NIH MH094328.

Poster 3-23**PILOT STUDY ON THE EFFECTS OF WITHANIA SOMNIFERA ON ELECTROPHYSIOLOGICAL MEASURES OF SENSORY AND COGNITIVE PROCESSING IN SCHIZOPHRENIA**

Paulina S. Marell¹, Timothy K. Murphy¹, Jaspreet Brar², Patricia Schlicht², Sarah M. Haigh¹, Brian A. Coffman¹, Kayla L. Ward¹, K.N. Roy Chengappa², & Dean F. Salisbury¹

¹University of Pittsburgh School of Medicine, ²University of Pittsburgh Medical Center

Descriptors: schizophrenia, antioxidant, auditory perception
Oxidative stress and neuroinflammation may contribute to decreased neuronal activity in schizophrenia by affecting the high metabolic demand parvalbumin-containing fast-spiking cortical interneurons. We measured the effects of the antioxidant and anti-inflammatory Ashwagandha (Withania Somnifera; WSE) on event-related potentials (ERPs). Eleven patients with long-term schizophrenia participated in a pilot double-blind adjunctive medication study: 6 took WSE, 5 placebo. Participants heard pitch (10%) and duration deviants (10%) among standard tones (80%) in a mismatch negativity (MMN) task while watching a silent movie. They also performed two auditory oddball tasks, either counting rare pitch deviants (15%) or ignoring sounds. For the oddball tasks, a 500 ms duration 40 Hz click train was presented between tones. ERPs were measured before administration of WSE or placebo (T1) and 3 months later (T2). Preliminary analyses indicated improvements in duration MMN with WSE ($d=1.28$) but not with placebo ($d=0.27$). In the oddball task, the WSE group showed a larger P3 from T1 to T2 (attend $d=0.47$; ignore $d=0.69$) compared to placebo (attend $d=0.24$; ignore $d=0.29$). Gamma-band steady-state potentials in the WSE group displayed greater attention-related amplitude increase at T2 ($d=0.59$) than the placebo group ($d=0.07$). WSE intake appears to recover some of the impaired early sensory/cognitive potentials in schizophrenia, possibly by reversing oxidative stress and neuroinflammation. These pilot data indicate further investigation into such adjunctive target pharmacotherapy is warranted.

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Poster 3-24**SCHIZOPHRENIA PRODROME DURATION AND MMN AT FIRST EPISODE**

Timothy K. Murphy, Sarah M. Haigh, Brian A. Coffman, Kayla L. Ward, & Dean F. Salisbury
University of Pittsburgh School of Medicine

Descriptors: first-episode schizophrenia, prodrome, mismatch negativity
Large effect size ($d \geq 1$) reductions of mismatch negativity (MMN) amplitude are seen in long term schizophrenia (Sz). However, the effect sizes for MMN reductions at the first psychotic episode within the schizophrenia-spectrum (FESz) are much smaller. Our recent meta-analysis showed no evidence for pitch MMN reduction ($d < 0.1$) and a medium effect size for duration MMN reduction ($d \sim 0.5$). To explore factors that might explain the variable findings of MMN reductions in FESz, we recorded MMN from 50 Sz (WASI = 104, sd 14) and 50 age-, gender-, and IQ-matched controls (WASI = 104, sd 11), and 30 FESz (WASI = 113, sd 14) and 30 matched controls (WASI = 110, sd 10). Participants watched a silent video while ignoring randomly presented tones (330ms SOA; standards: 1 kHz, 50ms, 80%; pitch-deviants: 1.2 kHz, 50ms, 10%; duration-deviants: 1 kHz, 100ms, 10%). Sz exhibited robust MMN reductions at FCz to pitch ($p < .001$) and duration ($p < .001$) deviants. FESz did not show MMN amplitude reductions to pitch ($p=.12$) or duration ($p=.70$) deviants. However, within FESz the duration of the prodromal phase was associated with duration MMN ($r = -.573, p=.003$), such that a more rapid transition to full psychosis was reflected in a more impaired duration MMN within the context of a “within normal limits” group mean MMN. Rapid conversion may reflect greater underlying cortical pathology, and these defective mechanisms appear to be reflected in duration MMN pathophysiology. Differences in prodrome duration may explain some of the discrepant findings in duration MMN in FESz.

NIH MH094328.

Poster 3-25**MULTILEVEL MODELS FOR CHARACTERIZING DYADIC PSYCHOPHYSIOLOGICAL REACTIVITY**

Hogan Jasara, Alexander Crenshaw, Stacia Bourne, Robert Kent de Grey, Nicholas Perry,Carolynne Baron, Janna Dickenson, Katherine Baucom, & Brian Baucom
University of Utah

Descriptors: statistical methods, dyadic psychophysiology
A primary area of interest in psychophysiological research is reactivity, but there is little consistency in how such change is conceptualized and modeled statistically. There are several recommended methods for modeling change, but the ways in which these methods operationalize and model change are not equivalent; the differences between methods have theoretical implications that render some approaches more appropriate than others depending upon the hypotheses being tested. These modeling issues are further amplified in research on dyadic reactivity because there is very little existing work that speaks to how individual models of reactivity can and should be extended to dyadic contexts. The current study extends regression-based methods for modeling individual change to the dyadic context, compares the similarities and differences between the models, and makes recommendations for matching models to specific research aims.

Participants are 60 married couples (N=120). Analyses for the present study focus on the change in EDA from a 5-minute resting baseline to a 10-minute discussion of the couple's self-reported area of highest conflict. A total of three models are run: 1) a basic multilevel model (MLM), 2) an actor-partner interdependence model (APIM), and 3) a growth model. Analyses reveal that growth models provide unique insights into reactivity during social interaction that cannot be obtained with models that summarize reactivity over a period of time (i.e., basic MLM and APIM). Implications of findings for selecting amongst models in future research are discussed.

Poster 3-26**MULTIVARIATE PHASE COVARIANCE ANALYSIS: A NEW APPROACH TO REVEALING FUNCTIONAL CONNECTIVITY IN EEG TIME-SERIES**

Kyle J. Curham, & John J.B. Allen
University of Arizona

Descriptors: connectivity, phase, network

Phase-synchronization is a potential mechanism to dynamically modulate functional connectivity between brain regions. The phase locking value (PLV), a bivariate measure of phase-synchronization, has been used to reveal functional relationships between EEG electrodes. For example, theta synchronization between medial and lateral-frontal electrodes after error commission on a forced-choice Flankers task, coincident with the error-related negativity (ERN), predicts post-error slowing on subsequent trials. However, bivariate approaches can lead to spurious correlations due to the third-variable problem, have low statistical power due to multiple comparisons, and potentially attenuate event-related relationships not time-locked to stimulus or response onset due to trial averaging. The current study overcomes these limitations with a new multivariate phase covariance analysis (MPCA) approach to infer network connectivity and mean phase differences between electrodes in EEG time-series. Sample covariance matrices are obtained for each trial by computing the outer product of the channel by time-point data matrix of complex-valued phases (obtained by wavelet transformation). The geometric mean of these matrices across trials is found by gradient descent in the space of Hermitian symmetric positive-definite (SPD) covariance matrices. Convergence is guaranteed due to the convexity of the space. When used to characterize network connectivity during error trials in the Flankers task, MPCA shows increased contrast and sensitivity compared to phase-synchronization using PLV.

Poster 3-27**N1 TO DISTRACTOR TONES IS AFFECTED BY TONE SALIENCE AND PRIMARY TASK DIFFICULTY**

Patrick L. Woody, Andrea Perez-Muñoz, James W. Rogers, Jamonté D. Wilson, & Jeffrey J. Sable
Christian Brothers University

Descriptors: ERP, attention, distraction

Previous research suggests that there is a tug-of-war between automatic and selective attention as they compete for limited cognitive resources. We manipulated selective attention by engaging participants in a 1-back (easy) or 3-back (difficult) task. Automatic attention (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 each train were separated by 400-ms onset-to-onset intervals, with 4-5 s between trains. Participants were instructed to ignore the tones and focus on the tasks. For each of the four conditions, we examined the N1 component of the ERP—an automatic response elicited by stimuli even in the absence of overt attention—to each tone. The N1 typically decreases in amplitude across the tones in a train. We also compared participant performance (reaction time and accuracy) among conditions. In accordance with previous research, we hypothesized that N1 amplitudes would attenuate less across the "same" trains than the "different" ones. Additionally, we hypothesized that "different" trains would be more distracting than "same" trains, producing a decrease in performance. As predicted, N1 amplitudes were larger to "different" trains than to "same" trains. This difference was greater in the 1-back than in the 3-back condition, and became larger to later tones in the trains. Although performance was better on the easy task than the difficult one, the characteristics of the tone trains did not affect performance.

This research was supported in part by NSF MRI award 1429263.

Poster 3-28**N400 TO EXPECTED BUT NOT PRESENTED EMOTIONAL SOUNDS**

Boris Kotchoubey¹, & Yuri G. Pavlov²
¹University of Tuebingen, ²Ural Federal University

Descriptors: learning, conditioning, disorders of consciousness

Research of learning abilities of patients with disorders of consciousness is an object for wide discussion. The most difficult issue is the lack of good developed paradigms for studying of learning in these patients. In the current study we tried to assess the potential of a novel learning paradigm which could allow us to evaluate the success of learning without any overt behavioral response. 23 healthy participants were included in this study. The procedure was subdivided into two phases. Participants were instructed to do nothing except listening to the sounds in both phases. In the 1st (learning) phase musical chords followed by emotional sounds were presented. One of the chords was associated with 5 different positive emotional sounds and the other one with 5 different negative emotional sounds. The 2nd (test) phase was a simple oddball paradigm, in which one of the chords presented during the 1st phase was used as a standard stimulus, and the other one as a deviant stimulus. A 64 channel EEG was recorded. The analysis of event-related potentials (ERP) in the 2nd phase revealed the presence of expected differences in P3a, P3b components between standard and deviant stimuli. In addition to these findings the analysis revealed a significant effect of condition on negative ERP component in 380-480 ms time window. Most pronounced effect was detected in frontal and fronto-central sites. We assume that the obtained N400 effect may reflect reactions of brain to the emotional stimuli that were associated with the chords in the learning phase but omitted in the test phase.

The study was supported by the German Research Society (DFG).

Poster 3-29**NEGATIVE AFFECT INTERFERENCE AND EROTIC CONTENT IN SURVIVORS OF SEXUAL TRAUMA**

Andria Schmid¹, Wendy D'Andrea², Greg Siegle³, & Jonathan DePierro¹
¹The New School, ²The New School for Social Research, ³University of Pittsburgh

Descriptors: affect, trauma, erotica

Negative Affect Interference (NAI) is a form of anhedonia defined as the experience of negative affect in typically positive situations and is evidenced in clinical observations of individuals with early and sustained trauma exposure (Frewen, Dean, & Lanius, 2012). NAI may explain why some individuals, particularly those who have experienced sexual trauma, may experience this typically-positive stimulus as aversive. To better understand the relationship between NAI and erotica in survivors of sexual trauma, the present study seeks to examine heart rate (HR) responses to images varying in valence and arousal including erotic stimuli. NAI was assessed via blocked IAPS image presentation, using the framework of the defense cascade to understand potential perception of the images as positive vs. threatening. An interaction following child sexual abuse x heart rate acceleration was found, confined to the first three seconds of heart rate reactivity, suggesting parasympathetic withdrawal while viewing erotic images. Pairwise comparisons revealed that, for participants who endorsed childhood sexual assault showed greater HR immediately following presentation of erotic stimuli ($M = 5.28$, $SD = .92$) compared to neutral stimuli ($M = 2.20$, $SD = .79$), $M_{diff} = 3.08$, $p < .05$, $d = 0.52$.

Poster 3-30**NEGATIVE ATTITUDES ABOUT TOUCH PREDICT VAGAL RESPONSE TO STRESS**

C. Jessie Duncan, David Parkhurst, Nicole A. Roberts, & Mary H. Burseson
Arizona State University

Descriptors: attitudes about touch, lab stressors, RSA

Previous studies have linked touch avoidance with unfavorable psychosocial outcomes, including neuroticism, marital dissatisfaction, poor interpersonal skills, and even poor problem-solving. In the present study, we investigated whether negative attitudes about touch (both general social touch and touch with a spouse) were associated respiratory sinus arrhythmia (RSA) responses to laboratory stressors. 214 married couples completed measures of discomfort with general social touch, aversion to spousal touch, and touch as a means of spousal control. They subsequently attended a lab session and performed speech and math tasks, which caused significant physiological stress responses across subjects. Regression analysis predicting stress-related change in RSA revealed significant effects for spouse ($p=.007$), touch for control ($p=.004$), the interaction between spouse and touch for control ($p=.027$), and the interaction between spouse and discomfort with general social touch ($p=.003$). For wives, higher discomfort with general social touch and higher touch for control were both associated with smaller stress-related reductions (or larger stress-related increases) in RSA. Stress-related phasic decreases in RSA are linked with efficient stress responding, whereas phasic increases in RSA have been associated with regulatory effort. These findings may suggest greater regulatory effort on the part of wives with negative attitudes about touch, or alternatively, a less efficient vagal response to stress-related physiological demands.

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Poster 3-31**NEURAL CORRELATES OF SELF-PERCEPTION IN INDIVIDUALS WHO VARY IN SOCIAL ENGAGEMENT**

Sarah E. McKinzie¹, & Lauren Ethridge²

¹University of Oklahoma, ²University of Oklahoma Health Sciences Center

Descriptors: cognition, social engagement, electroencephalography

Electroencephalography (EEG) studies indicate a reduced or absent self-preference effect for faces in individuals diagnosed with autism spectrum disorder (ASD). The current study extends these findings to adults below the diagnostic cut-off for ASD who differ in social engagement. Participants ($n=200$) were classified as either high or low in social engagement, but within the sub-clinical range, using the Autism-Spectrum Quotient and the Broad Autism Phenotype Questionnaire, then during dense array EEG a subset of participants were presented with images of faces in three categories: pictures of themselves (24 trials), a close "other" (24 trials), and a stranger (72 trials). For those low in social engagement, the N170 event-related potential showed a longer latency to their own face than to strangers and close others, whereas N170 latency did not differ between conditions for those high in social engagement. There was also a trend toward reduced lateralization of neural response to faces in low social engagement participants, consistent with stronger findings in ASD. Delayed processing of the self in those closer in social engagement to the clinical end of the autism spectrum suggests that neural processing of self-relevant concepts may vary incrementally across the entire spectrum according to social processing network function and may not be restricted to those with a clinical diagnosis of ASD.

Poster 3-32**NEURAL SYNCHRONIZATION DEFICITS LINKED TO CORTICAL HYPER-EXCITABILITY AND AUDITORY SENSITIVITY IN FRAGILE X SYNDROME**

Lauren E. Ethridge¹, Stormi P. White², Matthew W. Mosconi³, Jun Wang⁴,
Craig A. Erickson⁵, Matthew J. Byerly⁶, & John A. Sweeney⁵
¹University of Oklahoma, ²University of Texas Southwestern Medical Center, ³University of Kansas, ⁴Zhejiang University of Technology, ⁵University of Cincinnati, ⁶Montana State University

Descriptors: fragile x syndrome, EEG, gamma

Hypersensitivity to sensory stimuli is a common feature of Fragile X Syndrome (FXS) that can be clinically distressing and difficult to treat. Preclinical evidence and available clinical electrophysiology research suggests that cortical hyper-excitability, particularly in the gamma frequency range, may contribute to sensory processing abnormalities in FXS. The current study investigated basic functional properties of auditory cortex with a focus on gamma frequency band activity using a sensory entrainment task. Seventeen adolescents and adults with FXS and 17 age and sex-matched healthy controls participated in an auditory chirp task using a 1000 Hz tone amplitude modulated by a sinusoid linearly increasing in frequency from 0-100 Hz over 2 seconds during dense array EEG. Single trial time-frequency analyses revealed decreased gamma phase locking to the chirp in FXS, which was strongly coupled with broadband increases in gamma power. Changes in gamma phase locking and power were also associated with theta-gamma amplitude-amplitude and phase-amplitude coupling during the pre-stimulus period and with parent reports of heightened sensory sensitivities and social communication deficits. These findings represent the first demonstration of neural entrainment abnormalities in FXS, and thus provide novel evidence for the model of neocortical hyper-excitability in FXS. They parallel findings in *fmr1* knockout mouse models of FXS and thus may characterize a core pathophysiological aspect of FXS and provide a translational biomarker strategy for evaluating promising therapeutics.

NIMH/NICHD grant U54 HD082008-01 (Huber/Sweeney).

Poster 3-33**NEURAL MECHANISMS OF ATTENTIONAL PROCESSING UNDERLIE THE LINK BETWEEN ANXIETY AND EMOTIONAL EATING**

Eric Rawls, Greg Denke, Mejdy M. Jabr, Carl A. Armes, Diana A. Hobbs,
& Connie Lamm
University of New Orleans

Descriptors: attentional blink, emotional eating, anxiety

Emotional eating is for some people an attempt to deal with the stress associated with negative emotions; however, rather than reducing stress, this behavior often leads to additional distress. In particular, anxiety has been shown to predispose individuals to emotional eating. However, not all individuals who are high in anxiety exhibit emotional eating behavior. Anxiety and emotional eating behavior have both been linked with attentional biases, yet the specific attentional sub-processes that underlie these biases have not been explored. Therefore, the present study uses event-related potentials (ERPs) to decompose the chronology of attentional processing underlying the link between anxiety and emotional eating behavior. More specifically, the current study investigates which ERPs moderate the anxiety – emotional eating association. In order to examine this neural chronology, we examined three successive ERP components (the P2, the N2 and the P3) in the context of an attentional blink paradigm. Results indicated that the N2, as well as the P3, exhibited moderating effects on the relationship between anxiety and emotional eating behavior. The effect for the N2 was present only in neutral contexts, while the effect for P3 was present only in negative emotional contexts. The direction of this moderating effect for N2 & P3 activation was consistent with previous studies linking neural processing efficiency with reduced activation during cognitive tasks. Our results suggest that efficient attentional processing moderates the association between anxiety and emotional eating.

Poster 3-34**NEURAL PROCESSING OF EXECUTIVE FUNCTION: THE PARIETAL P3B IN PRESCHOOL CHILDREN**

Amanda Tarullo¹, Ashley St. John¹, Stacey Doan², & Srishti Nayak¹
¹Boston University, ²Claremont McKenna College

Descriptors: executive function, ERP, children

The preschool years are critical to executive function (EF) development, but little is known about neural processing of EF at this age. The parietal P3b indexes stimulus discrimination in adults and older children. This study investigated whether preschool children would show the P3b during a Dimensional Change Card Sort (DCCS) and whether the P3b would be linked to performance. Methods: EEG was recorded from 105 children (M=4.18 yrs) during a computerized DCCS. Children were instructed to sort by one dimension, e.g. shape, for 15 pre-switch trials, and then by a different dimension, e.g. color, for 30 post-switch trials. The P3b was defined as the third positive peak in midline parietal sites, with peak amplitude 450-700 ms after stimulus onset. To be included in analyses, children had to score above 70% accuracy on the pre-switch and have at least 10 artifact-free post-switch trials (M=18.74 trials). The relation of P3b amplitude to performance was tested with repeated measures ANOVA. Results and Discussion: Shorter post-switch reaction time on correct trials related to a smaller P3b amplitude, $F(1,47) = 4.34, p = .043$. The association of P3b amplitude and reaction time was more pronounced in the posterior parietal compared to anterior parietal region, $F(1,41) = 4.14, p = .048$. The P3b was not related to accuracy. Results show the P3b is present in preschool children on a set shifting task, though with a longer latency and slightly different topographic distribution than in adults. Smaller P3b amplitude may indicate greater neural efficiency in stimulus discrimination.

Poster 3-35**NEURAL SEX DIFFERENCES DURING CONTROL OF SOCIAL ATTITUDES**

Megan M. Filkowski, Ian W. Anderson, & Brian W. Haas
 University of Georgia

Descriptors: sex differences, fMRI, social attitudes

Sex differences in neural activation have been reported in studies of emotion processing and emotion regulation as well as in the processing of social appraisals and consumer trust. This study was designed to examine sex differences during the conscious control of interpersonal attitudes of trust and distrust toward another person. 114(45.2% male) healthy adults participated in behavioral testing and neuroimaging. Each participant underwent fMRI while instructed to control how much they either trusted or distrusted each face or to evaluate the age of the face. When controlling social attitudes of trust and distrust, men exhibited increased activation in several regions including the dorsolateral prefrontal cortex, middle temporal gyrus, and middle occipital gyrus/angular gyrus relative to women. Women exhibited no increased activation relative to men when controlling social attitudes. Distinct and overlapping regions were found within each condition. When attempting to control trusting attitudes, men exhibited increased medial prefrontal cortex and left middle occipital gyrus/angular gyrus response relative to women. When attempting to control attitudes of distrust, men exhibited increased activation in bilateral middle temporal gyrus and right inferior occipital gyrus in men relative to women. Together, these findings suggest that men engage an additional network of brain regions involved in the top down control of attitudes during the conscious control of interpersonal distrust and trust compared to women.

University of Georgia, Office of the Vice President of Research.

Poster 3-36**SELF-REPORTED ATTENTION TO EMOTIONAL STIMULI IS HEIGHTENED WHEN LISTENING TO OWN BODY SOUNDS**

Megan Strowger¹, C. Alix Timko², & Stephen Moelter¹
¹University of the Sciences in Philadelphia, ²University of Pennsylvania, Children's Hospital of Philadelphia

Descriptors: interoception, emotion recognition, attention

Perception of physiological arousal is associated with labeling of emotion. It is less clear how understanding of own body state (i.e., interoception) influences emotion recognition. We hypothesized that facial emotion recognition, as measured by the Reading the Mind in the Eyes test (RME), would be better when participants listened to their own heartbeat compared to other sounds. Participants (n=36) were randomized to listen to three body sounds (own live heartbeat via Fetal Doppler, other person's prerecorded heartbeat at 65 bpm, or footsteps) in one of six orders. A baseline no sound condition was always administered first. Ratings of self-reported attention to stimulus type (RME or body sound) were gathered via visual analog scales administered after each body sound condition. Contrary to predictions, RME performance did not vary according to body sound condition, $F(3, 105) = .53, p = .67, \eta^2 = .02$. There was, however, a significant interaction between attention ratings to stimulus and body sound such that self-reported attention to the RME test was higher when participants listened to their own heartbeat than to other body sounds, $F(2, 70) = 3.84, p < .05, \eta^2 = .1$. Our results suggest that more attention was directed toward facial emotions when subjects listened to their own heartbeat but this increase did not result in changes in RME performance. Future research using other measures of interoception and attention are necessary to confirm the result.

Poster 3-37**NEUROMETRIC VARIATION OF DECISION CONFLICT: NEUROPHYSIOLOGICAL SIGNALS DURING INTERTEMPORAL CHOICE**

Hause Lin, Blair Saunders, Cendri Hutcherson, & Michael Inzlicht
 University of Toronto

Descriptors: conflict, decision-making, neuroeconomics

People often experience decision conflicts when choosing between competing options or responses. Existing studies of conflict have focused on cognitive control tasks (e.g., Stroop task) where there exist objectively correct and incorrect responses; but relatively little is known about how the brain tracks conflict during value-guided decisions involving subjective preferences and tradeoffs between choice options. It is also unclear whether such conflict signals reflect different intensities of conflict. To investigate the nature of this conflict signal, participants performed an intertemporal choice task. We parametrically varied the amount of conflict in different choice pairs by asking participants to choose between immediate (\$15 today) and participant-specific delayed rewards (e.g., \$19 in 10 days), which were generated based on each participant's idiosyncratic hyperbolic discount function estimated from a prior behavioral session. We observe a large conflict-related neural potential at the point of maximal conflict where the immediate and delayed rewards are equally desirable. Crucially, the magnitude of this signal discerns not only high- versus low-conflict choices but also different gradations of decision conflict: As one reward becomes increasingly more desirable than the other, this signal decreases in magnitude. Our results provide evidence for neural systems that represent and compare the subjective value of choice options, showing that a neurometric approach can be used to study and quantify the neural processes underlying value-guided decisions.

Poster 3-38**SELF-COMPASSION, HAND-HOLDING, AND ERROR-REACTIVITY: EFFECTS OF INTERPERSONAL TOUCH FROM A ROMANTIC PARTNER ON SUBJECTIVE EXPERIENCE AND NEURAL PERFORMANCE MONITORING**Blair Saunders, & Michael Inzlicht
University of Toronto*Descriptors: performance monitoring, social neuroscience, emotion*

Recent research suggests that performance monitoring, particularly the error-related negativity (ERN), partially represents the aversiveness of mistakes. However, it is currently not clear if this affective evaluation always reflects a catastrophic response to failure, or might also be associated with more accepting and open responses to threat. Here we tested this possibility by assessing the effects of interpersonal touch between romantic partners on the performance monitoring and the subjective experience of control. Forty-five romantic couples (N = 90; > 6 months dating) were recruited to take part in the study. Error-related ERPs, subjective experience ratings, and inhibitory control were measured from one member of the couple while their partner intermittently held their hand during performance. Participants reported being less self-critical and self-judgmental during hand-holding, suggesting that interpersonal touch led to an increase in acceptance and self-compassion. Hand-holding also led to increased neural reactivity to errors (ERN amplitude) when holding hands with their partner. Together, these results suggest that early reactivity to errors are not always driven by catastrophic responses to mistakes per se, but are also potentiated by factors that increase openness to threat, including interpersonal touch.

Poster 3-39**OBSERVED DYNAMIC SOCIAL INTERACTIONS FACILITATE COOPERATION IN SUBSEQUENT DECISION MAKING: AN ERP INVESTIGATION**Matthew Moore¹, Yuta Katsumi¹, Florin Dolcos^{1,2}, & Sanda Dolcos¹
¹University of Illinois, Urbana-Champaign, ²Beckman Institute for Advanced Science & Technology*Descriptors: social cognition, financial decision making, ERPs*

Social decision-making is a complex process that unfolds over time, but impressions can be formed within hundreds of milliseconds. Hence, a method with high temporal resolution (electroencephalography, EEG/event-related potentials, ERPs) is necessary to clarify the neuro-behavioral mechanisms underlying social interactions and their effect on subsequent decision-making. In the present study, the influence of observed social interactions was examined with respect to decisions to accept or reject monetary offers in an ultimatum game. Subjects responded to offers following proposer behaviors of approach or avoidance, or following a non-social interaction control condition. Behavioral results from 23 subjects showed positive effects of social interaction, particularly of approach, compared to control, suggesting a facilitating effect of social interaction in increasing cooperative decisions. ERPs recorded from a subsample of five subjects showed greater N2 response at the start of social interaction conditions compared to control and greater medial frontal negativity responses to unfair offers following approach compared to avoidance. These findings show that the influence of proposer behavior on decisions is reflected at both behavioral and electrophysiological levels, with the latter suggesting possibly increased uncertainty in earlier stages of social interaction. These results expand on previous findings from studies of the traditional ultimatum game, and point to detectable temporal indices of response to social interactions that may predict subsequent financial decisions.

Poster 3-40**OBSERVING DYNAMIC INTERGROUP SOCIAL INTERACTIONS MODULATES SPATIAL AND TEMPORAL DYNAMICS OF THE SOCIAL COGNITION NETWORK**Yuta Katsumi¹, Matthew Moore¹, Florin Dolcos^{1,2}, & Sanda Dolcos¹
¹University of Illinois, Urbana-Champaign, ²Beckman Institute for Advanced Science & Technology*Descriptors: nonverbal behavior, functional MRI, ERPs*

Despite evidence for the role of prefrontal and lateral temporo-parietal cortices in observing dynamic social interaction, less is known about their temporal dynamics. Specifically, it is not clear how social cues that unfold over time are processed during continuous social interaction, and how these mechanisms may be implicitly impacted by subtle contextual factors, such as the ethnicity of interacting partners. In this study, 26 subjects observed and evaluated a series of social interactions with ethnically ingroup and outgroup members displaying approach or avoidance behaviors, with concomitant recording of fMRI (N=20) or EEG (N=6) data. First, behavioral results identified higher ratings of social interaction linked to observing approach than avoidance behavior, regardless of the hosts' ethnicity. Second, fMRI results revealed overall similar engagement of the lateral temporo-parietal cortices in observing social interaction, while the medial prefrontal cortex showed sensitivity to ingroup vs. outgroup interactions. Finally, ERP results identified a late positivity over centro-parietal sites starting at around 300 milliseconds following the hosts' display of dynamic nonverbal affective behaviors relative to static control, and this effect was more pronounced for ingroup hosts. These findings provide novel psychophysiological evidence that processing of dynamic social cues and contextual information in impression formation occurs implicitly as fast as a quarter of a second following social encounters, and engages distributed neural networks involved in social cognition.

Poster 3-41**OVERGENERALIZATION OF CONDITIONED FEAR IS A PATHOGENIC MARKER OF PTSD AFTER CONTROLLING FOR EFFECTS OF DYSPHORIA**Adrienne Manbeck¹, Samuel E. Cooper¹, Brian Van Meurs¹, Scott R. Sponheim², & Shmuel Lissek¹
¹University of Minnesota – Twin Cities Campus, ²Minneapolis VA Health Care System; University of Minnesota*Descriptors: fear conditioning, fear generalization, PTSD*

Overgeneralization of conditioned fear to stimuli resembling learned danger-cues is centrally implicated in PTSD, though little research on the topic exists. Here, we compare patterns of generalized conditioned fear in OEF/OIF veterans with (n=15) and without PTSD (n=19). To this end, we apply a validated generalization paradigm including rings of gradually increasing size, with extreme sizes serving as conditioned danger-cues (CS+) and conditioned safety-cues (CS-). The rings of intermediary size create a continuum-of-similarity between CS+ and CS- across which to assess response slopes, referred to as generalization gradients, with less steep downward gradients indicative of stronger generalization. Primary outcome variables included slopes for online risk-ratings and fear-potentiated startle (EMG). Veterans with versus without PTSD displayed markedly less steep risk rating gradients, indicative of overgeneralization, only after covarying dysphoria as defined by the Simms four-factor model of PTSD (Simms et al., 2002). Group differences in generalization, as measured by startle-EMG, did not reach significance regardless of whether levels of dysphoria were covaried. Current results provide some support for overgeneralization of conditioned fear in PTSD, and highlight the importance of accounting for dysphoria when examining fear-conditioning abnormalities in PTSD. Specifically, aspects of dysphoria associated with depression, a low arousal state, might dampen the heightened anxious arousal thought to precipitate overgeneralization in trauma-related psychopathology.

This work was supported by a National Institute of Mental Health K99/R00 grant awarded to SL (#5R00MH080130-04).

Poster 3-42**P300 RESPONSES TO NOVEL POSITIVELY VALENCE
STIMULI ARE NEGATIVELY CORRELATED WITH
DISENGAGEMENT AS A COPING STRATEGY**Katie Lehockey¹, Kelly Bickel², Alexandra Stephenson³, Eric Watson⁴,
Jonathan Highsmith⁵, & D. Erik Everhart³¹MedStar National Rehabilitation Hospital, ²Case Western Reserve University,
³East Carolina University, ⁴Mount Sinai Health System; East Carolina University,
⁵Southwest Texas Veterans Healthcare System*Descriptors: P300, coping, emotion*

Novelty is often a prominent facet of psychosocial stress. Therefore, it is necessary to consider this important factor when investigating an individual's capacity for adaptive adjustment. In order to explore associations between coping responses and responsivity to novel positive and negative stimuli, correlation analyses were conducted between scores on a self-report inventory of coping responses (Brief COPE) and P300 responses to positive and negative target stimuli during an oddball paradigm task completed by 77 young adults. A significant, negative correlation was observed between disengagement coping responses ($M=3.20$, $SD=3.559$) and P300 amplitudes elicited by positive target stimuli presentations at two electrode sites: Pz ($M=8.031$ microvolts, $SD=7.213$), $r(70)=-0.285$, $p=0.015$, 95% CI [-0.49, -0.050], and P4 ($M=8.874$ microvolts, $SD=7.041$), $r(70)=-0.249$, $p=0.035$, 95% CI [-0.46, -0.012]. As higher P300 amplitudes are thought to indicate a response to novel stimuli, these findings suggest that people who reported having a lower tendency to use disengagement as a coping strategy may be more sensitive to perceiving positively valenced stimuli infrequently presented among negative visual stimuli. Findings have potential implications for tailoring interventions in psychotherapy and while delivering important health information to patients.

Poster 3-43**P300B AND LPP-INDEXED CUE REACTIVITY IN NON-
PATHOLOGICAL GAMBLERS**Derek J. Fisher¹, Katelyn McKearney², Laura Smith², Emma Carter²,
Kathryn McNeil², Anne Sophie Champod³, & Will Sheard²¹Mount Saint Vincent University; ²Dalhousie University, ³Mount Saint Vincent University, ⁴Acadia University*Descriptors: gambling, ERP*

Previously, problem gamblers were found to have a larger late positive potential (LPP) elicited by gambling-related cues, thought to be reflective of brain-based pathology. It is unclear if these findings are in fact reflective of increased exposure to gambling cues and not illness. The primary objective of this study was to examine the effects of gambling experience on the LPP and the cue-elicited P300b in healthy gamblers. Methods: 28 healthy controls were divided in to high gambler (HG; $n=14$) and low gambler (LG; $n=14$) groups. EEG activity was recorded during the presentation of positive, negative and neutral emotive images, as well as gambling-related images. P300b and LPP were assessed in response to each stimulus type. Results: P300b amplitudes elicited by gambling stimuli were significantly larger than those elicited by neutral stimuli (with no difference between gambling, positive or negative stimuli) in HGs. P300 amplitudes elicited by gambling stimuli were not significantly different than neutral stimuli in LGs, and both were smaller relative to positive and negative stimuli. In both HGs and LGs, gambling and neutral LPPs were not significantly different and both were reduced compared to positive and negative LPPs. Discussion: Our findings support previous reports that altered LPPs elicited by gambling-related cues in problem gamblers are reflective of underlying pathology, rather than simple exposure. P300b components elicited by gambling-related cues do, however, appear to be larger in those who gamble more and may reflect experience rather than illness.

This study was funded by a Standard Internal Grant awarded by Mount Saint Vincent University to DF.

Poster 3-44**PARASYMPATHETIC REACTIVITY TO FEAR AND TODDLER
INHIBITION INTERACTIVELY PREDICT PRESCHOOL
INHIBITION**Sarah Kahle¹, Kenneth Rubin², Amy E. Root³, & Paul D. Hastings¹¹University of California, Davis, ²University of Maryland, ³West Virginia University*Descriptors: RSA, temperament, fear response*

This study examined whether parasympathetic responding to fear predicted changes in preschoolers' temperamental inhibition over time. Children ($n=88$) visited the lab at 2 and 4 years. At both times, change in respiratory sinus arrhythmia (RSA) was measured from a baseline condition to a fear induction. At each age, an aggregate of inhibited behavior was created from multiple measures, including observed and mother-reported ratings. A cross-lagged path analysis showed that, over and above stability in RSA reactivity and inhibited behavior, stronger RSA suppression to fear at 2 years predicted greater inhibition at 4 years ($\text{Beta} = -.21$, $p = .05$). However, this association was moderated by earlier inhibition ($\text{Beta} = .24$, $p = .03$). Children who showed strong RSA suppression at 2 years had moderately high levels of inhibition at 4 years regardless of their earlier inhibition. Conversely, RSA augmentation emerged as both a risk and a protective factor, depending on earlier inhibition. Children who increased RSA to fear and were highly inhibited at 2 years had the greatest inhibition at 4 years. Alternatively, children who increased RSA to fear but were less inhibited at 2 years showed the least inhibition two years later. Thus, the adaptiveness of a given physiological reaction to fear may depend on an individual's disposition towards fearfulness.

Poster 3-45**PARENTING IS ASSOCIATED WITH DELTA-BETA
COUPLING IN PRESCHOOLERS**Reema Najjar, & Rebecca J. Brooker
Montana State University*Descriptors: delta-beta coupling*

Parenting behaviors serve as early influences on children's developing regulatory capacities (Kopp, 1982). Sensitive parenting, or parents' ability to correctly interpret and respond to children's signals is believed to support the development of regulation. In contrast, harsh parenting, or uninvolved, or punitive parent behaviors, is thought to diminish regulatory development (Ainsworth et al., 1974). Delta-beta coupling is believed to index functional crosstalk between cortical and subcortical systems of the brain (Knyazev, 2007). Though coupling has been studied as an index of neural systems of regulation in children, it is unclear whether parenting impacts coupling in ways that are consistent with developmental theory. Thus, we tested associations between parenting behaviors and delta-beta coupling as regulatory systems are developing.

Using a measure of resting EEG, we found that preschoolers ($N=91$, $\text{Mage}=3.59$, $SD=.15$) with fathers high in harsh parenting showed greater coupling in the frontal sites ($z=-2.66$, $p < .01$) while fathers' low harsh parenting was linked to greater coupling in parietal sites ($z=2.38$, $p < .01$). There were no significant findings in mothers ($z < 1.33$). Greater coupling was also seen at frontal sites for preschoolers who were high in overanxiousness ($z=-1.86$, $p < .05$) or social fear ($z=-2.74$, $p < .01$), suggesting that enhanced early coupling in frontal regions may expedite the development of frontal regulatory networks in order to cope with negative parenting and may serve as proxy of regulation-based risk for anxiety problems in young children.

NIMH: K01 MH100240 (PI: Brooker) NIGM: P20 GM104417 (PI: Harmsen).

Poster 3-46**PAYING ATTENTION TO SMARTPHONE ADDICTION**

Frances H. Martin, & Kylie Campling
University of Newcastle

Descriptors: behavioural addiction, attention bias

The aim of this study was to investigate smartphone addiction by utilising methodologies used in addiction research to assess cue salience and attention bias to visual smartphone-related stimuli in females with high addiction scores. It has been well established that cue reactivity to substance-related stimuli is an indication of addiction, however, to date there have been no studies exploring cue reactivity in relation to smartphone addiction. Twenty-two female participants (11 with high addiction scores on the Smartphone Addiction Scale) completed a Dot-Probe Task while behavioural measures and EEG activity were recorded. Event-related-potential markers for attention reorienting (N2pc) were analysed to investigate attentional biases towards smartphones, social network site images and game images. While no significant group or picture effects were found in behavioural measures, larger N2pc amplitudes for females with high addiction scores were observed at occipital sites in response to social network site pictures, suggesting greater resource deployment was necessary to disengage from social network site pictures. These results suggest that social network site stimuli are motivationally salient for females which could result in addiction to smartphone devices.

Poster 3-47**PERCEIVED CONTROL INCREASES THE STIMULUS PRECEDING NEGATIVITY AND REWARD POSITIVITY**

Douglas J. Angus¹, Christina Steindl², Eva Jonas², Cindy Harmon-Jones¹, & Eddie Harmon-Jones¹

¹University of New South Wales, ²University of Salzburg

Descriptors: reward positivity, stimulus preceding negativity, ERP

In the current study we test the prediction that having a sense of control over outcomes increases the Stimulus Preceding Negativity (SPN) and Reward Positivity (RewP) compared to having no sense of control. Previous research has shown that the SPN and the RewP are modulated by motivational intensity. In this context, motivational intensity can be thought of as the amount of effort individuals are willing to expend on a given behavior. If a task is believed to be, impossible – in that an individual does not have control over the outcomes associated with their actions – then motivational intensity is reduced. Although past research using observational learning and roulette type tasks have found that reduced control is associated with smaller SPN and RewP amplitudes, these results may be confounded by task specific differences. Twenty-five female participants completed a gambling task in which a correct choice was followed by pictures of attractive men and an incorrect choice was followed by pictures of rocks. Rather than using fundamentally different tasks to manipulate perceived control, participants were told that in one block of trials, they could learn a mouse-click rule in order to see only pictures of men (high-control condition) while in the other block, the pictures would appear randomly (low-control condition). However, in both conditions, feedback appeared randomly. Although the SPN and RewP were elicited in both blocks, their amplitudes were larger in the high-control condition.

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Poster 3-48**PHYSICAL ACTIVITY FOR THE BRAIN, BUT FOR WHOM?**

Eric S. Drollette¹, Lauren B. Raine¹, Mark R. Scudder², Shih-Chun Kao², Daniel R. Westfall², Matthew B. Pontifex³, Naiman A. Khan¹, Neal J. Cohen¹, Arthur F. Kramer⁴, & Charles H. Hillman⁴

¹University of Illinois, Urbana-Champaign, ²Michigan State University, ³Northeastern University

Descriptors: individual differences, cognition, physical activity

The present investigation examined the interaction of socioeconomic status (SES) and sex to cognitive control outcomes associated with a 9-month physical activity intervention (FITKids clinical trial) in children. This was accomplished by randomizing three hundred eighty-four children into an afterschool physical activity intervention or a wait-list control group. All participants at pre- and post-test completed a cardiorespiratory fitness assessment as well as a modified flanker task while event-related potentials (ERP) were collected. Pre-test cardiorespiratory fitness and IQ were utilized as matching variables with one hundred seventy-two participants (n = 86 treatment; n = 86 wait-list) successfully matched across treatment, SES, and sex. Results demonstrated that a 9-month physical activity intervention significantly improved flanker accuracy and post-error accuracy for all children in the intervention, regardless of SES or sex. Additionally, ERP findings revealed sexual dimorphic facilitation in performance monitoring such that only females in the treatment group demonstrated decreased N2 amplitude while only females in the wait-list group demonstrated increase ERN amplitude from pre- to post-test. Together, these results have considerable implications for promoting organized physical activity interventions for improving cognitive health, regardless of SES or sex, with further implications for sexual selective benefits to performance monitoring brain patterns in preadolescent females.

Support provided by NIH HD069381 and HD055352.

Poster 3-49**PHYSIOLOGICAL AND SUBJECTIVE EMOTIONAL RESPONSES IN SOCIAL ANXIETY**

Georgia Panayiotou, Maria Karekla, Dora Georgiou, & Michaela Siamata
University of Cyprus

Descriptors: social anxiety, phobias, emotion

The study extends findings regarding psychophysiological and subjective reactivity to feared situations in social anxiety and public speaking anxiety. It was predicted that high social anxiety symptoms would relate to reactivity across types of imaginary anxiety scenes and not specifically to social anxiety-related. This would be attributed to comorbid depression. Public speaking fear was expected to be predicted by circumscribed reactivity to survival-threat scenes, due to its association with fearfulness. Community participants imagined a series of standardized anxiety situations, including socially anxious scenes, while their physiological reactivity and self-reported emotions were assessed. Findings supported that social anxiety was associated with undifferentiated physiological (HR, Facial EMG) and subjective reactivity across anxiety-provoking situations, except with regards to skin conductance level, which was higher in social imagery. Public speaking fear was related to increased reactivity to animal phobia and panic scenes. Covariance analyses indicated that the lack of response specificity in social anxiety could be attributed to depression, while the specificity in public speaking fear could be explained by fearfulness. Social anxiety seems to fall in-between a “distress-fear” continuum, whereas fear of public speaking is similar to specific phobias.

Findings highlight the need to assess not only primary anxiety symptoms but also comorbid negative affect and fearfulness, which likely predict discrepant reactions of individuals to anxiogenic situations.

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Poster 3-50**PHYSIOLOGICAL REACTIVITY TO FAVORITE FOODS IN HEALTHY WOMEN**

Rafael Delgado, Laura Miccoli, Pedro Guerra, Carmen Gervilla, Alicia Sánchez-Adam, Sonia Rodríguez-Ruiz, Jaime Vila, & M. Carmen Fernández-Santaella
University of Granada

Descriptors: emotion, food

In the absence of food deprivation the motivational relevance of food is only moderate and the physiological correlates of food cue processing are typically limited. To increase the motivational relevance of food cues, healthy women were displayed pictures of their personally favorite foods. Non-personal foods were also included. Affective images (erotica, neutral objects, and attacks) served as controls, so that the reactivity to food cues was compared to the reactivity to non-food affectively relevant stimuli. Stimuli were displayed repeatedly within a pseudo-randomized passive picture-viewing paradigm. Emotional images caused the expected patterns in skin conductance, zygomatic and corrugator muscles, and the startle blink reflex. In line with emotion research, foods prompted, compared to affective stimuli, a large inhibition of the corrugator muscles and a large potentiation of the zygomatic muscles, indicating appetitive motivation. On the contrary, electrodermal reactivity and the startle blink reflex indicated that foods were processed as motivationally neutral. However, the startle blink reflex was more inhibited for personal stimuli. In general, electrodermal and facial EMG data indicate that in the absence of food deprivation healthy women process personal and non-personal foods as motivationally unimportant. However, the startle reflex modulation showed sensitivity to the personal relevance of the stimuli and might prove especially informative when obese and eating-disordered women will look at images of the food they like/fear the most.

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Poster 3-51**MODERATORS OF OPTIMAL FORAGING IN A MODERN CONTEXT: PROCESSING SEX AND FOOD STIMULI IN THE DARK**

Rachel Bailey, Jiawei Liu, Tianjiao Wang, & C. Kit Kaiser
Washington State University

Descriptors: motivation, optimal foraging, energy density

Organisms must consume food in order to maintain proper metabolic balances. For this reason, food cues are considered primary biologically motivating stimuli. Optimal foraging theory predicts that due to natural selection pressures, organisms are biologically predisposed to prefer foods that are more energy dense. This study examines how this predisposition operates in a modern foraging context: viewing food advertisements. Previous research supports that more energy dense food is more motivating in this context, especially when individuals' energy needs are not already met. This study examines how stimuli that elicit resource expenditures (opportunity for sexual encounter and darkness) moderate this effect. Forty-two students watched ads for more or less energy dense food (e.g. fruit bowls vs. snack cakes). Half of these ads contained sexual appeals, half did not. Approximately half of the participants were randomly assigned to view ads with the room lights off. During exposure to the ads, participant's skin conductivity levels were collected. Results suggest that in darkness, which increases initial conditions of aversive activation and creates more difficulty in foraging, ads for more energy dense foods are more motivating when they do not also contain a concurrent potential expenditure of energy (e.g. sexual encounter), $F(33,1287)=2.73$, $p < .05$. In a lighted context, this pattern changes across time. Dual appetitive motivators (high energy density and sex) are most appetitive initially but single appetitive motivators show more gradual and sustained motivated response.

Poster 3-52**POOR SLEEPERS HAVE DECREASED P300 LATENCY FOR POSITIVELY-VALENCE SLEEP IMAGES**

Eric Watson¹, Alexandra Stephenson², & D. Erik Everhart²
¹Mount Sinai Health System; East Carolina University,
²East Carolina University

Descriptors: P300, sleep, individual differences

Event-related Potential (ERP) studies are limited when studying sleep due to the inability to behaviorally respond to stimuli. Using the oddball paradigm task to measure cortical arousal/excitability, ERP investigations attempt to assess information processing upon sleep onset or upon waking as a means to examine daytime consequences. The current literature shows inconsistent results, with several studies identifying a significantly higher level of cortical activation (increased P300 amplitudes) for people with disordered sleep. Enlisting the participation of 37 undergraduate students, the present study examined subjective sleep quality in relation to recorded P300 amplitudes and latencies at electrode sites Fz, Cz, and Pz. ERP data were recorded within an oddball paradigm in which participants examined a series of valenced sleep-related images. Analyses were employed to examine group differences for P300 amplitude and latency. There were no significant findings associated with P300 amplitude. Analysis of P300 latency showed self-reported poor sleepers ($M = 339.81$, $SD = 51.86$) as having an earlier P300 onset than good sleepers ($M = 384.33$, $SD = 21.70$) at the Fz electrode site for positively-valenced sleep images, $t(18.41) = 3.50$, $p = .003$, $d = .94$. As compared to good sleepers ($M = 377.67$, $SD = 21.59$), the poor sleepers ($M = 339.80$, $SD = 49.49$) also demonstrated this significantly early P300 latency at the Cz electrode site, $t(17.35) = 3.02$, $p = .008$, $d = .84$. Results suggest poor sleep may have a paradoxical effect on information processing for visually appealing images.

Poster 3-53**POSTAURICULAR AND STARTLE BLINK REFLEXES CAPTURE ANTICIPATORY AND CONSUMMATORY EMOTIONAL DEFICITS IN PSYCHOPATHY**

Stephany M. Molina, Meghan E. Pierce, & Stephen D. Benning
University of Nevada, Las Vegas

Descriptors: psychopathy, postauricular reflex, startle blink reflex

Psychopathy is a personality disorder that can be divided into two factors: fearless dominance (FD) and impulsive antisociality (IA). FD, but not IA, has been linked to reduced fear-potentiated startle and appetitive deficits. The role of anticipatory processing in the context of this model remains unclear. This study investigated anticipatory and consummatory processing in psychopathy in a clinically depressed community sample. Participants viewed emotional pictures, listened to emotional sounds, and saw geometric shapes that served as anticipatory cues associated with each stimulus valence. FD correlated with reduced startle blink modulation during aversive vs. neutral cues and with reduced postauricular reflex modulation during pleasant vs. neutral cues. IA was associated with reduced startle blink modulation during aversive vs. pleasant sounds. Correlations with psychopathy revealed that those high in both FD and IA showed enhanced potentiation during aversive vs. neutral sounds, whereas those high in FD but low in IA showed no such startle blink potentiation. Additionally, those high in FD but low in IA showed enhanced postauricular reflex potentiation during pleasant vs. neutral sounds and reduced inhibition during aversive vs. neutral sounds. Our results suggest anticipatory emotional processing deficits in those high in FD and depression, but not in IA or psychopathy. Conversely, FD was associated with greater appetitive and reduced defensive reactivity during sounds, but only for those low in IA.

The project described was supported in part by grant MH093692 from the National Institute of Mental Health.

Poster 3-54**POSTTRAUMATIC STRESS DISORDER AND P3 RESPONSES TO AVERSIVE COMBAT PICTURES AMONG MILITARY VETERANS**

Julie Flannery¹, Craig Marquardt², Seung Suk Kang³, & Scott R. Sponheim³
¹Minneapolis VA Health Care System, ²University of Minnesota, ³Minneapolis VA Health Care System; University of Minnesota

Descriptors: PTSD, affect, ERP

Posttraumatic stress disorder (PTSD) is a heterogeneous condition associated with the past occurrence of traumatic events and current alterations in arousal and reactivity. The present study ($n = 106$) investigated neural responses of a cross-sectional sample of United States military veterans recently deployed to wars in Iraq and Afghanistan to affectively arousing and neutral images. We presented pleasant, neutral, and unpleasant images from the International Affective Picture System (IAPS) as well as a set of highly arousing and aversive combat-relevant images to examine P3 event-related potentials (ERPs). Results indicated that the PTSD group had marginally reduced P3 amplitudes compared to the non-PTSD group for the combat images ($p = .06$) but not for other images across midline frontal, central, and parietal electrode sites (Fz, Cz, and Pz). Results also showed a marginal PTSD symptom severity by electrode site interaction in P3 amplitudes ($p = .058$), where reduced P3 amplitudes were associated with increased hyperarousal symptoms at only electrode site Pz ($p = .045$). Across all participants irrespective of PTSD diagnosis, strong P3 latency effects were observed at midline electrode sites ($p < .001$). P3 in response to combat pictures peaked 14 - 37 milliseconds before all other picture conditions, suggesting selective attention towards aversive visual content of personal relevance. Additional analyses will evaluate the relationships of PTSD and mild traumatic brain injury (mTBI).

This work was supported by the National Science Foundation Graduate Research Fellowship (CAM, grant number 00039202); the Congressionally Directed Medical Research Program (SRS); the Department of Defense (SRS, grant number PT074550); and the Department of Veterans Affairs, Veterans Health Administration, Rehabilitation Research and Development Service (Scott Sponheim, Psychologist, Minneapolis VAMC, grant number I01RX000622). The funding sources were not involved in the choice of topics, study design, data analysis or interpretation, or preparation/submission of the manuscript. Any opinion, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation, the Department of Defense, or the Department of Veterans Affairs.

Poster 3-55**PRINCIPAL COMPONENTS ANALYSIS OF MOCK GAMBLING TASK ERPS REVEALED NEGATIVITY SPECIFIC TO NONREWARDS**

Emilio A. Valadez, Kelly N. Farrell, & Robert F. Simons
 University of Delaware

Descriptors: reward, event-related potential, principal components analysis
 Previous principal components analysis (PCA) investigations of the doors mock-gambling task have indicated that what appears to be a negative-going frontocentral deflection in the human event-related potential (ERP) approximately 250-350 ms following negative feedback (the feedback-related negativity; FRN), may be better characterized as the absence of a large positive component that follows reward feedback (e.g., Foti et al., 2011). In the present study, 38 young adult participants completed a similar mock-gambling task. At the end of each trial, participants received feedback indicating that they won a lot, won a little, lost a lot, lost a little, or neither won nor lost money during that trial. Although PCA of the feedback ERPs revealed that variance in the FRN was, in fact, largely dominated by a frontocentral positivity following reward feedback that was attenuated following nonreward feedback, an additional PCA factor emerged with a similar topography (Fz maximum) and latency (254 ms post-feedback) that differentiated between rewards and nonrewards ($F(1, 37) = 18.83, p < .001$), such that the factor was negative for each of the three nonreward feedback types and positive for each of the two reward feedback types. In a second independent study, a similar factor again emerged and was stable across a two-month test-retest interval. Results suggest that the FRN may not be entirely an artifact of a missing reward positivity as recent reports argue, but partially comprised of a negativity that may be unique to nonrewards.

Poster 3-56**PROACTIVE MAINTENANCE UNDER THREAT OF SHOCK IN THE AX-CPT**

Tara A. Miskovich, Daniel M. Stout, Alexa N. Wild, & Christine L. Larson
 University of Wisconsin - Milwaukee

Descriptors: cognitive control, state anxiety

According to the dual mechanisms of control theory (Braver, 2012), cognitive control consists of processes that organize goal-driven behavior through two mechanisms: a proactive mechanism that maintains goal-related information, which is impaired in trait anxiety, and a reactive mechanism that responds transiently on an as needed basis, which is intact in anxiety. We aimed to characterize the impact of anxious states on cognitive control by using a well-validated task conducted both under threat of unpredictable shock and safe conditions, while measuring event-related potentials (ERPs). The AX-CPT provides a measure of proactive control as trials rely on maintenance of goal-relevant information. While monitoring a series of letters, participants respond "yes" when they see an X (probe) only when it follows an A (cue). Proactive control is most required on BX trials, which have a target probe (X), but an invalid cue letter (B) and maintenance overrides the prepotent response to the X. We found that engagement in cognitive control, as indexed by the N2 component, is increased in response to B cues, compared to A cues when individuals are under threat ($p = 0.02$). This difference is not present when individuals are safe from shock ($p = 0.48$). These findings provide a neural measure of cognitive control that reflects successful proactive control under states of anxiety; setting the stage for understanding the neural mechanisms underlying impaired maintenance of goal-related information under anxiety — a common symptom in individuals diagnosed with neuropsychiatric disorders.

Poster 3-57**PROSODY IN SARCASM: DOES SEX MATTER?**

Victoria A. Kazmerski, Dawn G. Blasko, Alysha Simmons, & Rachel Mooney
 Pennsylvania State University, Erie

Descriptors: language, ERPS

Sarcasm is often used to convey a message that is opposite of the usual meaning of the words. There are many factors that can influence how sarcasm is interpreted. In many cases the message is perceived by the listener as hurtful. However, if one listens to late night comedy TV, the message can be quite humorous. Interpretation can vary depending on characteristics of the speaker, such as their profession, status, and gender. In a previous study, we investigated whether participants could judge whether a single word was sarcastic or sincere based on the prosody. We found that words with a sincere prosody were categorized as being sincere more accurately and more quickly than sarcastic were. Furthermore, we found males were less accurate and slower than females. We also noted differences in the ERPs based on participant sex. In that study all the voices were male. In the current study we included both male and female voices in the recorded stimuli. We found that the voice gender influenced the rating of the words, in that there was no voice difference in how words with a sincere prosody were rated, however, for the sarcastic prosody a male voice was rated as more sarcastic than a female voice regardless of the participant's sex. As in our prior work, responses were faster to sincere words. They were also faster to male voices than female voices. Voice gender also influenced the ERPs for the sarcastic words particularly in the later processing stages (1800 ms). These data demonstrate that sarcasm is a complex form of language that must be understood in context.

Poster 3-58**PROSPECTIVE LONGITUDINAL FUNCTIONAL CONNECTIVITY CORRELATES OF MILITARY TRAINING STRESS**Nicholas Davenport¹, Erin Begnel², & Lisa Keacher³¹Minneapolis VA Health Care System; University of Minnesota, ²University of Minnesota, ³Minneapolis VA Health Care System*Descriptors: functional connectivity, stress, military*

Military training involves prolonged physical and psychological stress; individual responses may provide insight into subsequent military experiences (e.g., PTSD, depression). Based on evidence that prolonged stress can disrupt functional connectivity (FC) within and among distributed networks, we tested the hypothesis that longitudinal changes in FC are associated with military training stress. Twelve minutes of eyes-closed resting-state fMRI data (Siemens Prisma 3T) and a personality assessment (MPQ) were collected from 100 National Guard Service Members within 1 month of beginning Basic Training. Ratings of training stress were collected from 51 participants, and post-training MRI and MPQ data from 30 participants. Resting fMRI data from both time points were corrected for motion and distortion, and ICA (GIFT) was used to remove noise and to compare spatial maps (SM) and frequency spectra (FS) for 34 components, as well as the temporal correlation matrix (CM) among components, within subjects across the two time points (n=30). The entire sample (n=100) and survey sample (n=51) were used to test associations of baseline FC with MPQ traits and stress ratings, respectively. While changes in FC (i.e., SM, FS) were observed in several local networks and between networks (i.e., CM), they were not significantly correlated with stress ratings. Relationships of baseline FC with MPQ traits and stress ratings did not survive multiple comparison correction. Data collection is ongoing, and additional measures of stress and cognition will be considered in future analyses.

VA Rehabilitation R&D Career Development Award to Dr. Davenport (RX-000709-01A3).

Poster 3-59**PROTECTIVE EFFECTS OF POSITIVE EMOTIONS**Jessica Busler, Alejandro Lazarte, & Jennifer Robinson
Auburn University*Descriptors: positive emotions*

Positive emotions have been shown to broaden and build our psychological resources. In addition, positive emotions have the ability to undo physiological effects that negative emotions elicit. Moreover, positive emotions have been proposed to fuel psychological and physiological resilience. Given these qualities, we hypothesized that positive emotions would also have the power to prevent physiological effects elicited by negative emotions. To test this notion, we used video clips to induce participants into feeling either positive, negative, or neutral affect, followed by all participants experiencing the same negative emotion induction video clips. During this process, we continually measured impedance cardiography, heart rate, skin conductance, and respiration in order to see if our positive group exhibited a different pattern of physiological responding compared to our other two groups on these measures. Our results showed that the positive group did not exhibit a significantly different pattern of physiological responding. Though this result did not support our hypothesis, we have provided further value to the power of positive emotions being related to their undoing quality with respect to physiological arousal.

Poster 3-60**PSYCHOPATHIC TRAITS RELATE TO LIGHT FLASH ERPS BUT ARE MEDIATED BY REAL-WORLD ATTENTION**Meghan Weissflog, & Sidney Segalowitz
Brock University*Descriptors: psychopathic traits, real-world attention, visual ERPs*

It was reported that psychopathic individuals has shown a reduction of the P1/N1 ERP complex to light flashes (Raine & Venables, 1990). To date these results have not further explored or replicated in the literature despite potential implications for understanding information processing abnormalities associated with psychopathic traits. We used a similar basic perceptual paradigm, the alternating checkerboard task, to elicit early visual responses (VEPs: N75, P1) in undergraduate students varying in psychopathic traits. We hypothesized that VEP magnitude would be negatively related to psychopathic trait severity.

Male undergraduate students (N=33) viewed alternating checkerboards during which they attended to a fixation symbol presented in the lower third of the checkerboard. The black and white checkerboard squares alternated mimicking

the onset of a light flash. Participants also completed self-report measures assessing psychopathic traits (Self-Report Psychopathy Scale) and the Attentional Control Scale (ACS), due to the importance of attention in abnormal information processing in psychopathic individuals.

Specific factor-level correlations were observed for the latency of the N75 and the peak amplitude of the P1: Individuals higher in Factor 2 had later N75 peak latencies and those with higher Factor 1 traits had smaller P1 peak amplitudes. Further analyses showed that the ACS mediated those relations. Our findings address many of the information processing abnormalities seen in psychopathic individuals (e.g., emotion processing, aversive conditioning, etc.).

Poster 3-61**PSYCHOPHYSIOLOGICAL CORRELATES OF EMOTIONAL REGULATION**M. Carmen Pastor¹, Nieves Fuentes¹, Irene Jaén¹, Raúl López², Ignacio Lucas³, Eva Cifre¹, & Jaime Vila³¹University Jaume I, ²University of Illes Balears, ³University of Granada*Descriptors: emotional regulation, startle reflex, affective ratings*

Emotional regulation is defined as the ability to influence what emotions we have, when we have them, and how we experience and express them. One of the most investigated strategies of emotional regulation is cognitive reappraisal, basically using brain measures (fMRI or ERP). However, only a few studies have focused on peripheral psychophysiological correlates of these processes. Our study aims to investigate startle reflex modulation using pictures of different content (Erotica, Adventure, Household objects, Attacks, Victims) in a classic emotional regulation task (group 1: Pleasant vs. Neutral; group 2: Unpleasant vs. Neutral). Each trial began with a "cue" (2 s) indicating the strategy (Look, Increase, Decrease) to follow during picture presentation (8 s). Acoustic probes (white noise, 105 dB, 50 ms) were delivered either at 4 or 7 s after picture onset (4/5 of each condition) in order to prompt defensive startle reflexes. After picture offset, affective ratings (hedonic valence & arousal) were collected using the Self-Assessment Manikin (9-point scale). Preliminary results show that blink responses vary depending on the picture category and task instructions. Similarly, affective evaluations differ depending on the specific content and task instructions. These results suggest that startle reflex is a reliable peripheral index of voluntary regulation of affect, showing how certain strategies such as cognitive reappraisal can modulate physiological responses. Further clinical implications on psychopathologies characterized by emotional dysregulation are also discussed.

Universitat Jaume I (Reference P1-1A2013-06).

Poster 3-62**PSYCHOPHYSIOLOGICAL MODEL OF COLOR-EMOTION SEMANTIC INTERACTION IS FOUR-DIMENSIONAL AND SPHERICAL**Andrey A. Kiselnikov¹, Arkadiy A. Sergeev¹, Dmitry A. Vinitzky¹, Alexander V. Vartanov¹, Stanislav A. Kozlovskiy¹, & Julia A. Marakshina²¹Lomonosov Moscow State University, ²Lomonosov Moscow State University, Psychological Institute of Russian Academy of Education*Descriptors: color, emotion, semantics*

We studied color and emotions interaction at semantic level in conceptual frame of E.N. Sokolov's 'Vector Psychophysiology'. Every possible combination of 20 Russian words (10 basic color and 10 basic emotions) was presented to 50 subjects 5 times with order to use 1-9 scale to estimate difference. 20*20 full matrix and 10*10 color and emotional submatrices were averaged and multidimensionally scaled. 19-channel EEG was recorded and ERPs to process of categorization of stimulus as belonging to Color or Emotion categories were calculated. 20 group-averaged ERPs were intercorrelated in every of 19 leads in each of 100-ms epochs and corresponding sets 20*20 full 'correlational' EEG-matrices and 10*10 color and emotional EEG-submatrices were analyzed. 1. The semantic emotional subspace is four-dimensional and spherical (corresponds to Sokolov E.N., 2013) and represented by 3 bipolar (Pleasure, Arousal, Dominance) and one unipolar ('Condemnation') axes. 2. The semantic color subspace is also 4D & spherical and represented by 4 bipolar axes: 2 chromatic ('Green-Red', 'Blue-Yellow'), Intensity and 'Contrast Grey' (achromatic vs. chromatic but not in the order of saturation). 3. The full semantic space is 4D & spherical and mainly repeats emotional axes hence color system has been substantially overwhelmed by the emotional one. 4. Subjective- and EEG-matrices are significantly correlated in specific leads and latencies indicating cortical mechanisms of color-emotion interaction. These data produce new multidimensional psychophysiological model of color-emotion semantic interaction.

The research was supported by the Russian Science Foundation (project № 16-18-00066).

Poster 3-63**PUPILLARY INDICES OF ALTERATIONS IN COGNITIVE RESOURCE ALLOCATION IN TBI USING A DUAL TASK PARADIGM**

Jessica Kegel¹, Jamie Hershaw², Sardeep Virk², Ashley Safford¹, Evelyn Cordero¹, & Mark L. Ettenhofer²

¹Henry M. Jackson Foundation/Uniformed Services University of the Health Sciences, ²Uniformed Services University of the Health Sciences

Descriptors: traumatic brain injury, cognitive resources, pupillary indices
Evidence is inconclusive whether individuals with chronic traumatic brain injury (TBI) have different patterns of cognitive resource allocation from controls. We used a dual task paradigm to examine whether task difficulty moderates the effect of TBI on resource allocation. While performing a cued attention task with three cue-target pair types, participants also made judgements about the targets: in the low load condition, they pressed a button when the target appeared (target detection); in the moderate load condition, they identified the color of the target (target discrimination); in the high load condition, they decided if the color of the target matched the previous target (working memory). A 2 (group) x 3 (trial type) x 3 (condition) ANOVA was used to evaluate influences on manual response time (RT). RTs increased as task difficulty increased for both groups, but no group differences were evident. Similar ANOVAs were used to assess group differences in pupil diameter. Pupil metrics included average diameters over a 200ms baseline and a 1700ms cue-locked epoch. Baseline and cue-locked diameter were greater in the high load condition relative to low and moderate. The TBI group had greater baseline and cue-locked diameter than controls. No significant interactions were found. The condition effect confirms that a working memory task is more resource intensive than target detection and target discrimination. Importantly, these results also suggest that resource allocation is greater in TBI despite similar task performance.

Support for this research was provided by Congressionally Directed Medical Research Program (CDMRP) Award #W81XWH-13-1-0095, the Defense and Veterans Brain Injury Center (DVBIC), and the Center for Neuroscience and Regenerative Medicine (CNRM). The technology described in this manuscript is included in U.S. Patent Application #61/779,801, with rights assigned to USUHS. The views and opinions presented in this manuscript are those of the authors, and do not necessarily represent the position of USUHS, the Department of Defense, or the United States government.

Poster 3-64**QEEG IN TEENAGERS WITH PSYCHOPATHIC TRAIT**

Ana Calzada-Reyes
Legal Medicine Institute

Descriptors: EEG, qEEG, LORETA

To date, there is no other research studying Low-Resolution Brain Electromagnetic Tomography (LORETA) technique using QEEG analysis in adolescents with CD and psychopathic traits.

Objective: To find electrophysiological differences specifically related to the psychopathic traits. The current investigation compares the Quantitative EEG (QEEG) and the current source density measures between adolescents with CD and psychopathic traits and adolescents with CD without psychopathic traits.

Methods: The resting EEG activity and LORETA for the EEG fast spectral bands were evaluated in 42 teenagers with CD, 25 with and 17 without psychopathic traits according to the Antisocial Process Screening Device. All adolescents were assessed using the DSM IV-R criteria. The EEG visual inspection characteristics and the use of frequency domain quantitative analysis techniques (Narrow band spectral parameters) are described.

Results: QEEG analysis showed a pattern of beta activity excess on the bilateral frontal-temporal regions and decreases of alpha band power on the left centro-temporal and right frontal-central-temporal regions in the Psychopath group. Current source density calculated at 17.18 Hz showed an increase within fronto-temporo-striatal regions in the Psychopath relative to the Non-psychopath group.

Conclusions: These findings indicate that QEEG analysis and techniques of source localization may reveal differences in brain electrical activity among teenagers with CD and psychopathic traits, which was not obvious to visual inspection

Poster 3-65**REAPPRAISAL WITH A TWIST: EXPERIENTIAL, BEHAVIORAL, AND PHYSIOLOGICAL EFFECTS OF EMOTIONAL COUNTER-REGULATION**

Sylvia D. Kreibig, Andrea C. Samson, & James J. Gross
Stanford University

Descriptors: emotion regulation, cognitive reappraisal, peripheral physiology
The effects of regulating affective responses constitutes a central topic in the field of affective science. Whereas prior research has principally examined the down-regulation of negative and the up-regulation of positive states, little is known about the effects of emotional counter-regulation, i.e., focusing on positive aspects of a negative situation or the negative aspects of a positive situation. To address this issue, we presented 48 healthy young women with 54 film clips that elicited negative and positive states. Participants were instructed to either view the films naturally or to focus on the positive aspects of negative films or the negative aspects of positive films. We measured self-reported feelings after and facial electromyographic, cardiovascular, electrodermal, and respiratory activity during presentation of films. In comparison to viewing negative films, positive reappraisal increased mixed emotional feelings, decreased corrugator supercilii reactivity, and decreased cardiac sympathetic and parasympathetic reactivity. In comparison to viewing positive films, negative reappraisal increased mixed emotional feelings, increased corrugator supercilii and decreased zygomaticus major reactivity, increased cardiac parasympathetic reactivity, and decreased peripheral vasoconstriction and central inspiratory drive. These data demonstrate that emotional counter-regulation results in a more mixed emotional state, with certain components of the original response preserved, others undone, and still others newly emerged.

This research was supported by the Swiss National Science Foundation (PBGEPI-125914, PA00P1_139593, PBFPR1-127896, PA00P1_136380).

Poster 3-66**RED LIGHT, GREEN LIGHT: UNDERSTANDING THE PERCEPTUAL QUALITIES OF ALPHA INHIBITION AND THE ROLE OF ATTENTION IN ENTRAINMENT**

Jonathan Kuziek, & Kyle E. Mathewson
University of Alberta

Descriptors: alpha oscillations, electrophysiology, attention

Alpha oscillations, rhythmic neural activity fluctuating 8-12 times per second (Hz), modulates awareness and inhibits detection of visual stimuli. This inhibitory process is dependent on both high amounts of alpha activity and the precise moment a visual stimulus occurs during the alpha cycle. These alpha oscillations can be induced using an entrainment technique whereby visual stimuli are rapidly presented at 8-12 Hz, causing alpha to oscillate in a similar rhythm. Targets then presented in-time with entrainment are better detected than those out-of-time. However it is unclear if attention plays a role in modulating this entrainment process.

The goal of the current research is to understand the role of feature attention in the entrainment of neural activity, specifically, can entrainment be isolated to a single set of distinct attended stimuli when multiple, competing entrainers are presented at the same spatial location but in counter-rhythm to the attended set. Data suggests entrainment can be actively manipulated by attending to certain stimuli while ignoring others; participants tend to be entrained by attended stimuli and not by the competing stimuli or the combined rhythm of all presented stimuli. Brief visual targets presented in-rhythm of the attended set of entrainers are better detected than those presented out-of-rhythm of the attended set. These results suggest that attention can modulate the entrainment process, influencing detection of visual stimuli based on the rhythm of attended, rather than unattended, entrainers.

NSERC.

Poster 3-67

REDUCED BETA-BAND AUDITORY STEADY-STATE RESPONSE IN BIPOLAR DISORDER WITH OR WITHOUT PSYCHOSIS: FINDINGS FROM THE BIPOLAR & SCHIZOPHRENIA NETWORK ON INTERMEDIATE PHENOTYPES

David Parker¹, Jennifer McDowell¹, Matcheri Keshavan², Carol Tamminga³, Godfrey Pearlson⁴, & Brett Clementz¹
¹University of Georgia, ²Harvard Medical School, ³University of Texas Southwestern Medical Center, ⁴Yale University School of Medicine & The Institute of Living, Hartford Hospital

Descriptors: bipolar disorder, auditory steady-state, EEG

Psychotic symptomatology occurs in about half of persons with bipolar I disorder (BD). The presence of psychotic symptoms could indicate important and unique neurobiological distinctions between BD disease states. This study measured brain activity using EEG during auditory steady-state (aSSR) to probe beta-, gamma- and high gamma-band (20-hz, 40-hz, 80-hz) oscillatory network capability between BD disorder persons with (BD-P) and without psychosis (BD-NP).

Methods: 136 individuals (Healthy=68, BD-P=41, BD-NP=27) participated. Stimuli were 1500ms binaural broadband noise sequences modulated at 20, 40, or 80-hz. Grand average ERPs for each frequency was used in a spatial PCA on the 64-sensor EEG data to comprehensively and accurately capture the spatial topographies of ERPs. Two components for each frequency were identified; these components were used to reduce the multi-sensor data to one waveform per component for each subject. FFTs with 1-hz resolution were calculated on each component waveform resulting in time-frequency plots ranging from 5 to 90-hz and -500 pre to 2000ms post-stimulus onset for each frequency and subject. ANOVA's were calculated for each component for each frequency of interest to test for group differences.

Results: Both BD-P and BD-NP showed significantly weaker entrainment at 20-hz than the healthy comparison group ($P < .0012$).

Conclusions: Deficits at 20-hz suggest dysregulation of long-range neural communication between the primary sensory cortices and higher order cortical regions and is related to the pathology of both BD-P and BD-NP.

MH096900;MH096942;MH096957;MH096913.

Poster 3-68

REDUCED FRN IN PROBLEM GAMBLERS BUT NO DIFFERENCES IN NEAR OUTCOME PROCESSING COMPARED TO CONTROLS

Natalie Ulrich¹, & Johannes Hewig²

¹University of Würzburg, ²Julius-Maximilians-University Würzburg

Descriptors: problem gambling, near miss, frn

Near outcomes in gambling refer to wins and misses where the current trial would have almost resulted in the opposite outcome. Previous research has shown evidence of differences in the feedback-related negativity (FRN) and P300 following near compared to full (i.e. non-near) outcomes, although the results are heterogeneous concerning the direction of the differences. In case of the P300 this might be due to confounding influences of outcome probability in the paradigms used.

The current study used a wheel of fortune paradigm, balancing the probabilities of wins and misses and near and full outcomes, respectively. A group of 20 problem gamblers and 20 matched controls were compared in the processing and evaluation of near outcomes using the amplitudes of FRN and P300 as well as subjective rating data on valence, motivational effects, arousal and the probability of winning in the next trial.

Near and full outcomes did not differ in the elicited FRN, whereas the P300 was smaller for near compared to full outcomes. The subjective rating data did not show differences between near and full outcomes. Problem gambling status did not interact with outcome closeness on any of the dependent measures. However, problem gamblers showed a reduced FRN and increased subjective arousal compared to controls.

The reduced FRN in problem gamblers is in line with previous results and might indicate reward and punishment hyposensitivity in this group. Future studies should test whether the reduced P300 following near outcomes is linked to increased perceptual demands of these outcomes.

Poster 3-69

RELATIONAL MEMORY IN INFANTS: 9-MONTH-OLD INFANTS CAN REACTIVATE VISUAL AREAS TO ASSOCIATED SOUNDS FOLLOWING SINGLE PRESENTATION OF SOUND-VIDEO PAIRINGS

John A. Walker, Kathy A. Low, Neal J. Cohen, Monica Fabiani, & Gabriele Gratton
 University of Illinois, Urbana-Champaign

Descriptors: development of memory, reactivation, relational memory

The point at which infants can start to create and utilize relational memories from single episodes has yet to be established. Some studies have been able to show that associations can be created as early as three months (e.g. Rovee-Collier et al., 1980), but it typically takes multiple trials for infants to learn these associations. Memory for associations formed after a single episode is typically thought to begin after the first year of life. However an eye tracking study suggests that 9-month-old infants may demonstrate this type of memory (Nelson & Richmond, 2009). Here we tested the ability for 9-month-old infants to demonstrate relational memory using the Event-Related Optical Signal (EROS), a technique allowing us to image brain activity with cm precision on a ms timescale. Here we examine whether infants can show the same type of relational brain activation to the presentation of one item in an episodically learned pair as is present in young adults (Walker et al., 2014). We had infants listen to nonsense sounds by themselves or with a short audio-less movie clip and then re-presented those sounds by themselves. We found that those sounds that were previously paired with movies reactivated visual cortices whereas the sounds that were not paired with movies showed no such activity, demonstrating that infants as young as 9-months old can create and use relational memory. Furthermore we found that infants look at the screen more for those sounds that were paired with movies, demonstrating that relational memory can also manifest in behavior at this age.

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Poster 3-70

RELATIONSHIP BETWEEN RESTING LF/HF HEART RATE VARIABILITY AND IN-VIVO AGGRESSION

Alexander Puhalla¹, Dan Kulper¹, Mitchell Berman², & Michael McCloskey¹
¹Temple University, ²Mississippi State University

Descriptors: heart rate variability, aggression, taylor aggression paradigm

Previous studies have shown that resting sympathovagal balance (i.e. low frequency/high frequency [LF/HF] heart rate variability [HRV]) is positively associated with aggression. The current study examined the relationship between resting LF/HF and in-vivo aggression.

HRV data were collected in 76 participants during a 10-minute baseline period. Participants completed 36 reaction-time trials (9 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 low provocation, to quickly increasing to high provocation, and then quickly returning to low provocation). Aggression was defined as the average intensity of electric shocks set within each block, with greater shock intensity indicating greater aggression. We examined aggression during peak provocation and over the provocation periods.

Results showed that aggression during peak provocation was positively associated with LF/HF, $r = .26$, $p < .05$. A repeated measures ANOVA showed a main effect of shock [$F(8,584) = 6.50$, $p < .001$], with all participants increasing in aggression when provocation increased and then decreasing in aggression when provocation decreased. There was no main effect of LF/HF, $F(1,73) = .24$, $p = .62$. The LF/HF x shock interaction was significant [$F(8,584) = 10.39$, $p < .001$], such that as LF/HF increased so did the relationship of provocation period and aggression. Thus, resting sympathovagal balance is positively associated with in-vivo aggression and aggression reactivity.

This work was supported by grants from the National Institute of Mental health: R01MH086525 (Dr. Michael McCloskey).

Poster 3-71**RELIABILITY OF FMRI AND EEG MEASURES OF REWARD RESPONSE DURING CHILDHOOD AND EARLY ADOLESCENCE**Katherine R. Luking¹, Brady D. Nelson¹, Zachary P. Infantolino², Colin L. Sauder³, & Greg Hajcak¹¹Stony Brook University, ²University of Delaware, ³University of Texas Health Science Center at San Antonio*Descriptors: reliability, reward, development*

Abnormal neural reward-response is increasingly thought to act as a transdiagnostic, trait-like vulnerability factor predicting change in internalizing and externalizing symptoms/behaviors during adolescence. However, this view assumes such responses show good psychometric properties, a rarely tested assumption. Here we examine the split-half reliability of neural response to reward assessed via Electroencephalogram and fMRI in a large community sample ($n=177$) of 8-14 year-old females. Participants completed the 'Doors' reward task, where money was gained and lost, to elicit reward-related Event-Related Potentials (ERP - Reward Positivity) and BOLD response within the ventral striatum (VS) and medial/lateral prefrontal cortex. Response on odd versus even trials to gain, loss, and gain-loss difference scores were compared using Spearman Brown correlation coefficients (SB). Moderation analyses were conducted to investigate whether reliability differed by age. ERP and VS responses to gain and loss feedback showed strong reliability ($SBs \geq 0.70$). However, differences in response to gain versus loss, ERP and VS, showed weak reliability ($SBs \leq 0.36$). Age did not significantly moderate split-half relationships, indicating similar reliability across childhood/early-adolescence. Results suggest focusing on response to gain or loss, rather than difference scores, when investigating individual difference relationships or identifying biomarkers of psychopathology risk during these ages.

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Poster 3-72**SEX DIFFERENCES IN THE ANTICIPATION OF DIFFERENT TYPES OF PREDICTABLE AND UNPREDICTABLE THREAT**Kreshnik Burani, Brady D. Nelson, & Greg Hajcak
Stony Brook University*Descriptors: unpredictability, sex difference, startle*

Heightened sensitivity to threat is an important trait related to anxiety symptoms and disorders. The predictability of threat has been suggested to differentiate fear (elicited by predictable threat) and anxiety (elicited by unpredictable threat). Consistent with gender differences in anxiety symptoms and disorder prevalence, one study found that women, relative to men, were characterized by an increased sustained startle response in anticipation of both predictable and unpredictable shocks relative to no threat (Grillon, 2008). However, the predictable threat condition contained elements of unpredictability and it is unclear whether these results extend to other aversive stimuli. In the current study, we aimed to replicate and extend the Grillon (2008) finding by investigating whether sex differences were also evident in anticipation of unpleasant pictures. All participants completed a no, predictable, and unpredictable threat (NPU-threat) startle task—including counterbalanced versions that used either shocks or unpleasant pictures. Results indicated that women, relative to men, were characterized by increased startle potentiation in anticipation of unpredictable (but not predictable) threat relative to no threat—and this was evident across both types of aversive stimuli. The present study suggests that women, relative to men, demonstrate an increased sensitivity to unpredictable threat, irrespective of the type of aversive stimulus. These results provide insights regarding potential mechanisms that may contribute to sex differences in anxiety symptoms and disorders.

Poster 3-73**RESTING CARDIAC AUTONOMIC BALANCE (CAB) PREDICTS CURRENT MAJOR DEPRESSIVE DISORDER**Peter J. Ehmann, Christopher J. Brush, Ryan L. Olson, & Brandon L. Alderman
Rutgers University*Descriptors: depression, autonomic function, cardiac autonomic balance*

Studies have shown that major depressive disorder (MDD) is associated with impaired cardiac vagal control and heart rate variability (HRV). Recently, cardiac autonomic balance (CAB) has been proposed to index the ratio of parasympathetic to sympathetic activation (Bertson et al., 2008), and may reflect adaptive flexibility. Few studies have examined CAB in relation to depression, and whether the relation is influenced by known health variables. Thus, the purpose was to determine if CAB and cardiac autonomic regulation (CAR) predict current MDD status and covariation with aerobic fitness and body mass index (BMI). We examined CAB and CAR during a 5-min vanilla baseline task in 182 participants (83 with MDD, 99 nondepressed controls; Mage = 21 yrs). Autonomic function was assessed through HRV and impedance cardiography measures of CAB (zRSA-(-zPEP)) and CAR (zRSA+(+zPEP)). Variables were derived from respiratory sinus arrhythmia, an index of parasympathetic activity, and pre-ejection period, an index of sympathetic activity. Findings indicated impaired HR, $F(1,180) = 13.5$, $p < .001$, RSA, $F(1,180) = 6.3$, $p < .05$, and CAB, $F(1,180) = 7.2$, $p < .01$, in MDD relative to nondepressed controls, while PEP and CAR were nonsignificant. Regression analyses demonstrated that CAB significantly predicted current MDD status, even after controlling for known individual physical health characteristics of BMI and cardiorespiratory fitness. These findings suggest that CAB may be a successful indicator of current MDD, but may not be influenced by traditional exercise and dietary interventions.

Supported by The Charles and Johanna Busch Memorial Fund at Rutgers, The State University of New Jersey.

Poster 3-74**RESTING-STATE FUNCTIONAL CONNECTIVITY OF ANTERIOR CINGULATE CORTEX AND SUBSTANCE USE: A CO-TWIN CONTROL ANALYSIS**Scott Burwell, Stephen Malone, Kathleen Thomas, Ruskin Hunt, & William Iacono
University of Minnesota*Descriptors: substance use, functional connectivity, resting-state*

Current research suggests that resting-state functional connectivity (rsFC) between dorsal anterior cingulate cortex (dACC) and brain regions important for goal-directed behavior is reduced in individuals diagnosed with substance use disorders relative to controls. Yet, it remains unclear whether substance exposure itself causes diminished rsFC, or whether preexisting genetic and shared environmental vulnerabilities are responsible for this difference. A co-twin control (CTC) analysis may be used to distinguish shared familial effects from exposure effects by re-expressing an individual's substance use as between-pair (average exposure among twins from the same family) and within-pair (differing exposure among twins from the same family) use, respectively. Functional magnetic resonance imaging data and self-reports of prior substance use were acquired from a sample of 50 pairs of female twins (approximate age = 25 years). Consistent with published research, we found that rsFC strength between dACC and regions spanning thalamus and striatum was inversely related to quantitative measures of illicit substance use (marijuana, cocaine, amphetamine). Further examination using the CTC elucidated this association attributable to between-pair effects rather than within-pair effects. These results are consistent with a familial vulnerability to substance use behavior, and support the notion that reduced rsFC between dACC and these subcortical regions may serve as a potential endophenotype for substance use disorders.

DA036216; DA05147.

Poster 3-75**MONETARY AND SOCIAL REWARD IN EARLY ADOLESCENCE AND EMERGING ADULTHOOD**Paige Ethridge¹, Autumn J. Kujawa², Kodi B. Arfer³, Ellen M. Kessel³, Daniel N. Klein³, & Anna Weinberg¹¹McGill University, ²University of Illinois at Chicago, ³Stony Brook University*Descriptors: monetary reward, social reward, reward positivity (RewP)*

Abnormal reward processing has been implicated in multiple forms of psychopathology. The reward positivity (RewP), an ERP occurring approximately 300ms following feedback, is sensitive to the receipt of rewards vs. non-rewards. However, it is not clear whether the RewP is equally sensitive to all reward types, or to what extent the incentive value of these two types of reward might differ over the course of development. The primary aim of this study was to compare the underlying components of the RewP in response to monetary and social reward in early adolescence (n = 34, age 12) and emerging adulthood (n = 48, mean age = 20.3). In the Doors task, participants guessed which one of two doors contained a monetary prize, and received feedback indicating whether they won or lost money following each trial. In the Island Getaway task, participants voted to 'keep' or 'kick out' computerized co-players, and received feedback indicating whether co-players accepted or rejected them following each trial. Using principal component analysis and source localization, we decomposed the RewP in each task and identified likely neural generators. In both groups, social and monetary reward elicited a RewP maximal at approximately 300ms that localized to medial prefrontal cortex and striatum. However, social reward elicited additional early and late positivities, and exhibited a more complex factor structure. These results indicate that reward is not a uniform construct, suggesting that identifying weighting of different reward types may be important in understanding psychological dysfunction.

Poster 3-76**SELECTIVE ATTENTIONAL BIAS TO EXPLICITLY AND IMPLICITLY PREDICTABLE OUTCOMES**Noelia Do Carmo Blanco¹, Jeremie Jozefowicz¹, & John J.B. Allen²¹University of Lille, ²University of Arizona*Descriptors: attention, associative learning, N2pc*

Expectations of an event can facilitate its neural processing. One of the ways we build these expectations is through associative learning. Besides, this learning of contingencies between events can occur implicitly, without intention and awareness. Here we asked how a learned association between a cue and an outcome impacts the attention allocated to this outcome, and particularly when this association is irrelevant to the task at hand and thus implicit. We used an associative learning paradigm where we manipulated predictability and relevance of the association upon streams of cue-outcome visual stimuli, while stimulus characteristics and probability were held constant. In order to measure the event related component N2pc, widely recognized to reflect allocation of spatial attention, every outcome was embedded among distractors. Importantly, the location of the outcome could not be anticipated. We found that predictable outcomes showed an increased spatial attention as indexed by a greater N2pc component, and surprisingly, even when the learned association was irrelevant to the main task. A later component, the P300, was sensitive to the relevance of the outcome (i.e. intention to learn). The current study confirms the remarkable ability of the brain to extract and update predictive information, including implicitly, in accordance with a predictive coding model of brain functioning. Associative learning can guide a visual search and shape covert attentional selection in our rich environments.

Conseil Régional Nord - Pas de Calais DAI-ED SHS.

Poster 3-77**OBESE AND HEALTHY WOMEN: ELECTRODERMAL AND FACIAL REACTIONS TO PREFERRED FOODS AND AFFECTIVE CUES**Laura Miccoli, Rafael Delgado, Pedro Guerra, Sonia Rodríguez-Ruiz, Jaime Vila, & M. Carmen Fernández-Santaella
University of Granada*Descriptors: emotion, food, obesity*

There are scarce data on the peripheral physiological correlates of food cue processing in obesity. In the present work, obese and healthy women were presented with images of their own preferred foods while peripheral measures were recorded. Affective images (erotica, neutral objects, and attacks) were included as controls, so that the reactivity to food cues was compared to the reactivity to non-food affectively relevant stimuli. Food and emotional images were displayed repeatedly within a pseudo-randomized passive picture-viewing paradigm. Physiological measures informed on general reactivity (skin conductance) and reactivity to pleasant (zygomatic muscles) and unpleasant stimuli (corrugator muscles). Overall, electrodermal and facial reactions to affective and food images were in line with literature, showing: larger skin conductance to erotica and attacks compared to food and neutral stimuli, larger zygomatic muscles responses to food compared to other stimuli, and larger inhibition of the corrugator muscles for food and erotica. However obese women, compared to controls, overall tended to react less to all cues, showing blunted electrodermal reactions to all cues and not showing distinct reactions to food and emotional cues in measures related to approach (zygomatic) and avoidance (corrugator muscles). The inclusion of preferred foods and high-arousing affective images provided reliable stimuli to investigate motivation in obesity. As a whole, peripheral data tended to suggest low motivational reactivity in obese women.

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Poster 3-78**SELF-FACE PROCESSING AND SUICIDE ATTEMPTS AMONG DEPRESSED ADOLESCENTS.**Ariel Currie¹, Mitchell Sauder¹, Hannah Scott¹, Garry Smyda², & Karina Quevedo¹¹University of Minnesota, ²University of Pittsburgh*Descriptors: fMRI, suicide attempts, self-face processing*

This study sought to test whether the neurobiology of self-processing, measured as self- versus other-face recognition, would differ between depressed adolescents with a history of suicide attempt from depressed adolescents with high or low suicide ideation, and healthy controls. Adolescents (N=119) were assessed with a structured psychological interview and were separated into one of four groups: depressed youth with suicide attempt (SA, N=22), high suicidality (HS, N=27), or low suicidality (LS, N=33), and healthy controls (HC, N=37). Participants completed a visual self-recognition fMRI task in the scanner, during which they identified their own or an unfamiliar adolescent face across three emotional expressions (happy, neutral or sad). A mixed repeated measure GLM: 4 Group (SA, HS, LS, HC) by within subject factors 2 Self conditions (self, other) by 3 Emotions (happy, neutral, sad), showed that SAs are distinguished from HS, LS, and HC youth by less MPFC activity during recognition of their own happy face compared to other happy faces. SAs also more ventral striatum (L-caudate) activation compared to HS adolescents. Additionally, SA and HS youth showed limbic hypoactivity during recognition of the happy self-face compared to LS and HC groups, suggesting low affective engagement with positive self-cues. These results suggest that future suicide behavior might be predicted by MPFC and caudate activity during happy self-face recognition, and the change from thoughts to suicide behaviors might be predicted by low MPFC mediated awareness of positive self-information.

NARSAD Young Investigator Grant from the Brain & Behavior Research Foundation: 2012-2015, QUEVEDOK (PI). 1K01MH092601. The Neurobiology of Self Appraisals and Social Cognition in Depressed Adolescents.

Poster 3-79**NEURAL CORRELATES OF SELF-PROCESSING IN DEPRESSED AND MALTREATED ADOLESCENTS**Kiry Koy¹, Christine Egan¹, Mitchell Sauder¹, Hannah Scott¹, Garry Smyda², Jennifer Pfeifer³, & Karina Quevedo¹¹University of Minnesota, ²University of Pittsburgh, ³University of Oregon*Descriptors: neuroimaging, maltreatment, adolescence*

BACKGROUND: The neurophysiology of self-processing changes drastically during adolescence, but the effect of maltreatment duration has not previously been studied. Understanding how the duration of maltreatment affects brain function, especially in relation to self-processing, will be important in identifying neurobiomarkers that suggest new treatment methods and in improving self-development, self-identity, and overall mental health among victims of child maltreatment. **METHODS:** Depressed adolescents ($n=52$) who experienced maltreatment in the form of physical abuse, sexual abuse, neglect, and/or witnessed domestic violence underwent functional magnetic resonance imaging (fMRI) while appraising positive and negative self-descriptors. The impact of maltreatment duration on brain activity during self-processing was studied through regression analysis in Statistical Parametric Mapping 8 (SPM8). **RESULTS:** While appraising positive and negative self-descriptors, a shorter duration of maltreatment was associated with higher activation of the prefrontal cortex (PFC) ($p < 0.005$), while a longer duration of maltreatment was associated with greater activation of the cingulate cortex and caudate nucleus ($p < 0.005$). **DISCUSSION:** As expected, longer maltreatment durations result in decreased PFC activity, leading to dampened decision making and executive function. Increased activation of emotional, behavioral, and self-processing regions due to longer maltreatment durations points to possible treatment approaches in dealing with depressed and maltreated adolescents.

1K01MH092601: 2011-2016, QUEVEDOK (PI). The Neurobiology of Self-Appraisals and Social Cognition in Depressed Adolescents. NARSAD Young Investigator Grant from the Brain & Behavior Research Foundation: 2012-2015, QUEVEDOK (PI). Identifying Neural and HPA Axis Markers of Chronic Adolescent Depression.

Poster 3-80**SENSITIVE CHARACTERISTICS OF THE HEART RATE VARIABILITY**

Evgeny Vaschillo, Bronya Vaschillo, Jennifer Buckman, Gurpreet Singh, & Marsha Bates

Rutgers, The State University of New Jersey

Descriptors: heart rate variability, baroreflex, alcohol

Standard parameters of heart rate variability (HRV) have a long history as health indicators. The goal of this study was to explore novel parameters of heart rate variability (HRV) that more sensitively capture a physiological process through which the baroreflex contributes broadly to physical and mental regulation. We compared young healthy alcohol drinkers (age $M=21.9$, $SD=2.2$ years of age) who did not ($n=23$) or did ($n=24$) engage in binge drinking, which is associated with reduced cognitive and emotional regulation. Parameters included baroreflex (BRS) gains in heart rate, stroke volume, and vascular tone baroreflex arcs, standard HRV indices, and an HRV index representing a RRI spectral power peak at 0.066 Hz (at rest). BRS signs of unhealthy drinking were found: all three BRS gains were significantly lower in the binge than in the social drinking group. Yet, there were no group differences in the standard HRV indices. Importantly, significant negative associations were found between the number of years of drinking and vascular tone BRS gain ($p < 0.014$, $R^2 = 0.2$) and the 0.066 Hz ($p < 0.001$, $R^2 = 0.37$) RRI spectra power peak. These results suggest that the power of a RRI spectrum peak at 0.066 Hz in binge drinkers provides information about drinking history and the degree of harm to vascular tone regulation, given the relation of binge drinking to vascular tone BRS gain. Results showed that a specific RRI spectrum parameter of HRV, i.e., the power of the peak at 0.066 Hz, can be more sensitive to subtle, compromised health states than the common HRV indices.

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Poster 3-81**SEX DIFFERENCES IN LATERALITY THROUGH MOTOR FUNCTION AND CONCURRENT CEREBRAL REGULATION OF AUTONOMIC NERVOUS SYSTEM TASKS**Grace Herrick, Benjamin DeVore, Kelly Harrison, & David Harrison
Virginia Tech*Descriptors: laterality, hostility, arousal*

Over the past decade, there has been an increase in research into the neural substrates of hostility. However, many of the studies have failed to recognize the importance of sex differences on the laterality of brain function. Previous research by Williamson & Harrison (2003) found differences in right frontal lobe functioning between high- and low-hostile males in a study assessing blood pressure, heart rate, and perseverative errors corresponding to two neuropsychological tasks mediated by the right and left anterior hemispheres of the brain. In the current study, sex differences in the influence of hostility levels on verbal and non-verbal fluency, and the concurrent cerebral regulation of autonomic nervous system functioning was examined in high or low hostile females. Relying on Kinsbourne's functional cerebral space theory, the verbal Controlled Oral Word Association Test and the nonverbal Ruff Figural Fluency Task, mediated by the left and right anterior cerebral systems respectively, were used as dual task antagonists of frontal lobe regulatory control of sympathetic drive. Blood pressure and electrocardiography, along with fluency and perseverative errors, were analyzed. In contrast to the previously mentioned research, preliminary results indicated brain laterality differences in low- and high-hostile females resulted in non-statistically significant differences in dependent measures. These findings support research that suggests more interhemispheric connections in the brains of females versus greater intrahemispheric connections in the brains of males.

Poster 3-82**RESPIRATORY SINUS ARRHYTHMIA AS AN INDICATOR OF EMOTIONAL AROUSAL DURING COMPREHENSION OF A SEDUCTIVE SCIENTIFIC TEXT**Michael C. Mensink¹, Jacob Achtemeier², & Paige Lysne³¹University of Wisconsin-Stout, ²University of Minnesota, ³University of Florida*Descriptors: text comprehension, respiratory sinus arrhythmia, memory*

Highly engaging anecdotes related to the human condition (e.g., death or sex) are commonly added to scientific texts by authors to increase readers' emotional interest in boring content, with the expectation of enhancing learning (Kintsch, 1980). Yet, these attempts typically elicit a seductive details effect, in which these seductive details attract attention while reducing memory for important content (Rey, 2012). Across two experiments, the authors examined how emotional arousal, as indicated by respiratory sinus arrhythmia (RSA), contributes to the seductive details effect during reading and recall. In Experiment 1, participants read two seductive scientific texts and rated sentences for interest and importance in order to ensure the text elicited a seductive details effect during reading. In Experiment 2, participants read a seductive and non-seductive scientific text while both sentence reading times and recalls were measured. Respiratory sinus arrhythmia (RSA) events were measured continuously throughout the experiment. Participants demonstrated longer reading times and higher proportional recalls for seductive detail sentences, and participants recalled more important content overall for the non-seductive science texts. However, RSA events only significantly increased during the recall phase for the seductive scientific text. These preliminary findings suggest that seductive details may impair readers in different ways during different phases of the reading process, as indicated by differing levels of emotional arousal.

Poster 3-83**SHAPE OF THINGS TO COME: FACIAL ELECTROMYOGRAPHY VS AUTOMATIC FACIAL CODING VIA FACET**Arvid Kappas, Dennis Kuester, Pasquale Dente, & Christina Basedow
Jacobs University Bremen*Descriptors: EMG, facial activity, affective computing*

Facial activity has been of interest to emotion scholars since centuries. Particularly since Darwin, there been the notion that there are universal facial activation patterns associated with a variety of mental states. In the last decades, emotion research has been relying of manual coding of facial movements with standardized tools such as Ekman and Friesen's Facial Action Coding System (FACS) and facial electromyography. While the two methods cannot be directly compared, as FACS targets visible changes and EMG the activation of underlying facial muscles, both methods have been part of emotion researchers' tool box. One of the great advantages of EMG, apart from high temporal resolution, is the immediate availability of activation measurements, as opposed to the time of coding that can take months or even years. Because of this, there is a strong interest in computer based automatic coding of facial movement with the hope to have a quick and reliable assessment of facial activity.

We present data from a task in which 23 participants learned the association of Japanese characters and sounds in interaction with a NAO robot. During the task EMG was taken at the sites of Corrugator Supercilii and Zygomaticus Major, while video was recorded. Video was coded with iMOTIONS FACET software and we compare EMG data with AU4 and AU12. We demonstrate high variability in coherence between the two methods. We also tested and addressed methodological issues such as the influence of EMG electrodes on automatic coding by comparing skin colored cable and electrodes with standard sensors.

This research was partially funded by EU FP7 EMOTE (ICT-2011-8 317923).

Poster 3-84**SKIN CONDUCTANCE REVEALS AN EFFECT OF MOOD ON REWARD-BASED IMPULSIVITY**Jeanette Taylor
Florida State University*Descriptors: impulsivity, mood, skin conductance*

Negative and sometimes positive moods lead people to act rashly – or do they? The association between trait measures of impulsivity and emotional reactivity have not been uniformly confirmed in experimental studies using mood induction. The present study provided an experimental investigation of the effect of four mood states (happy, sad, angry, and neutral) on motor- and reward-based impulsivity that was informed by the inclusion of skin conductance measurement throughout most tasks. Participants were 60 undergraduates (31 women) with no current suicidal ideation or mood disorder. Mood ratings were taken using a computerized visual analog scale at 6 time points. Mood induction occurred through a combined sentence reflection/music task. Reward-based impulsivity was measured with the Balloon Analog Reward Task (BART) and motor impulsivity was measured by stop signal reaction time (SSRT) before and after the mood induction. Results showed a significant time x gender x mood interaction for SSRT such that men in the sad and angry conditions became less impulsive but women in the angry condition became more impulsive. The BART task revealed only a significant main effect for time with all mood groups collecting more on the post-test. However, a significant decline in SCR amplitude to collections of money from pre- to post-test were found in angry participants only. Negative mood states appear to induce changes in certain types of impulsivity, and changes in arousal associated with certain negative moods may impact the experience rather than the level of rewarding activity.

Poster 3-85**SPATIOTEMPORAL DYNAMICS OF ATTENTION: COMBINED REPRESENTATIONAL SIMILARITY ANALYSIS OF FUNCTIONAL MAGNETIC RESONANCE IMAGING DATA AND EVENT-RELATED BRAIN POTENTIALS**Kimmo Alho¹, Emma Salo¹, Juha Salmi², & Viljami Salmela¹
¹University of Helsinki & Aalto University, ²University of Helsinki, Aalto University & Abo Akademi University*Descriptors: attention, functional magnetic resonance imaging, event-related potentials*

To overcome low temporal resolution of functional magnetic resonance imaging (fMRI), we used multivariate pattern analysis in combined analysis of fMRI data and temporally accurate event-related brain potentials (ERPs) from identical experiments. In these experiments, healthy adult participants were presented with audiovisual stimulus pairs consisting of a tone varying in pitch and a grating varying in orientation. They performed either a forced-choice pitch or orientation discrimination (1-back) task (selective attention conditions), or both (divided attention), or neither task. Thus, in addition to target modality, we varied the mode of voluntary attention. Randomly on 1/6 of the trials, an auditory distractor (a novel sound), and on another 1/6 of the trials, a visual distractor (a novel texture) was presented together with the tone-grating pair to elicit involuntary attention. With representational similarity analysis, we revealed from fMRI data spatial activity patterns corresponding in representational structure to short temporal segments in ERPs. These activity patterns were apparently associated with bottom-up processing of distractors and involuntary attention to them, top-down attentional control, initiation of motor responses, and shifting between brain states. According to our results, fMRI activation patterns contain recoverable spatial information from different time points. In the present study, this recovered information revealed spatiotemporal dynamics of voluntary and involuntary auditory and visual attention within one second from stimulus onset.

This research was supported by the Academy of Finland (grant #260054).

Poster 3-86**TO FLEE OR NOT TO FLEE: FRONTAL ACTIVATION PATTERNS AND BEHAVIOR IN A VIRTUAL T-MAZE**Johannes Rodrigues¹, Mathias Müller¹, Andreas Mühlberger², & Johannes Hewig¹¹Julius-Maximilians-Universität Würzburg, ²Universität Regensburg*Descriptors: frontal asymmetry, virtual reality, EEG: alpha frequency*

Different theories about frontal asymmetry and its meaning are present. The original theory of Davidson and the diversification by Harmon – Jones & Allen allocated approach motivation to left frontal brain activation and withdrawal motivation to right frontal brain activation. Hewig and colleagues extended this theory by adding a bilateral frontal activation representing a biological correlate of the behavioral activation system if actual behavior is shown. Wacker and colleagues theorized that left frontal brain activation stands for behavior, while right frontal brain activation stands for behavioral inhibition and the experience of conflict. Frontal asymmetry has been investigated in state based approaches where different stimuli are used to induce emotions and motivational states. One major problem of many state based approaches is the lack of opportunity to show behavior. In this study, 30 participants explored a virtual T-maze in a desktop virtual reality paradigm, giving participants the opportunity to react to stimuli and showing frontal brain activation as well. Analyzing the influence of frontal brain activation on the observed behavior, we found an influence of frontal asymmetry on the resulting behavioral categories shown in the paradigm. Also, there was more bilateral frontal brain activation when participants were engaged in behavior compared to doing nothing at all during a trial. Hence this study provides evidence for the theory of Hewig and colleagues, where frontal asymmetry stands for behavioral motivation and bilateral frontal activation for behavior.

Universitätsbund Würzburg.

**POSTER SESSION IV
SATURDAY, SEPTEMBER 24, 2016**

Poster 4-1

**SMALLER AMYGDALA VOLUME AND INCREASED
NEUROTICISM PREDICT ANXIETY SYMPTOMS IN
HEALTHY SUBJECTS: A VOLUMETRIC APPROACH USING
MANUAL TRACING**

Yifan Hu¹, Zachariah Bertels¹, Benjamin Olivari¹, Audra Chaves¹, Matthew Moore¹, Sanda Dolcos¹, & Florin Dolcos²

¹University of Illinois at Urbana-Champaign, ²University of Illinois at Urbana-Champaign & Beckman Institute for Advanced Science & Technology

Descriptors: amygdala, trait anxiety, neuroticism

Volume reductions in the amygdala have been found in both anxiety patients and subclinical participants with high trait anxiety scores. Smaller amygdala volume has also been related to neuroticism, a personality factor consistently linked to increased vulnerability to anxiety. However, it is not clear how amygdala volume and neuroticism together may contribute to anxiety symptoms in healthy participants. These issues were investigated in a sample of 46 healthy participants, who received anatomical MRI scans and completed measures of trait anxiety and neuroticism. Unlike most of the extant research, amygdala volume was assessed using manual tracing, based on anatomical landmarks identified in each anatomical image. First, amygdala volume was negatively correlated with neuroticism, which in turn was positively correlated with trait anxiety. Second, mediation analyses confirmed that amygdala volume had a significant indirect effect on trait anxiety through neuroticism. This effect was not bidirectional, as trait anxiety did not predict amygdala volume through neuroticism. Collectively, these findings provide support for a brain-personality-symptom framework of understanding affective dysregulation, which may help inform the development of prevention and intervention paradigms targeting preservation of amygdala volume and reduction of neuroticism, to protect against anxiety symptoms.

Poster 4-2

**SMOOTHING SPLINE ANOVA MODELS FOR ANALYZING
EVENT-RELATED POTENTIAL DATA**

Nathaniel E. Helwig
University of Minnesota

Descriptors: event-related potential, individual differences, smoothing spline

Many event-related potential (ERP) studies quantify individual and/or group differences by comparing ERPs at select time points, e.g., 300-500 ms after the stimulus. In most cases, the researcher must choose which time points to examine, which can lead to a selection bias. Furthermore, if multiple time points (or windows) are of interest, some sort of multiple comparison correction is needed to control the false-positive rate, which could severely reduce the power to find differences. This study reveals the benefit of using the Smoothing Spline Analysis of Variance (SSANOVA) framework to analyze individual and group differences in ERP data. Unlike the pointwise analysis approach, the SSANOVA framework can analyze individual and/or group differences simultaneously across multiple ERP time points. Furthermore, with a Bayesian interpretation, the SSANOVA results can be used to examine differences across multiple time points without the need for a multiple comparison correction. Using visual stimulus ERP data collected from control and alcoholic subjects, we demonstrate how the SSANOVA model can be used to examine amplitude differences in ERPs simultaneously across multiple time points. Our results reaffirm previous results on the P300 attenuation in alcoholic subjects. However, we find noteworthy individual differences in ERPs both within and between subject populations. Consequently, this study illustrates the importance of examining both individual and group differences in ERP data.

Start-Up funds from the University of Minnesota.

Poster 4-3

**SNAKES AND SPIDERS, BUT NOT POINTED GUNS, RESIST
INSTRUCTED EXTINCTION AFTER DIFFERENTIAL FEAR
CONDITIONING**

Camilla C. Luck, & Ottmar V. Lipp
Curtin University

Descriptors: fear conditioning, preparedness theory, electrodermal responding

Preparedness theory proposes that some stimuli are evolutionarily prepared to associate with aversive events. Prepared associations should to be rapidly acquired, resistant to extinction, and resistant to cognitive influence. Snakes and spiders are the only stimuli which have been shown to fulfil all of the above criteria, but fear acquired to pointed guns resists extinction. We examined whether fear acquired to pointed guns would also resist cognitive intervention. Using a differential fear conditioning design, an image of a gun (fear-relevant CS+) and hair-dryer (fear-irrelevant CS+) were followed by an aversive electrocutaneous shock and loud noise blast, whereas, a second gun (fear-relevant CS-) and hair-dryer (fear-irrelevant CS-) were presented alone. During acquisition, differential electrodermal responding was acquired between the fear-relevant and fear-irrelevant CS+ and CS-, which was immediately abolished after participants were informed that the aversive stimuli would no longer be presented (instructed extinction). In Experiment 2, using the same within-participants design, we replicated the original finding that fear acquired to images of snakes and spiders resists instructed extinction. The results suggest that the original reports of resistance to instructed extinction using snakes and spiders are reliable but that images of pointed guns do not show the same resistance to instruction.

This work was supported by grants number DP120100750 and SR120300015 from the Australian Research Council.

Poster 4-5

**SPATIO-TEMPORAL DYNAMICS OF THE RESPONSE TO
EMOTIONAL DISTRACTION: A MULTIMODAL BRAIN
IMAGING INVESTIGATION**

Alexandru D. Iordan¹, Matthew Moore¹, Yuta Katsumi¹, Ryan Larsen¹, Edward L. Maclin¹, Andrea Shafer², Anthony Singhal³, Sanda Dolcos¹, Bradley P. Sutton¹, Monica Fabiani¹, Gabriele Gratton¹, & Florin Dolcos⁴
¹University of Illinois at Urbana-Champaign, ²Wayne State University, ³University of Alberta, ⁴University of Illinois at Urbana-Champaign & Beckman Institute for Advanced Science & Technology

Descriptors: multimodal imaging, emotional distraction, emotion regulation

The link between temporal (when) and spatial (where) aspects of the neural correlates of most psychological phenomena is not clear. Elucidation of this relation requires integration across multiple brain imaging modalities and tasks that reliably modulate the engagement of brain systems of interest. The present poster illustrates one such integration across 3 imaging modalities: electroencephalography/event-related potentials (EEG/ERP), functional magnetic resonance imaging (fMRI), and event-related optical signals (EROS). Two executive tasks with emotional distraction were used because such dual-task designs can dissociate between large-scale dorsal and ventral brain systems involved in cognitive and affective processing. Pilot data from 5 subjects performing an emotional odd-ball task provided initial validation of simultaneous EEG-fMRI and EEG-EROS recordings and identified prefrontal and parietal cortical responses consistent with unimodal spatial and temporal evidence. Additional data (N=5) extended these results to a combined working memory-emotion regulation (ER) task with emotional distraction, and showed further spatio-temporal dissociations convergent across the 3 modalities in fronto-parietal areas, as a function of the source of distraction (external-percepts vs. internal-memories) and the type of ER (spontaneous vs. instructed). Finally, EEG-informed fMRI analyses identified links between ERP amplitude at parietal electrodes and fronto-parietal hemodynamic responses when coping with distraction, further supporting the value of multimodal imaging integration.

This research was supported by a UofI Campus Research Board grant and by BRIDGE Initiative Funds (to FD), and by NIH grant S10-RR029294 (to GG).

Poster 4-6**STABILITY AND RELIABILITY OF ERROR-RELATED ELECTROMYOGRAPHIC ACTIVITY OVER THE CORRUGATOR SUPERCILII**

Nathaniel Elkins-Brown, Blair Saunders, & Michael Inzlicht
University of Toronto

Descriptors: corrugator, stability, reliability

Historically, electromyographic activity over the corrugator supercilii (cEMG) has been used as measure of negative emotion and of exerted effort. Recently, researchers have found evidence for early increased cEMG during errors in cognitive control tasks, and that these increases are correlated with behavioral and neurophysiological measures of error monitoring. Given the potential for cEMG to be a more objective, continuous, and unobtrusive measure of emotion or cognition than self-report, we sought to assess its stability and reliability during errors of commission. In the present study, we reanalyzed error-related cEMG data from two studies—one using an inhibitory control task ($n = 54$) and the other using a classic Eriksen flanker task ($n = 51$)—and compared them to established measures of neural monitoring, the ERN and Pe. Calculations of Cronbach's alpha, signal-to-noise ratios, and correlations with grand average signal revealed that error-related cEMG was sufficiently stable and reliable in as few as 6 trials, and acquired high or excellent stability and reliability between 10 and 14 trials. Surprisingly, these results are fairly comparable to both the ERN and Pe, despite the greater overall inter- and intra-variability of facial EMG compared to EEG. These findings suggest that cEMG is a stable and reliable measure when event-locked to errors, and may prove useful to researchers seeking an additional measure of negative affect or effort in error monitoring tasks.

Natural Sciences and Engineering Research Council (NSERC).

Poster 4-9**STRESS INTERACTS WITH PRE-EJECTION PERIOD REACTIVITY TO REWARD TO PREDICT ANHEDONIA SYMPTOMS AMONG ADOLESCENTS**

Joshua Ahles, Jaclyn Aldrich, Andrew Fox, & Amy Mezulis
Seattle Pacific University

Descriptors: pre-ejection period, anhedonia, stress

Under specific stimulus conditions, approach motivation and reward responsiveness may be indexed by cardiac pre-ejection period (PEP) reactivity (Zisner & Beauchaine, 2016), a measure of sympathetic nervous system arousal. Vulnerability-stress models of depression posit that in the context of increased stress, individual differences such as responsiveness to reward may confer greater risk for depression. This study examined the interaction between stressful life events and PEP reactivity to a reward task as a predictor of future anhedonia symptoms in a community sample of young adolescents ($N = 70$; 50% male; Mean age = 13.24).

Participants completed measures of stress exposure and depressive symptoms. Anhedonia symptoms were assessed using items from the Child Depression Inventory-II (Wetter & Hankin, 2009). PEP reactivity was assessed in response to a modified delayed-matching-to-sample task in which adolescents were able to earn \$10 dollars.

Moderation analyses were conducted using Hayes PROCESS macro (2013). The analyses revealed a significant interaction between PEP reactivity to reward and stress ($b = .01$, $p = .04$) such that as stress exposure increased, adolescents who displayed no change or lengthening PEP to reward reported greater levels of anhedonic symptoms at a six month follow-up ($b = .09$, $p = .02$). In contrast, adolescents with more pronounced PEP shortening to reward reported the same level of anhedonic symptoms regardless of the degree of stress exposure ($b = .01$, $p = .74$).

R15MH098294-01A1.

Poster 4-10**STRESS-RELATED CHANGES IN NEURAL MARKERS OF REGULATION IN PREGNANT WOMEN ARE BUFFERED BY SOCIAL SUPPORT**

Lisa J. Schmall¹, Rebecca J. Brooker¹, & Elizabeth J. Kiel²
¹Montana State University, ²Miami University

Descriptors: pregnancy, emotion regulation, stress

The Late Positive Potential (LPP) is believed to index emotional reactivity at the neural level (Hajcak et al., 2012). The LPP is reduced when emotions are successfully regulated (Hajcak & Nieuwenhuis, 2006), making enhanced LPP a potential neural marker of risk for mental health problems associated with regulatory deficits. During pregnancy, women are at increased risk for the development of anxiety and depressive symptoms (Heron et al., 2004). Though factors such as social support are thought to buffer risk (Cohen & Willis, 1985), it is unclear whether this effect operates at the level of neural function. To test this possibility, we investigated the links among LPP, perceived stress, and levels of social support in expecting mothers ($N = 31$). We anticipated that greater stress would deplete emotion regulation, relating to increases in LPP, but that these increases would be diminished in mothers with higher levels of social support.

We found that LPP was enhanced for emotional relative to nonemotional stimuli across all mothers ($F(4,112) = 4.73$, $p < 0.05$), during a passive viewing task. Consistent with expectations, we found that social support moderated the association between perceived stress and LPP ($B = -0.65$, $p < 0.01$), such that, at low levels of social support, greater stress predicted greater LPP ($B = 0.51$, $p < 0.01$). However, stress was unrelated to LPP at high social support ($B = -0.18$, $p > 0.10$). Results are consistent with the idea that social support may buffer associations between perceived stress and emotional reactivity by supporting emotion regulation.

National Institutes of Health 5P20GM104417 Montana State University Undergraduate Scholars Program.

Poster 4-11**STRUCTURAL EQUATION MODELING INDICATES VARYING ROLES OF ATTENTION IN CHILDREN PERFORMING A GO-NOGO TASK ACROSS SESSIONS**

Brittany K. Taylor, Patricia L. Davies, & William J. Gavin
Colorado State University

Descriptors: attention, development, event-related potential (ERP)

The contingent negative variation (CNV) is a slow negative drift in event-related potentials (ERPs) resulting from attentional anticipation between two stimuli. A previous study in children indicated that across two sessions, CNV E-wave amplitudes became more negative. Prior research suggests that changes in ERP amplitudes after practicing a task may indicate shifts in cognitive strategies. The purpose of the present study was to determine how attentional control changed across sessions. ERP data were collected from 51 children (7-13yrs, $M = 10.37$, $SD = 1.59$) while performing a Go-NoGo task during two sessions (S1 and S2). The averaged E-wave amplitude was measured for each individual for each session. Participants also completed the Test of Everyday Attention for Children (TEA-Ch) to measure selective, sustained, and shift attention. Using structural equation modeling, two models were compared: one where TEA-Ch measures predicted E-wave amplitudes, and one where E-wave amplitudes predicted TEA-Ch measures. Age was controlled in both models. Only the model with E-wave amplitudes predicting TEA-Ch measures was valid, $\chi^2(51) = 36.06$, $p = .91$, CFI = 1.0, RMSEA < .001. The results indicated that the E-wave of S1 predicted only selective attention, $\beta = -.38$, $p = .03$. In contrast, the E-wave of S2 predicted both shift, $\beta = .29$, $p = .05$, and sustained attention, $\beta = .32$, $p = .05$. Thus, across sessions the E-wave amplitude relates to different types of attentional processing in children, possibly due to utilizing different types of attention as they learn a task.

NICHD 5R03HD046512; CSU College of Health and Human Sciences to PLD & WJG; CSU Department of Occupational Therapy to PLD, WJG, BKT, & MHL.

Poster 4-12**TAKING OFF THE TRAINING WHEELS: MEASURING BRAIN ACTIVITY DURING OUTDOOR CYCLING USING AN ACTIVE WET EEG SYSTEM**

Joanna Scanlon, Kimberly Townsend, Danielle Cormier, Jonathan Kuziek, & Kyle E. Mathewson
University of Alberta

Descriptors: mobile EEG

Mobile EEG allows the investigation of brain activity in increasingly complex environments. In this study, EEG equipment was adapted for use and transportation in a backpack while cycling. Participants performed an auditory oddball task while cycling outside and sitting in an isolated chamber inside the lab. Cycling diminished alpha amplitude and increased EEG noise. Significantly decreased P2 amplitude was observed when evoked by both standards and targets during cycling outside. This may be due to attentional processes filtering the overlapping sounds between the tones used and similar environmental frequencies. This study established methods for mobile recording of ERP signals. Future directions include investigating P2 filtering inside the laboratory.

NSERC helped to fund this project.

Poster 4-13**THE VISION RHYTHM? ENTRAINMENT AT MULTIPLE FREQUENCIES REVEAL DIFFERENTIAL INTERACTIONS BETWEEN NEURAL OSCILLATIONS AND VISUAL PERCEPTION.**

Sayed A.D. Kizuk¹, Ankur Banerjee¹, & Kyle E. Mathewson²
¹Neuroscience and Mental Health Institute, ²University of Alberta

Descriptors: alpha, entrainment, neural oscillations

Attentional biasing is needed to select relevant sensory information. Recently, it has been shown that alpha band (7-14 Hz) oscillations can serve attentional biasing functions via phase and amplitude changes which modulate neural activity and perceptual awareness in a pulsating inhibition. These pulses of inhibition can be entrained by bottom-up induction of temporal expectancies with repetitive visual stimuli, eliciting cyclic decrements in visual performance for stimuli appearing out-of-phase with the external rhythm. One outstanding question is whether these phase-dependent decrements in visual processing are specific to the alpha frequency. If so, it would suggest that alpha specifically reflects neural processes related to visual perception, whereas non-alpha oscillatory rhythms have functions unrelated to vision. We presented bilateral entrainers 4, 8.5, 12, 15, and 20 Hz, corresponding to Theta, Low Alpha, Alpha, High Alpha, and Beta. Oscillations in brain activity were entrained at each frequency, with increased phase-locking observed at all 5 frequencies. However, the behavioural interaction with phase was present to a greater extent for the 12-Hz rhythm. These findings extend the recent findings on the dependence between alpha phase and visual perception, showing that this phase-dependency cannot be extended to non-alpha rhythms, and thus provide further evidence implicating alpha as a pulsating inhibition which serves to rhythmically inhibit visual processing.

Poster 4-14**TASK SWITCHING PERFORMANCE IN OLDER ADULTS IS LINKED TO GLOBAL AND TRACT-SPECIFIC CHANGES TO WHITE MATTER MICROSTRUCTURE**

Frini Karayanidis¹, Todd Jolly¹, Patrick Cooper¹, Jaime Rennie¹, Christopher Levi¹, Rhoshel Lenroot², Patricia Michie¹, & Mark Parsons²
¹University of Newcastle, Australia, ²University of New South Wales, Australia

Descriptors: cognitive aging, task-switching paradigm, cerebral white matter
Task switching performance declines with increasing age, especially under conditions of high interference. In older adults, task switching performance has been shown to be sensitive to changes in white matter microstructure. This study examines whether age-related decline in task switching performance is mediated by global or tract-specific disruption in cerebral white matter microstructural organisation. We also examine whether the presence of cardiovascular risk factors moderates the relationship between white matter disruption and task switching performance. Seventy cognitively intact individuals (43-87y) completed a cued-trials task switching paradigm, as well as structural MRI and diffusion-weighted imaging (DWI) sequences. Measures of microstructural white matter changes

were calculated using diffusion tensor imaging (DTI) analyses on the DWI sequence. The relationship between age and task switching performance was removed after controlling for variance associated with global white matter microstructural organisation. In contrast, the relationship between task switching performance and white matter microstructure remained when controlling for age. Task switching performance was more strongly related to white matter microstructural changes in tracts that connect frontal and parietal regions. All effects were most strongly evident in participants who reported the presence of one or more cardiovascular risk factors. These findings suggest that age-related cognitive decline may represent the emerging effects of modifiable cardiovascular risk factors.

HMRI Project Grant, Discovery Project (DP120100340), Australian Postgraduate Award, HMRI Research Higher Degree Scholarship.

Poster 4-15**TECHNOLOGY AS AN ESCAPE MECHANISM: NEURAL CORRELATES ASSOCIATED WITH MULTIMEDIA MULTITASKING DURING FACE-TO-FACE INTERACTIONS**

Mejdy M. Jabr¹, Eric Rawls¹, Connie Lamm¹, & Nathan Fox²
¹University of New Orleans, ²University of Maryland

Descriptors: multitasking, cognitive control, social multimedia

The sweeping dissemination of mobile social technologies in recent years has irrevocably changed the way in which we communicate. Although a great deal of good has come about as a result of our unprecedented interconnectedness, research suggests that this technology's pervasiveness in our day-to-day interactions might also have social-emotional consequences. The literature on such issues, however, remains sparse at best. This study sought to examine the distinct temperamental and neural correlates of individuals who engage heavily in social multimedia multitasking during face-to-face interactions. Utilizing an AX-continuous performance task (CPT) and event-related potentials (ERP; n = 36 undergraduates), results revealed that individuals who reportedly spent more than half of their daily face-to-face interactions simultaneously texting, emailing, or engaged in social media displayed greater (more negative) N2 activation, an ERP associated with conflict monitoring, beta = -.50, t (30) = -3.30, p = .003. Furthermore, high social multimedia multitasking correlated positively with anxious-introversion, beta = .36, t (32) = 2.17, p = .038. Conjointly, these results indicate that heavy social multimedia multitasking individuals might have anxiety induced cognitive inefficiencies in social contexts and therefore turn to technology as an avoidance technique.

Poster 4-16**TEMPORAL DYNAMICS IN EEG BRAIN ACTIVITY IN THE DYNAMIC HEALTH QIGONG TECHNIQUES BA DUAN JIN AND YI JIN JING**

Diana Henz, & Wolfgang I. Schöllhorn
University of Mainz

Descriptors: EEG, qigong

Chinese Health Qigong is a technique of Traditional Chinese Medicine commonly applied to strengthen mental and physical health. Several studies have reported increases in electroencephalographic (EEG) theta and alpha activity after meditative Qigong exercise indicating a relaxed state of mind. Much less is reported on effects of brain activation patterns induced by dynamic Qigong techniques that involve bodily movements that direct attention to movement control and kinaesthetic sensations. In the present study, we compared effects of the dynamic Health Qigong techniques Ba Duan Jin and Yi Jin Jing on EEG theta and alpha activity. Subjects performed the techniques Ba Duan Jin (Eight Pieces of Brocade) and Yi Jin Jing (Muscle/Tendon Change) in a within-subjects design. Eyes-open and eyes-closed resting EEG was recorded before and immediately after each 15-minute exercise block. Our results demonstrate different temporal dynamics in theta and alpha activity for the two dynamic Qigong techniques. Theta activity remained at the same level in Ba Duan Jin after 15 and 30 minutes, whereas alpha activity was increased after 15 minutes, with a further increase after 30 minutes. Theta and alpha activity was increased after 15 minutes, followed by a further increase after 30 minutes when training the Qigong technique Yi Jin Jing. We hypothesize that the found brain activation patterns result from different attentional focusing mediated by different breathing techniques performed during the investigated dynamic

Health Qigong techniques.

Poster 4-17**TESTING THE EFFECTS OF ADOLESCENT ALCOHOL USE ON ADULT CONFLICT-RELATED THETA DYNAMICS**

Jeremy Harper, Stephen Malone, & William Iacono
University of Minnesota

Descriptors: adolescent alcohol use, cognitive control, theta

Research suggests that adolescent alcohol use is related to adult executive functioning deficits. However, less is known about any potential long-term consequences of early drinking on EEG correlates of cognitive control. Testing etiological hypotheses of the association between adolescent drinking and adult outcomes has been difficult since most studies to date have used purely observational designs. The present study tested the hypothesis that adolescent drinking is associated with reduced theta-band EEG dynamics of cognitive control (midfrontal cortex [MFC] power; MFC-dorsal prefrontal cortex [dPFC] functional connectivity) during a flanker task in a large longitudinal sample of twins assessed at the target ages of 11, 14, 17, and 29. Cumulative adolescent alcohol use (between ages 11-17) was negatively related to adult (age 29) theta MFC power and MFC-dPFC connectivity, suggesting diminished cognitive control-related theta dynamics. A cotwin control analysis examined whether premorbid familial risk towards drinking or the potential causal effects of early drinking better explained the observed effects. Results suggested that reduced MFC power and MFC-dPFC connectivity was associated with a preexisting genetic/shared environmental risk towards adolescent drinking. To our knowledge, these results provide the first evidence that a heritable liability towards drinking may underlie the association between adolescent alcohol use and diminished adult theta dynamics of cognitive control.

DA005147; AA009367; NSF-GRF No. 00039202.

Poster 4-18**THE SEVERITY OF BURNOUT AND RESPONSE TO THE MUSIC**

Sergii Tukaiev, & Igor Zyma
National Taras Shevchenko University of Kyiv

Descriptors: emotional burnout, classical music, EEG

Music changes the emotional state of the listener if it gets into resonance with his/her emotional state. The aim of this study was to investigate the dynamics of changes of psychophysiological parameters under listening to music depending on the severity of burnout. 75 healthy volunteer students aged 17-22 years old participated in the study. We used the CAM (cenesthesia, activity, mood), State Anxiety Inventory, and the Syndrome of Emotional Burnout test. EEG was registered over a period of 5 min during the rest state, 3 min during listening to the music (Beethoven, Fier Elise), and 3 min of aftereffect. The resistance stage was detected in 29 students. The influence of music was more significant for the group, which did not develop the resistance stage. Listening to music decreased the level of anxiety and improved the level of cenesthesia. Generalized decrease in spectral power density indicated an overall decrease of activation of cognitive processes and weakening of the emotional background of mental activity in both groups. Depression of the theta2-, alpha1-, alpha2-subbands indicated a decrease in psychic tension. Listening to music led to changes in alpha- and beta-subbands. The level of activation of the general tone was lower than in the group with the resistance stage. It was characterized by the transition to the state of tranquility and actualization of memorial traces. Simultaneous desynchronization of theta1-, beta2 and alpha-subbands indicated a reduced level of nonspecific activation. Thus, the severity of burnout affected the traits of response to music.

Poster 4-19**THE CONTROL SYSTEM AND FRONTAL ASYMMETRY: NEURAL CORRELATES OF ANXIOUS AND IMPULSIVE PERSONALITY**

Lauren B. Neal, Jonathan P. Sowell, & Philip A. Gable
University of Alabama

Descriptors: personality, motivation, frontal asymmetry

The approach, withdrawal, and control systems are thought to lie at the core of human personality. Models of frontal asymmetry link greater relative left and right frontal activity with greater approach and withdrawal motivation, respectively. Much lesion and fMRI research links the right hemisphere with the control system. Past evidence has also found that trait deficits in control (e.g. impulsivity) relate to reduced right frontal activity. We assert that stronger trait control system function-

ing should be related to greater relative right frontal activity. In the current study, we sought to investigate whether traits related to stronger control functioning, but not withdrawal motivation, were associated with greater right frontal activation. Participants (182) completed personality measures (UPPS-P Impulsivity, BIS, BAS) and resting EEG recordings. BIS-Anxiety (risk appraisal and control) and BIS-FFFS (withdrawal motivation) subscales were calculated based on Gray's revised RST theory. Greater BIS-Anxiety related to greater relative right frontal activity. Impulsivity related to less relative right frontal activity. Controlling for BIS-FFFS and BAS motivation did not influence these relationships. Enhanced control system functioning is related to greater relative right frontal activity, but reduced control system functioning is related to less relative right frontal activity. Relative right frontal activity appears to underscore traits associated with the control system.

Poster 4-20**THE DYNAMIC INTERACTION OF EDUCATIONAL CONTENT AND PARENT CHILD CO-VIEWING ON CHILDREN'S PHASIC COGNITIVE PROCESSING OF MEDIATED MESSAGES**

Collin K. Berke, Travis Loof, Rebecca Densley, Eric Rasmussen, & Justin R. Keene
Texas Tech University

Descriptors: children, co-viewing, educational media content

The dynamic interaction of educational content—in the form of explicit plot content, explicit educational content, and implicit inferential content—and parent child co-viewing can result in changes in children's phasic cognitive processing of mediated messages. This variation in phasic processing has important effects on what children learn from educational media content. Specifically, predictions of children's phasic cognitive processing in relation to co-viewing and educational content type were derived from both Social Facilitation Theory and the Limited Capacity Model for Motivated Mediated Message Processing (LC4MP) theoretical frameworks. Two main predictions were made in this study. First, parent child co-viewing would lead to greater resource allocation to encoding the message—as indicated by cardiac deceleration. Second, information that required internal processing, such as explicit educational or implicit inferential content would lead to greater resources allocated to internal processing—as indicated by cardiac acceleration. A multi-level model was used to examine children's cardiac response curves to the three types of content in a co-viewing situation. Results reveal co-viewing leads to cardiac deceleration ($\beta = -1.19$) and implicit content leads to cardiac acceleration ($\beta = 1.57$). In sum, these results provide evidence that both educational content type and parent child co-viewing have an effect on children's over time phasic cognitive processing responses of educational media content.

Poster 4-21**THE EFFECTS OF EMOTIONAL TRAJECTORIES IN ANTI-DRUG MESSAGES ON PSYCHOPHYSIOLOGICAL AROUSAL AND ATTITUDE AMBIVALENCE**

Zachary P. Hohman, Justin R. Keene, Breanna N. Harris, & Elizabeth Niedbala
Texas Tech University

Descriptors: emotion, ambivalence, coactivation

People often hold simultaneously positive and negative evaluations of an object, a feeling called attitude ambivalence. However, the motivational activation by which these ambivalent attitudes are formed is not fully understood. One possibility is that coactivation in the motivational systems results in ambivalence. This study used five possible emotional trajectories within anti-drug messages (pleasant, unpleasant, simultaneously pleasant and unpleasant, start pleasant and end unpleasant, and start unpleasant and end pleasant) in order to better understand the dynamic interaction of coactive motivational activation, arousal and attitudes. This study measured self-reported ambivalence and physiological arousal via salivary cortisol investigate if coactivation, as evidenced by arousal, is predictive of resulting ambivalence. The results revealed a significant main effect of emotional trajectory on salivary cortisol, $F(4,86) = 5.14, p < .001$, and a significant main effect of emotional trajectory on felt ambivalence, $F(1,324) = 12.94, p < .001$. Participants reported greater felt ambivalence to messages that started pleasant and ended unpleasant or that co-presented pleasant and unpleasant content compared to the other emotional trajectories. These two emotional trajectories also resulted in an increase in cortisol after the message presentation where the other messages resulted in a decrease. In sum, emotional trajectories that elicit coactivation in the motivational systems would seem to lead to greater arousal and also result in greater attitude ambivalence.

Poster 4-22**THE DYNAMICS OF MALADAPTIVE RESPIRATORY RESPONSES TO INCREASING FEELINGS OF DYSPNEA**

Christiane Pane-Farre, & Christoph Benke
University of Greifswald

Descriptors: defense cascade, dyspnea, interoceptive threat

Evidence from animal and human research indicates that defensive behavior dynamically changes with increasing imminence of a threat. Threat may originate from within one's own body, e.g., from the respiratory system. Such interoceptive threat bears high relevance for a number of anxiety and health problems. The current study aimed at evaluating a new experimental paradigm to characterize the dynamics of defensive mobilization to increasing levels of dyspnea indicating proximity of a short respiratory occlusion requiring breath-holding for a limited time. Persons low and high in suffocation fear (SF; N=69) were exposed to a looming sequence of increasing levels of dyspnea induced by inspiratory resistive loads and directly followed by the short occlusion for 8 times. When dyspnea was severe and the occlusion about to occur, high compared to low-SF persons exhibited a maladaptive breathing pattern as indicated by an increased respiratory rate that was accompanied by increased reports of panic symptoms. This pattern was also observed when participants terminated the looming sequence prematurely to avoid delivery of the occlusion. Results will be discussed in reference to descriptive models of defensive mobilization in relation to threat proximity as well as etiological models of panic.

This study was supported by the Landesgraduiertenförderung Mecklenburg-Vorpommern, Germany to CB, and the Käthe-Kluth research group at the University of Greifswald, Germany to CPF.

Poster 4-23**THE EFFECT OF THE TASK TYPE FOR THE DISTRACTION EFFECT**

Sanae Naka, & Jun'ichi Katayama
Kwansei Gakuin University

Descriptors: distraction effect, P300

Task irrelevant environmental changes attract attention and sometimes impair the ongoing cognitive processes. This study investigated the relationship between this distraction effect and the set for the task by manipulating the types of the duration discrimination task. Task relevant visual stimuli were presented once every 1200 ms with long (400 ms) or short (100 ms) duration (50% each). Each visual stimuli consisted of small blue circle and large gray square. The square was always presented at the center of display and the circle was presented at either the center (90%), lower left quadrant (5%), or upper right quadrant (5%) on the square. The position of the circle was task irrelevant information. ERPs were recorded while twelve participants performed three types of duration discrimination task; a choice task to respond both short and long duration stimuli by corresponding button press, and two go/no-go tasks for short or long duration stimuli. The RT for the short duration stimuli was longer than those in the go/no-go task. In the choice task, the P3 amplitude increased for the deviant information of the short duration stimuli compared with those of the standard stimuli. The distraction effect for the short duration stimuli in the choice task was smaller than those for the others. These results suggest that attention allocated to the short deviant stimuli in the choice task, and the set changed by the task and then in the choice task, they were unable to respond to short as quickly as possible. Therefore, the RT distraction effect decreased because of the task type.

Poster 4-24**THE SPATIAL EXPECTATION FOR SUBSEQUENT SOMATOSENSORY STIMULI IS MODULATED BY REGULARITY OF APPROACHING VISUAL STIMULI**

Tsukasa Kimura, & Jun'ichi Katayama
Kwansei Gakuin University

Descriptors: multisensory interaction, sequential effect, expectation

The aim of the present study is to investigate how the regularity of visual stimuli approaching the body modulates spatial expectations of subsequent somatosensory stimuli by recorded event-related brain potentials (ERPs) during a simple reaction time task to somatosensory stimuli. The participants (N = 21) were instructed to put their arms on a desk, and LEDs as visual stimuli were placed between arms with equal distance (8.0 cm each). The mild electrical stimulation as somatosensory stimulus was presented to the left (or right) wrist with a high probability, and to the opposite wrist with a low probability. Each trial was composed of three visual stimuli and one somatosensory stimulus, with the interval (SOA) of 1000 ms. Four blocks (95, including 5 catch trials for each block) were presented in each condition. In the sequential approach condition, the right, center, and left (or reverse order) LEDs were presented sequentially approaching the wrist where the high probability stimulus was presented, whereas, in random approach condition, LEDs were randomly presented, but the third visual stimulus was always presented near the wrist for the high probability stimuli. After them, the somatosensory stimulus was presented to the left (or right) wrist. The P3 amplitudes elicited by low probability stimuli were larger under the sequential condition than under the random condition. The present study indicates the existence of an automatic adjustment function using regularity of visual stimuli approaching the body for spatial expectations of subsequent somatosensory events.

Poster 4-25**THE EFFECTS OF AGE AND FITNESS ON THE TIMING OF CEREBROVASCULAR REACTIVITY: CONCURRENT RECORDING OF ARTERIAL SPIN LABELING AND NEAR INFRARED SPECTROSCOPY**

Benjamin Zimmerman, Kathy A. Low, Chin Hong Tan, Mark A. Fletcher, Niels Schneider-Garces, Edward L. Maclin, Bradley P. Sutton, Gabriele Gratton, & Monica Fabiani
University of Illinois at Urbana-Champaign

Descriptors: aging, cerebrovascular reactivity, cardiorespiratory fitness

Cerebrovascular health is important to cognitive integrity, especially in the context of normal, age-related cognitive decline. Cerebrovascular health is often studied using reactivity to manipulations such as hypercapnia. Both the amplitude and the timing of reactivity may be important, reflecting different components of cerebrovascular health. Here, we looked at how the timing and magnitude of the response to hypercapnia was associated with age and fitness in a cohort of older adults (age 55-88). Arterial spin labeling (ASL) and near-infrared spectroscopy (NIRS) data were concurrently recorded during six blocks of voluntary breath holding, which induces global vasodilation in the brain. We found that ASL amplitude measures alone could lead to data whose interpretation is difficult, due to differences in timing of the cerebrovascular response. For instance, we found that during the rest period between breath holding epochs, blood flow positively correlated with cardiorespiratory fitness (CRF) in the younger half of the subjects, but negatively correlated with CRF in the older half. This opposite pattern could manifest if the lower fit older adults do not return to baseline before the next breath holding period begins. In support of this hypothesis, the concurrently recorded NIRS data, providing superior temporal resolution compared to ASL, show that the younger half recovers more quickly following breath holding. These results demonstrate how using concurrent, multi-modal brain imaging measures can improve our understanding of brain physiology.

This project was supported by a grant NIH 1 RC1 AG035927 Z ARRA to Monica Fabiani and an NSF IGERT fellowship (0903622) to B. Zimmerman.

Poster 4-26

THE EFFECTS OF ANTICIPATORY STRESS ON
REGULATION OF SYMPATHETIC TONE IN HIGH AND LOW
TRAIT ANXIOUS INDIVIDUALS: CHANGES IN SYSTOLIC
BLOOD PRESSURE UPON EXPOSURE TO AFFECTIVE
STRESS

Kate Holland¹, Alana Rosa¹, Cristina Blanco¹, Michael Doster¹, & David Harrison²

¹University of South Carolina Lancaster, ²Virginia Tech

Descriptors: trait anxiety, anticipatory stress, right hemisphere activation
Anticipation of stress in laboratory settings has been associated with high levels of trait anxiety (Juster et al., 2012). Trait anxiety has been associated with increases in right temporoparietal activation. Accordingly, it was predicted that high trait anxious participants would evidence increased systolic blood pressure (SBP) relative to low trait anxious individuals upon exposure to two affective stressors. Participants completing the Trait scale of the State-Trait Anxiety Inventory were classified as having high (n=23) and low (n=23) levels of trait anxiety. Participants viewed a video depicting scenes of animal neglect before completing the Auditory Affective Verbal Learning Task (AAVLT). A Trait x Condition interaction was found ($F(3, 132)=2.63, p=.05$), indicating that low trait anxious individuals evidenced a reduction in SBP relative to high trait anxious individuals in task conditions where they were required to view a distressing video and recall negatively valenced words on the AAVLT. No between group differences were found for the final SBP reading. A main effect for Trait was found for the number of errors made on the AAVLT ($F(1, 44)=4.56, p=.03$), indicating that high trait anxious individuals made more errors on the AAVLT. Taken together, our hypothesis that high trait anxious individuals would experience more anticipatory stress relative to low trait anxious individuals was supported. The results provide support for the theory that anticipatory stress is associated with increases in relative right hemisphere activation in high trait anxious individuals.

Poster 4-27

THE DYNAMIC INTERACTION OF EMOTIONAL CONTENT
AND MODALITY ON COACTIVATION IN THE
MOTIVATIONAL SYSTEMS AND PSYCHOPHYSIOLOGICAL
RESPONSES

Travis Loof, Collin K. Berke, Austin Davidson, Jacob Fisher, & Justin R. Keene
Texas Tech University

Descriptors: emotion, media, coactivation
The dynamic interaction of a text frame—gain or loss—and the emotional trajectory of a public service announcement—pleasant or unpleasant—can result in coactivation of the motivational systems. This coactivation has important effects on physiological arousal, cognitive processing, attitude formation, memory, and, ultimately, choice behavior with relation to drug abuse prevention and drug use cessation. The limited capacity model for motivated mediated message processing (LC4MP) was used to examine the physiological arousal—indexed here by skin conductance level—and cognitive resources allocated to encoding—indexed here by cardiac deceleration over time—in response to the sequential presentation of a text frame and a audio/visual anti-drug message. It was predicted that non-congruent combinations—such as a loss frame with a pleasant message—would result in motivational coactivation and that these coactive combinations would elicit lower arousal and higher cognitive resource allocation over time. A multi-level model was used to examine this prediction. Results revealed that incongruent message combinations lead to significantly lower arousal responses and significantly higher cognitive resource allocation over time during the audio/visual PSA (Loss/Pleasant [$\beta=-1.03, p<.05$]; Gain/Unpleasant [$\beta=-5.58, p<.001$]). In sum, these results support the claim that incongruent combinations lead to coactivation in the motivational systems, as evidenced by lowered arousal responses and higher cognitive resource allocation over time.

Poster 4-28

THE MODERATING EFFECT OF SENSATION SEEKING ON
THE COGNITIVE PROCESSING OF AND EMOTIONAL
RESPONSES TO DYNAMIC EMOTIONAL TRAJECTORIES IN
ANTI-DRUG PSAS

Justin R. Keene¹, Collin K. Berke¹, Brittany E. Blanchard¹, & Annie Lang²
¹Texas Tech University, ²Indiana University, Bloomington

Descriptors: motivation, emotion, sensation seeking

Emotional content is commonly used to increase the effectiveness of public service announcements (PSAs). Extant literature indicates both emotional content and trait-level sensation seeking (SS) can affect cognitive resource allocation (CRA) toward the encoding of a message. However, less is known about the dynamic interaction between content and SS on CRA of anti-drug PSAs. The limited capacity model for motivated mediated message processing was used as a framework to examine the impact of SS on psychophysiological arousal and CRA to the encoding of PSAs' emotional trajectory (i.e., increasingly pleasant, unpleasant, both pleasant and unpleasant increasing simultaneously). We hypothesized coactive content would elicit less arousal but greater CRA. Second, SS would moderate the effect of emotional trajectory on arousal and CRA of message content. Heart rate was used as an indicator of CRA, whereas arousal was measured by skin conductance. A multilevel model was used to test these hypotheses. Results indicated coactive messages lead to lower arousal responses ($\beta=-0.26, p<.05$) and higher CRA ($\beta=.61, p<.05$). Second, results indicated a marginally significant moderation of SS and negative content on CRA ($\beta=.15, p=.06$) and a moderating effect of SS and both negative ($\beta=.01, p<.05$) and positive ($\beta=.04, p<.05$) content on arousal. In sum, these results support the prediction that coactivation lowers arousal and increases CRA of PSA content; moreover, these results indicate a moderating role of SS on individual's responses to emotional trajectories.

Poster 4-29

THE ELECTROPHYSIOLOGICAL CORRELATES OF
EMOTIONAL FACIAL EXPRESSION PROCESSING ALONG
AN EMOTION TRAJECTORY

Sreekari Vogeti, & Paul M. Corballis
University of Auckland

Descriptors: emotion, face space, ERP/EEG

Visual perception of emotional facial expressions has been associated with a range of event related potential (ERP) components. Despite the large corpus of research in this area, the electrophysiology of facial expression processing remains poorly understood. Here, we aimed to investigate the way in which emotional expressions are processed along the expression trajectory. We recorded EEG while participants viewed either faces that were neutral in expression or morphed faces that were 20%, 40%, 60%, 80%, or full-intensity happy or angry faces. Participants were asked to indicate whether each face displayed an emotional or a neutral expression. Results show that faces = < 40% emotional elicited a greater positivity in the occipital regions from onwards 120 ms in comparison with neutral faces, whereas 80% and 100% emotional faces elicited a greater negativity from 270ms. There was also a graded positive response in the central region as a function of emotion intensity starting from 360ms (100% emotion had the highest amplitude and 20% had the lowest amplitude). Furthermore, happy images elicited greater positivities than angry ones. This aligns with behavioural data which indicates that happy faces were rated emotional at lower intensities than angry ones. These data suggest that ERP modulations for different basic expressions are not equal. Furthermore, they indicate that there are systematic differences in ERPs that are modulated as a function of the intensity of emotional facial expressions.

Poster 4-30**THE EMOTIONAL EFFECTS OF REALITY TELEVISION CONTENT: MEDIA IMPACT ON AFFECT LATERALITY AND PSYCHOPHYSIOLOGICAL ACTIVITY**Benjamin DeVore¹, David Harrison¹, & Dale Alden²
¹Virginia Tech, ²Lipscomb University*Descriptors: psychophysiological, media, affect*

The effect of media on psychological processing, including emotion response and self-appraisal, is an area in need of continued research efforts. Within this construct, reality television has become increasingly popular with millions of people viewing reality shows every week. There is an increasing need for research on the psychological effects of this specific type of programming on viewers. By analyzing psychophysiological reactivity to emotionally positive and negative content in reality television clips, neural correlates of affect response were hypothesized. Utilizing the valence theory of emotion, the current research effort explores the impacts of media on the sympathetic and parasympathetic responses via lateralized control of the right hemisphere for negative affect and the left for positive affect. 42 university students were analyzed using heart rate variability and galvanic skin response to assess changes in emotional responses to the presented reality television media content. Significant differences were observed compared to baseline and the implied neural arousal associated with general emotional reactivity to various reality television clips is discussed.

Poster 4-31**THE EMPATHIC VALUE OF EMOTIONAL PROSODY: DOES THE WAY YOU EXPRESS FEELINGS SHAPE BOTH NEURAL EMPATHIC REACTIONS TRIGGERED BY CONCOMITANT FACIAL EXPRESSIONS AND LANGUAGE CONTENT? AN ERP STUDY**Arianna Schiano Lomoriello, Federica Meconi, & Paola Sessa
University of Padua*Descriptors: social/affective, empathy, prosody*

Empathy is the ability to share and to explicitly infer others' inner states and is the foundation of social interactions. Together with facial expressions, a primary form of communication between individuals for successful interactions is doubtless language. By using event-related potentials (i.e., ERPs) technique, in the present study, we investigated the role of emotional prosody in modulating empathic reactions to faces with a painful/neutral expression when the meaning of the sentence was either intelligible or not for the participants. We orthogonally manipulated language (participants' mother tongue vs. pseudo-language), emotional prosody of the report (painful vs. neutral) and the expression of the face (painful vs. neutral). We observed an effect of congruence/incongruence between prosody and facial expression on the N2-N3 temporal window, such that painful prosody presented with a painful face enhanced empathic reactions over centro-parietal regions irrespective of the language, whereas painful prosody was associated with a suppression of the empathic reactions when presented with a neutral facial expression over the same regions. Furthermore, prosody enhanced empathic reactions only when pain was expressed in participants' mother tongue whereas suppressed empathic reactions when semantic content was unintelligible on the later P3 component irrespective of the facial expression. To conclude, our findings strongly suggest that emotional prosody serves empathic reactions in both early and later time-windows but only when other cues are available.

Poster 4-32**THE GAP-STARTLE PARADIGM TO ASSESS AUDITORY TEMPORAL PROCESSING: MONAURAL VS. BINAURAL PRESENTATION**Philippe Fournier¹, & Sylvie Hébert²
¹Université d'Aix-Marseille, Centre national de la recherche scientifique (CNRS), ²École d'orthophonie et d'audiologie, Faculty of medicine, Université de Montréal*Descriptors: acoustic startle, auditory research, temporal processing*

The gap-startle paradigm is the primary gap detection test used in animal research to identify gap detection thresholds¹ and impairment. The startle reflex is inhibited when a silent gap is presented shortly before the loud startle stimuli: the amount of

inhibition is assumed to reflect detection. The effect of the presentation condition, that is monaural vs. binaural, on the startle reactivity and its inhibition by a silent gap has not been assessed in normal human adults. Twenty-nine normal-hearing adults (Mean age: 21.9 years old) were tested binaurally and monaurally with one of the two gap durations (5 or 50 milliseconds) in two different frequency backgrounds (.5 and 4 kHz narrow-band noise). Binaural presentation produced greater startle reactivity with means of 234 vs. 99 microvolts (mV) ($p < .001$) and shorter latency with means of 59 and 62 ms ($p = .005$) for binaural vs. monaural conditions, respectively. Regarding gap durations, there was a significant interaction between the frequency background and the presentation condition ($p = .017$). Indeed, when the gap was presented within a high-frequency background noise, inhibition was not different in the binaural and monaural presentation (binaural: 45, monaural: 53 mV). However, when the gap was presented within a low-frequency background noise, inhibition was increased in the binaural compared to the monaural presentation (monaural: 42, binaural: 105 mV, $p = .004$). Binaural vs. monaural presentation can dramatically affect startle reactivity, latency and its inhibition by gaps, and should be considered in future research.

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Poster 4-33**THE EFFECTS OF REWARD MAGNITUDE ON REWARD PROCESSING: AN AVERAGED AND SINGLE-TRIAL EVENT-RELATED POTENTIAL STUDY**Caroline C. Meadows¹, Philip A. Gable², Keith R. Lohse¹, & Matthew W. Miller¹
¹Auburn University, ²University of Alabama*Descriptors: reward positivity, approach motivation, dopamine*

From a neurobiological and motivational perspective, the feedback-related negativity (FRN) and reward positivity (RewP) event-related potential (ERP) components should increase with reward magnitude (reward associated with valence (success/failure) feedback). To test this hypothesis, we recorded participants' electroencephalograms while presenting them with potential monetary rewards (\$0.00 - \$4.96) pre-trial for each trial of a reaction time task and presenting them with valence feedback post-trial. Averaged ERPs time-locked to valence feedback were extracted, and results revealed a valence by magnitude interaction for neural activity in the FRN/RewP time window. This interaction was driven by magnitude affecting RewP, but not FRN, amplitude. Moreover, single trial ERP analyses revealed a reliable correlation between magnitude and RewP, but not FRN, amplitude. Finally, P3b and late positive potential (LPP) amplitudes were affected by magnitude, with the P3b also being affected by valence. Results partly support the neurobiological (dopamine) account of the FRN/RewP and suggest motivation affects feedback processing, as indicated by multiple ERP components.

Poster 4-34**THE N2PC COMPONENT RELIABLY CAPTURES ATTENTIONAL BIAS IN SOCIAL ANXIETY**Mario Reutter¹, Johannes Hewig¹, Matthias J. Wieser¹, & Roman Osinsky²
¹Julius-Maximilians-University Würzburg, ²University of Osnabrück*Descriptors: attentional bias, N2pc, social anxiety*

We systematically compared different measures of attentional bias (i.e. reaction times, the N2pc component in the EEG, and explicit stimulus ratings) in their ability to capture attentional engagement to threatening vs. neutral facial stimuli in a Dot Probe Task and tested their relation to trait measures of general and social anxiety. We found that the N2pc component captures a bias towards angry faces with excellent internal consistency. Similar results were obtained for explicit ratings. Reaction time (RT) differences, however, were not indicative of attentional biases and showed zero odd-even reliability. We further found that higher (i.e. more negative) N2pc amplitudes were associated with more severe symptoms of social anxiety even when controlling for general trait anxiety. The valence rating bias was also specifically associated with social anxiety. Conversely, the RT bias was not related to social anxiety levels but to general trait anxiety. This highlights the importance of valid and reliable outcome measures for interventions like attentional bias modification protocols. Mutual exclusivity of different bias operationalizations is discussed.

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Poster 4-36**THE LATE POSITIVE POTENTIAL TO CUES THAT SIGNAL UNPREDICTABLE SOCIAL FEEDBACK IS ASSOCIATED WITH SOCIAL ANXIETY SYMPTOMS**

Felicia Jackson, Brady D. Nelson, & Greg Hajcak
Stony Brook University

Descriptors: unpredictability, social anxiety, late positive potential

Fear of negative evaluation (FNE) is a core element of social anxiety (SA). However, an emerging literature suggests that intolerance of uncertainty is as strong a predictor of SA as FNE. Few studies, however, have examined neural response to unpredictable social evaluation. In the present study, 25 undergraduate females completed (1) self-report measures to assess FNE and SA, and (2) our novel Mixed Evaluation and uNpredictability (MEAN) task to examine neural response to cues that signal predictable and unpredictable social feedback. In MEAN, participants received social feedback from four female characters—three were always neutral, positive, or negative, and the fourth was unpredictable (i.e. randomly positive or negative). On each trial, feedback was preceded by a social anticipation cue—the character's neutral face paired with a phrase to signal pending evaluation (e.g. "Jessica says..."). The late positive potential (LPP) was measured in response to the social anticipation cue to assess stimulus processing while awaiting predictable and unpredictable feedback. Results showed that a larger LPP to the unpredictable social anticipation cue predicted greater SA, over and above the LPP to predictable neutral, positive and negative social anticipation cues. Moreover, the LPP to the unpredictable social anticipation cue predicted SA over and above FNE. Findings demonstrate the association of SA with sensitivity to cues that signal unpredictable social feedback, and thus contribute to the literature suggesting that SA is characterized by a core sensitivity to unpredictability.

Poster 4-37**THE IMPACT OF PREDICTABILITY ON PSYCHOPHYSIOLOGICAL INDICATORS OF MOTIVATION AND ATTENTION IN ANTICIPATION OF EMOTIONAL PICTURES**

Elizabeth A. Parisi, Brady D. Nelson, & Greg Hajcak
Stony Brook University

Descriptors: emotion, startle reflex, event-related potentials

Temporal predictability and stimulus valence have both been shown to impact psychophysiological indices of motivation (startle reflex) and attention (event-related potentials). However, research has primarily examined these characteristics in isolation and it is unclear whether they have independent or interactive effects. In the current study, 95 participants completed a picture-viewing task during which neutral, pleasant, and unpleasant images were presented with either predictable or unpredictable timing. The startle reflex and probe N100 and P300 were measured in anticipation of picture presentation. Consistent with previous research, results indicated that the startle reflex was increased in anticipation of pleasant and unpleasant relative to neutral pictures – and this effect was similar for both predictable and unpredictable trials. In addition, the startle reflex was potentiated on trials with unpredictable, relative to predictable, timing irrespective of picture valence. Both the probe N100 and P300 were enhanced in anticipation of pleasant and unpleasant relative to neutral pictures, suggesting that the anticipation of motivationally-salient information enhances early sensory attention and primes later attention toward an unexpected stimulus (i.e., startle probe). Predictability had no impact on either the probe N100 or P300. This study suggests that temporal unpredictability uniquely primes defensive motivation, whereas the anticipation of emotional stimuli potentiates defensive and attentional measures of information processing in response to the startle probe.

Poster 4-38**THE INTERACTION BETWEEN AMYGDALA ACTIVATION AND HORMONES PREDICTS SOCIAL ANXIETY SYMPTOMS IN ADOLESCENTS**

Zachary P. Infantolino¹, Jamie Ferri², & Greg Hajcak³
¹University of Delaware, ²University of California, San Francisco, ³Stony Brook University

Descriptors: adolescence, puberty, social anxiety

Research has shown that neutral faces elicit amygdala activation, potentially due to the salience and ambiguity of neutral facial expressions. We previously found that this activation was inversely related to puberty and positively related to social anxiety symptoms. That is, more socially anxious and less developed girls were characterized by increased amygdala activation to neutral faces. The present study examined the interaction between amygdala activation to neutral adolescent faces and hormonal levels of pubertal development on social anxiety symptoms. Adolescents (N = 72) with no history of social phobia completed an emotional face-matching task that contained male and female faces. Results indicated that participants exhibited increased activation in bilateral amygdala for neutral faces relative to shapes. In addition, the interaction between right amygdala activation and hormonal levels of pubertal development predicted social anxiety. Increased amygdala activity to neutral faces predicted social anxiety, but only for less developed girls. These data suggest that hormones associated with pubertal development may moderate the association between amygdala reactivity and social anxiety symptoms.

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Poster 4-39**THE NEURAL CORRELATES OF MENTAL IMAGERY AND WORKING MEMORY IN PSYCHOPATHOLOGY**

Jerry Chen, Nicholas Madian, Whitney N. Geller, & Stacie L. Warren
Palo Alto University

Descriptors: mental imagery, working memory, fMRI

Mental imagery (MI), defined as the ability to mentally construct images, is associated with cognitive functioning, particularly working memory (WM) and attention. Aberrant MI vividness and cognitive dysfunction are associated with anxiety and depression, but the specific mechanisms are not well understood. As MI relies in part on WM and attention, delineating the relationship between MI and cognition can further elucidate their roles in the development and maintenance of psychopathology. The present study examined fMRI responses as a function of MI vividness during a working memory sorting task in community participants with varying levels of co-occurring depression and anxiety. Results demonstrated that the degree of MI vividness differentiated frontal pole regions supporting attentional control: increased MI vividness was associated with greater activity in vmPFC, whereas decreased MI vividness was associated with less activity in bilateral frontopolar cortices. Additionally, behavioral data demonstrated that decreased MI vividness improved WM task performance (e.g., faster RT), while increased MI vividness disrupted WM task performance (e.g., slower RT). In combination, neuroimaging and behavioral results suggest that enhanced MI commandeers task-independent attentional resources, resulting in poorer WM task performance. Overall, the relationship between WM and MI vividness is complex, and present results raise questions about how regions supporting attentional control interact in psychopathology.

Department of Psychology Palo Alto University.

Poster 4-40**DO WAVELETS PROVIDE AN ADVANTAGE OVER TIME DOMAIN CLASSIFICATION FOR ERP BIOMETRICS?**

Maria Ruiz-Blondet, Elizabeth Anderson, & Sarah Laszlo
Binghamton University

Descriptors: biometrics

A significant challenge for brain biometrics regards their collectability; that is, the ease and speed with which they can be collected from a user (e.g., fingerprints are highly collectable, DNA is not). In the particular case of ERP biometrics, collectability is a function of how many sensors and data epochs are needed in order to achieve a particular level of identification accuracy (i.e., protocols requiring fewer sensors and fewer trials are more collectable). One way of improving the collectability of data acquired from a given protocol is to apply machine learning techniques to its post-processing, in order to reduce the amount of raw data needed to make an identification. In prior work, we have demonstrated that a very simple time-domain classifier, built on cross-correlation, can achieve 100% biometric identification accuracy in a pool of 50 users who submitted their ERPs for analysis, when data are considered from 3 electrodes and 360 trials of visual stimulation. Here, we asked whether the minimal classifier needed to achieve 100% recognition could be slimmer (in terms of number of electrodes and trials needed) if data were considered in the combined time/frequency domain, through the use of wavelet transformation. Results indicate that wavelets classification is at least as sensitive as the time domain cross-correlation classifier. We discuss tradeoffs between accuracy advantages obtained with the wavelet classifier and its increased computational weight.

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Poster 4-41**THE P3b COMPONENT OF THE EVENT-RELATED POTENTIAL REFLECTS THE SUBITIZING/COUNTING DISTINCTION IN NUMEROSITY PERCEPTION**

Mark S. Schmidt
Columbus State University

Descriptors: numerosity perception

Subitizing and non-verbal counting are mechanisms proposed for numerosity perception of small item sets. Subitizing (1-3) is fast and accurate; non-verbal counting (4-6) is systematically slower and less accurate. The P3b component of the event-related potential (ERP) is a large positive deflection with onset/offset latencies 300 - 900 ms post-stimulus and maximum amplitude over Pz. P3b amplitude and latency are thought to reflect aspects of stimulus processing; large amplitudes with better discrimination and short latencies with faster evaluation time. In this study, it was predicted that P3b amplitude and latency would reflect the distinction between subitizing and non-verbal counting typically seen with accuracy and response time measures. ERPs were recorded at Pz, Cz, Fz in response to 150 ms dot displays varying in numerosity (1-7). Six odd-ball tasks in which target numerosity (1-6) occurred on 14% of trials were presented. Participants (N=12) responded by pressing one of two buttons (target/non-target) and were instructed to emphasize both accuracy and speed. P3b difference waves (DW) were obtained from target and non-target waveforms at Pz and the jackknife-based scoring method was used to compare DW amplitude and latency across target numerosities. Larger P3b amplitudes and shorter P3b latencies were found in the subitizing range compared with the non-verbal counting range. These results extend previous findings on the subitizing/counting distinction, and provide additional support for P3b as a measure of stimulus discrimination and evaluation time.

Poster 4-42**THE PREDICTIVE VALUE OF PUPILLARY MEASURES OF COGNITIVE LOAD FOR POST-CONCUSSIVE SYMPTOMS IN MILD TRAUMATIC BRAIN INJURY**

Evelyn Cordero^{1,2}, Jamie Hershaw², Jessica Kegel^{1,2}, Ashley Safford^{1,2}, & Mark L. Ettenhofer²

¹Henry M. Jackson Foundation, ²Uniformed Services University of the Health Sciences

Descriptors: pupillometry, post-concussive symptoms

Mild traumatic brain injury (mTBI) research indicates that most cognitive impairments resolve within two to three months of the initial injury. Yet, a small subset of those experiencing mTBI continue to report post-concussive symptoms well beyond the three-month mark. Currently, neuropsychological assessments are the main tool used to measure cognitive impairment, while post-concussive symptoms are typically measured by use of self-report measures such as the Neurobehavioral Symptom Inventory (NSI). Neuropsychological assessments have not been useful in predicting the post concussive symptoms in mTBI; therefore, better predictors are needed. In the current study, we evaluated the ability of pupillary measures of cognitive load in conjunction with neuropsychological outcomes to predict post-concussive symptoms, and compared this to the predictive ability of neuropsychological outcomes alone. Using a series of hierarchical linear models, we discovered that the addition of pupillary metrics significantly improved the predictive value of the model over neuropsychological outcomes alone. This indicates that pupillary metrics, a more direct measure of cognition and neural integrity, may be a useful predictor of post-concussive symptoms.

This project was funded by the Uniformed Services University of the Health Sciences. Disclaimer: The technology described in this manuscript is included in U.S. Patent Application #61/779,801, with rights assigned to USUHS. The views and opinions presented in this manuscript are those of the authors, and do not necessarily represent the position of USUHS, the Department of Defense, or the United States government.

Poster 4-43**THE RELATIONSHIP BETWEEN HEART-RATE VARIABILITY, SLEEP, RESILIENCE, AND BEHAVIORAL HEALTH SYMPTOMS IN A SAMPLE OF INTERNATIONAL CROSS-CULTURAL AID WORKERS**

Page Hayley, Mackenzie Labus, Amy Early, & Nathaniel J. Thom
Wheaton College

Descriptors: resilience

Aid workers represent a unique cohort of people who expose themselves to extreme levels of adversity potentially resulting in behavioral health concerns that affect their performance. We've demonstrated a link between autonomic function, interoception, and behavioral health, suggesting that high-functioning individuals process information distinctively. We conducted a preliminary study by collecting heart-rate variability (HRV) as a measure of autonomic function, and by administering surveys that assess sleep, resilience, and behavioral health to men (n=7) and women (n=3) workers with exposure to tremendous trauma (e.g., rape, murder, natural disaster, bad accident). Our data showed a Pearson Correlation of 0.77 (p=0.07) between the PCL and the low-frequency/high-frequency ratio, suggesting that as self-reported PTSD symptoms rise, HRV decreases. We also found an inverse relationship (r = -0.90, p < 0.01) between the PSQI and the RSES and a positive relationship (r = 0.78, p = 0.04) between the PSQI and the Mini-Screen indicating that better sleep quality is associated with less depressive symptoms and greater resilience. Finally, both the RSES (r = -0.73, p = 0.04) and the CD-RISC (r = -0.83, p = 0.02) showed significant inverse relationships to the Mini-Screen, suggesting that depressive symptoms decrease with increasing resiliency. These preliminary results from our pilot data successfully extend previous research. HRV and sleep may be potential indices of performance under duress among a unique sample. Future studies will directly assess brain activity EEG and fNIRS.

This work was funded in part by Wheaton College's G.W. Aldeen Memorial Fund.

Poster 4-44

THE RELATIONSHIP BETWEEN MINDFULNESS AND ATTENTION TO NEGATIVE EVENTS: AN ELECTROPHYSIOLOGICAL INVESTIGATION

Megan Fisher, Yanli Lin, & Jason S. Moser
Michigan State University

Descriptors: EEG, mindfulness, attention

Substantial research has linked mindfulness with changes in responding to aversive events. The present study examined the relationship between dispositional mindfulness and attentional responding to negative events, in particular. Participants completed a selective attention flankers task and passive picture-viewing task while continuous EEG was recorded. Two event-related potentials (ERPs)—the error positivity (Pe) and the late positive potential (LPP)—were measured to assess attention to errors and attention to negative images, respectively. Dispositional mindfulness was measured using the Five-Factor Mindfulness Questionnaire – Acting with Awareness (FFMW-AA) subscale. Initial correlational analyses showed dispositional mindfulness was associated with both a smaller Pe ($r = -.43, p = .01$) and a smaller LPP ($r = -.45, p = .01$). Moreover Pe and LPP were related to one another ($r = .55, p < .01$), consistent with the idea that both the Pe and LPP are thought to reflect attention to motivationally relevant stimuli (i.e., errors and negative pictures). When simultaneously entered into a linear regression analysis, neither the Pe nor LPP ($ps > .16$) alone predicted dispositional mindfulness. Together, however, the shared variance between LPP and Pe accounted for a significant portion of the variance in dispositional mindfulness ($R^2 = .16, p = .04$). Consequently, our findings suggest that attentional processes may play a key role in the relationship between mindfulness and responding to aversive events.

Poster 4-45

THE RELATIONSHIP BETWEEN SLEEP AND ATTENTIONAL FILTERING UNDER HIGH AND LOW TASK DIFFICULTY

William G. Murphy, Amy Anderson, Ellen Saylor, Jacob Gurera, Catlin Pearson, & Diane L. Filion
University of Missouri - Kansas City

Descriptors: sleep, startle, attention

Research has shown that sleep deprivation negatively affects a variety of cognitive abilities including attention and memory. For attention specifically, Petrovsky (2014) recently reported that one night of total sleep deprivation significantly decreased Prepulse Inhibition of Startle (PPI), a measure that indexes sensorimotor gating and early attentional filtering. Rather than total sleep deprivation, college students often report a more chronic partial sleep deprivation, obtaining less than an optimal amount of sleep each night over a prolonged period. The current study investigates the relationship between objectively measured sleep data and PPI assessed under conditions of high and low task difficulty. Undergraduates ($n=25$) wore commercially available activity bands for two weeks, and then completed a serial arithmetic task that included easy and difficult problems. The task was presented visually and required participants to keep a silent running total in order to report the correct solution at the end of each trial. A startle-eliciting noise burst was presented occasionally throughout each trial, with half preceded by a tone prepulse at a lead interval of 120ms. We hypothesized that there would be a significant correlation between PPI scores and average minutes of sleep per night. Results supported our hypothesis for the difficult task condition ($r = .40, p < .05$) but not the easy condition. This finding highlights the importance of sleep to efficient attentional filtering and also suggests that sleep may be an important moderator of attention during difficult tasks.

Poster 4-46

THE RELATIONSHIPS AMONG MULTIPLE PSYCHOPHYSIOLOGICAL AND SELF-REPORT MEASURES OF NEGATIVE AFFECT INDEXED ACROSS MULTIPLE TASKS WITHIN THE SAME SAMPLE

Daniel E. Bradford, Jesse T. Kaye, & John J. Curtin
University of Wisconsin - Madison

Descriptors: NPU, IAPs, startle

Psychophysiology research has begun to combine multiple physiological and self-report measures in attempts to better index latent constructs relevant to psychopathology and individual differences in emotion. These goals are synergistic with recent RDoC and related initiatives designed to further understand mechanisms in psychopathology. These efforts may be most successful if they include data from both multiple measures and multiple tasks. In the current study, participants ($N = 128$) completed the No Shock, Predictable Shock, Unpredictable Shock (NPU) task, Affective Picture Viewing task (APV), and Resting State task twice separated by one week. We measured potentiation/modulation scores in NPU and APV tasks for startle and corrugator responses and general startle reactivity in the Resting State task. We also administered an array of trait negative affect related self-report questionnaires. We examined correlations among all of these psychophysiological and self-report variables across sessions. We then completed an exploratory factor analysis (EFA) to test evidence for underlying constructs of relevance. We found moderate to strong significant correlations within and between some psychophysiological and self-report variables. However, EFA analysis with various multiple factor solutions suggests that the relationships among these variables may be dominated by method variance. This should raise concerns and spur discussion about issues relating to method variance when attempting to tease out underlying constructs of interest.

Poster 4-47

THE REWARD POSITIVITY IS RELATED TO BIASED CLASSIFICATION OF EMOTIONAL FACES

Amanda Levinson¹, Brandon E. Gibb², & Greg Hajcak¹
¹Stony Brook University, ²Binghamton University

Descriptors: reward positivity, face morphing, emotion recognition

Individual differences in the Reward Positivity (RewP) have been related to reward-related neural networks using fMRI, self-report and behavioral measures of reward sensitivity, as well as variability in depression and depression risk. Depression is characterized more broadly by biased processing of positive and negative emotional stimuli. The current study of 107 girls aged 8 to 13 sought to examine whether reward sensitivity as indexed by the RewP would predict sensitivity to emotional information. The participants completed a face morphing task in which they view images of faces gradually changing from neutral to emotional (happy, sad, or afraid) and are instructed to classify the emotion as quickly as possible. The RewP was also elicited using the doors guessing task. We then examined the relationship between the RewP and behavioral measures of emotion detection on the face morphing task. Correlational analyses found a smaller RewP was associated with slower reaction times to all emotional faces. In hierarchical regression analyses, after adjusting for age and reaction times to other emotional faces, a smaller RewP predicted slower reaction time to happy faces and faster reaction time to sad faces. Together, these data suggest that an increased RewP is associated with a behavioral bias to classify emotional faces expressing positive affect (i.e., happy) and not negative affect (i.e., sad). Insofar as both measures have been linked to depression, future work will explore whether these measure can be used in combination in relation to depression and risk.

Funding provided by the NIMH (# 1 R01 MH097767-01).

Poster 4-48**THE ROLE OF MACULAR PIGMENT OPTICAL DENSITY IN CHILDREN'S ATTENTIONAL CONTROL AND ACADEMIC ACHIEVEMENT**

Anne Walk¹, Naiman A. Khan¹, Sasha McCorkle¹, Eric S. Drollette¹, Lauren B. Raine¹, Arthur F. Kramer², Neal J. Cohen¹, Lisa Renzi³, Billy Hammond³, & Charles Hillman²

¹University of Illinois at Urbana-Champaign, ²Northeastern University, ³University of Georgia

Descriptors: attentional control, lutein, cognitive development

Macular pigment, specifically the carotenoid lutein, has been the focus of several recent reports related to brain and cognitive health. Early evidence suggests that lutein may be especially critical for neural development in children. However, to date no systematic investigation has attempted to link lutein to measurements of brain or cognition in children. We measured macular pigment optical density (MPOD) using a modified heterochromatic flicker photometry technique in 54 preadolescent children (8-9-year-olds). ERPs were used to measure the neural correlates underlying attentional control during a modified Eriksen flanker task. The Kaufman Test of Educational Achievement (KTEA) was implemented to assess academic achievement. For incongruent flanker trials, where attentional control demands are high, MPOD was directly related to response accuracy, but indirectly related to P3 amplitude at midline electrodes as well as at a six sensor region of interest encompassing the topographic maxima. These results suggest that lutein may be related to neural efficiency, especially when attentional control is employed. In addition, MPOD was positively related to the math composite and subtests of the KTEA. These results indicate that lutein is related to cognitive and brain health in a variety of domains within the pediatric population.

This research was funded by Abbott Nutrition through the Center for Nutrition, Learning, and Memory (CNLM) and by NIH Grant (HD069381). Lauren Raine was supported by the Agriculture and Food Research Initiative of the USDA National Institute of Food and Agriculture under the Illinois Transdisciplinary Obesity Prevention Program grant (2011-67001-30101) to the Division of Nutritional Sciences at the University of Illinois.

Poster 4-49**THE SELECTIVELY NEGATIVE INFLUENCE OF CENTRAL ADIPOSITY ON NEUROELECTRIC INDICES IN PREADOLESCENT CHILDREN**

Lauren Raine¹, Neal J. Cohen¹, Arthur F. Kramer², Naiman A. Khan¹, & Charles H. Hillman²

¹University of Illinois at Urbana-Champaign, ²Northeastern University

Descriptors: visceral adipose tissue, P300

The neurocognitive impact of adiposity during childhood remains controversial. Visceral adipose tissue (VAT) is metabolically active and implicated in inflammation and insulin resistance; however, the influence of VAT on children's cognitive function remains virtually unexamined. This investigation evaluated the impact of VAT on neuroelectric and behavioral indices of cognitive function among 9-10-year-old children. 94 children (41 females) performed flanker and oddball tasks while event-related brain potentials (ERPs) and task performance were recorded. %body fat (%FM) and VAT were assessed by DXA. Covariates included demographics, IQ, and fitness. Males and females had different levels of VAT and %FM, warranting separate analyses by sex. Correlation analyses revealed no significant associations between behavior and adiposity. However, %FM and VAT were negatively correlated with P3 amplitude at central-parietal midline electrodes. Regressions were performed to determine whether the association between %FM and P3 amplitude was mediated by VAT, following adjustment of age and fitness. Although %FM was negatively associated with P3 amplitude in the regression models, this relationship was mediated by VAT. Increasing VAT negatively predicted P3 amplitude only during the flanker task

condition requiring upregulation of inhibitory control. These results suggest that, in males, VAT compromises inhibitory control when task demands are increased. These results point to VAT as an adiposity marker related to the neural underpinnings of cognitive control in prepubescent males.

Supported by the Center for Nutrition, Learning, and Memory at the University of Illinois, Abbott Nutrition, and the Agriculture and Food Research Initiative of the USDA National Institute of Food and Agriculture under the Illinois Transdisciplinary Obesity Prevention Program grant (2011-67001-30101) to the Division of Nutritional Sciences at the University of Illinois.

Poster 4-50**THE ROLE OF STRIATAL DOPAMINE IN ATTENTIONAL FLEXIBILITY**

Rebecca Calcott, & Elliot Berkman
University of Oregon

Descriptors: cognitive control, attentional flexibility, dopamine

Effective cognitive control requires not only stable maintenance of one's attentional focus, but also flexible adjustment of attentional focus when necessary. Stability and flexibility of attention appear to exist in an antagonistic balance, such that higher flexibility comes at the cost of greater distractibility and thus reduced stability. Dopamine (DA) is thought to influence this balance between stability and flexibility, but its precise role remains unclear. The aim of the present study is to clarify the role of DA by independently examining flexibility and distractibility within a single task. Participants (N=64) completed an attention shifting task. Flexibility was indexed by the switch cost magnitude when subjects shifted between attending one of three standard colors (red, blue, green) in an array. To measure distraction, a task-irrelevant distractor in a novel color (e.g., orange) appeared on 20% of trials. DA was measured using eye blink rate (EBR), a marker of striatal DA levels. EBR significantly interacted with trial type, such that EBR positively predicted switch costs on standard trials, but not on trials with oddball distractors. Thus, higher striatal DA was linked with reduced flexibility when switching to a familiar but previously-irrelevant target. Critically, these data suggest that DA may be specific to flexibility and may not be involved in distractibility by novel, task-irrelevant stimuli. A follow-up study will use eye tracking to determine the particular gaze patterns that underlie these DA-linked effects on switch costs.

Poster 4-51**THE ROLE OF THE LEFT DORSOLATERAL PREFRONTAL CORTEX IN PROSPECTIVE MEMORY: A DIRECT CURRENT STIMULATION STUDY**

Ashley Scolaro¹, & Kira Bailey²

¹Central College, ²Ohio Wesleyan University

Descriptors: prospective memory, DLPFC, direct current stimulation

The gateway hypothesis posits differential roles of the lateral and medial prefrontal cortices in prospective remembering (Burgess et al., 2008). Given that recent studies have demonstrated improved performance on task switching after anodal direct current stimulation of the left dorsolateral prefrontal cortex (Leite et al., 2013; Loftus et al., 2015), we hypothesized that similar stimulation would improve prospective remembering. In the current study, transcranial direct current stimulation was applied to the left dorsolateral prefrontal cortex of healthy participants while they completed two task-switching blocks (one block included an embedded prospective memory component). Analyses of ongoing trials replicated previous findings of a cognitive benefit of anodal stimulation of the left dorsolateral prefrontal cortex. Surprisingly, anodal stimulation of the left dorsolateral prefrontal cortex reduced prospective accuracy relative to sham and cathodal stimulation conditions suggesting a complex role of the dorsolateral prefrontal cortex in task switching and prospective memory paradigms.

Poster 4-52**THE ROLE OF THE RIGHT HEMISPHERE IN THE PROCESSING OF LEXICALLY MARKED SYNTACTIC VIOLATIONS**Michelle Leckey, & Kara D. Federmeier
University of Illinois at Urbana-Champaign*Descriptors: language, syntax*

Evidence from both brain-damaged and neurologically intact participants has suggested that the right cerebral hemisphere (RH) is more able to process language syntax than was traditionally appreciated. Recent work has further linked RH involvement in syntactic processing to the familial sinistrality profile of the individual. In response to phrase structure violations those right-handers who do not have left-handed relatives (FS-) show a P600 response in the left hemisphere (LH) only, whereas right-handers with left-handed relatives (FS+) show a bilateral P600 response. Findings like these raise questions about what aspects of syntax the RH of the FS- group can appreciate. Prior work has shown that lexically marked syntactic violations elicit a bilateral P600 compared with a LH-only response to morphologically marked violations, suggesting that the RH may rely more on lexical aspects of language when processing syntax. Here, we followed up on these findings by examining whether lexically marked violations will show differential patterns of RH P600 responses based on familial sinistrality. 48 young adults (24 FS-, 24 FS+) were presented with sentences containing lexically marked morphosyntactic violations, the probability of which was manipulated across blocks. Both the FS- and FS+ groups showed a bilateral P600 response, indicating that the RH of FS- participants is capable of appreciating syntactic information under at least some conditions.

Poster 4-54**THE SOCIAL MIND: HOW ASCRIBED SENDER EXPERTISE AMPLIFIES CORTICAL PROCESSING OF EMOTIONAL LANGUAGE FEEDBACK**Sebastian Schindler, & Johanna Kissler
Bielefeld University*Descriptors: EEG/ERP, social feedback, language/emotion*

The personal significance of a language statement depends on its communicative context. Recently, studies showed that emotional and neutral adjectives are processed more intensely when putatively sent by another human compared to a computer. Here, we investigated how ascribed expertise alters the cortical processing of language-based personality feedback.

To this end, thirty participants described themselves in a video interview and filled in a short personality questionnaire. They were told that based on this an 'expert' (psychotherapist) or a 'layperson' evaluated them on written positive, negative, or neutral adjectives, while high-density EEG was recorded. In a control condition participants received putatively random computer-feedback. Actually, in all conditions random feedback was presented.

Sender effects modulated the N1, P2, EPN, P3 and LPP amplitudes. Crucially, linear trends showed for all components that decisions by an 'expert' led to largest amplitudes, followed by those of a 'layperson'. An interaction on the P3 showed that all decisions from the 'expert' were amplified, while for the 'layperson' this was only the case for emotional feedback. Linear effects were also observed in source space in broad visual, parietal, frontal and somatosensory regions as well as in the posterior cingulum. Finally, emotional decisions led to larger P3 and LPP amplitudes.

These findings show the contextual plasticity of (emotional) language processing and highlight the importance of developing ecologically situated communicative designs to investigate its neuronal bases.

Poster 4-55**THE EFFECTS OF ACETAMINOPHEN ON THE LATE POSITIVE POTENTIAL DURING PASSIVE IMAGE VIEWING**Katie E. Garrison¹, Julia B. McDonald², Adrienne L. Crowell³, Nicholas J. Kelley⁴, & Brandon J. Schmeichel¹¹Texas A&M University, ²University of South Florida, ³Hendrix College, ⁴Northwestern University*Descriptors: emotion/affect, acetaminophen, late positive potential*
Acetaminophen, the active ingredient in Tylenol, is a common over-the-counter pain reliever. Research has suggested that acetaminophen blunts not only physical

pain but also emotional pain (Durso, Luttrell, & Way, 2015). In the current experiment we moved beyond self-reported measures to test the hypothesis that acetaminophen blunts emotional responding at the neural level. The late positive potential (LPP), an event-related potential in the electroencephalogram (EEG), served as our index of emotional responding. Undergraduate participants were randomly assigned to ingest either acetaminophen or a placebo. Later, participants' brain activity was recorded as they viewed 19 positive, 19 negative, and 19 neutral images presented in random order and displayed for 6 seconds each. We quantified the LPP as the mean EEG activity in the time window 500-1000 ms after picture onset. Results revealed a main effect of picture type, such that positive and negative images elicited larger LPPs than neutral images. Contrary to predictions, there was no effect of pill condition and no interaction between pill condition and picture type on LPP magnitudes. We explored moderating effects of trait behavioral inhibition sensitivity (BIS) and discovered an interaction between pill condition and BIS. Specifically, trait BIS predicted LPP magnitudes during emotional images in the placebo condition, but this relationship was eliminated by acetaminophen. This finding fits with the hypothesis that acetaminophen modulates emotional responding.

Poster 4-56**THE STARTLE PROBE P3 DURING EMOTIONAL IMAGERY**Rachel Zimmerman, Zachary Clark, Karly Bender, Destiny Davis, Carlie Bright, Tiffany Barker, Melanie Hetzel-Riggin, Victoria A. Kazmerski, & David R. Herring
Pennsylvania State University, Erie*Descriptors: imagery, EEG, emotional engagement*

Picture perception research indicates that startle probe P3s of the event-related potential are reduced for emotional compared to neutral stimuli. These data suggest emotional images require more attention thus leaving fewer resources to attend to the auditory probes. Given different emotion induction techniques engage different processes evident by unique peripheral physiology (e.g., startle EMG), we investigated whether probe P3s during emotional imagery would be similarly reduced relative to probe P3s during neutral imagery, akin to the picture perception literature. Fifteen participants underwent a narrative script-driven emotional imagery procedure. These narrative scripts were followed by an imagery period in which 95 dB startle probes were presented. Similar to the picture perception literature, probe P3s were reduced during emotional relative to neutral imagery. These initial data suggest that while peripheral physiology may be distinct between emotional imagery and perception, attention is allocated similarly to emotional stimuli during these induction techniques. The probe P3 may prove useful as a measure of emotional engagement during script-driven imagery.

Poster 4-57**THE STUDY OF OPTO-KINETIC NYSTAGMUS CHARACTERISTICS DURING VECTION ILLUSION PERCEPTION**Artem Kovalev, & Galina Menshikova
Lomonosov Moscow State University*Descriptors: opto-kinetic nystagmus, vection illusion, virtual reality*

Motion sickness symptoms can occur in the absence of real physical motion of the observer. Specifically, the self-motion illusion, or vection illusion (an example of visually induced motion sickness) often ensues as a result of exposure to dynamic visual displays. We developed a method of quantitative evaluation of the vection illusion (VI) strength based on optokinetic nystagmus (OKN) characteristics during the VI perception. According to our hypothesis the OKN may be considered as the compensation mechanism to reduce the VI. We studied the VI strength depending on viewing angle values of dynamic visual displays. The VI was initiated using the CAVE virtual reality system. The VI strength was analyzed using the SSQ questionnaire and OKN characteristics. Results revealed complex links between viewing angle values, the VI strength and OKN characteristics. When dynamic visual displays were occupying half of the visual field, the VI strength and OKN characteristics were not very pronounced. For displays which occupied the whole visual field the VI strength was greatly higher and the OKN characteristics were significantly changed: there were a lot of microsaccades in the slow OKN phase and high-amplitude high-frequency saccades in the fast OKN phase with blinks at the end of the OKN cycle. Our result showed that the OKN characteristics were tightly linked with the VI strength, so it would be possible to use them as real time indicators of the VI perception.

Poster 4-58**THE TIME-COURSE OF OUTCOME EVALUATION IN AN OBSERVATIONAL LEARNING TASK**

Rebecca Burnside, Adrian G. Fischer, & Markus Ullsperger
Otto-von-Guericke University Magdeburg

Descriptors: observational learning, FRN, P3

Reinforcement learning theory states that learning is driven by prediction errors—the discrepancy between the predicted and actual outcome of a performed action. It is unclear, however, how learning occurs in the absence of a performed action and how this process unfolds over time. This study examines the temporal dynamics of observational learning, using a combination of EEG recording and model-based analyses. Twenty participants learned the stimulus-outcome contingencies for a probabilistic three-armed bandit task. They played in pairs, with the acting and observing player switching every one to three trials. An adapted Q-learning algorithm (Sutton & Barto, 1998) was fit to participants' choices in this task. Comparable model estimated learning rates were obtained for trials in which the same player acted consecutively, relative to when players switched from an observing to an acting role. This suggested that participants weighted the outcomes they received from making and observing choices on each trial similarly. A feedback-related negativity (FRN), which is an event-related potential (ERP) component that is thought to index reward prediction error, was also elicited equivalently in each condition. In contrast, P3a (FCz) and P3b (Pz) ERPs were smaller in amplitude when participants viewed the action-outcomes of the other player. The P3b has been linked to behavioural adaptation. Therefore, it is the aim of an ongoing analysis to determine if response-switching can be predicted by trial-by-trial P3 amplitude to the same extent in the acting and observing conditions.

Poster 4-59**TASK INSTRUCTIONS MODULATE REWARD POSITIVITY AMPLITUDE ELICITED BY FEEDBACK INDICATING MONETARY REWARDS AND PHYSICAL PAIN**

Sepideh Heydari, & Clay B. Holroyd
University of Victoria

Descriptors: reward positivity, decision making, EEG

Substantial evidence indicates that midbrain dopamine neurons encode a reward prediction error (RPE) signal that indicates whether a forthcoming reward is better or worse than expected. These RPE signals are believed to be utilized for the adaptive modification of behavior according to principles of reinforcement learning (RL). Further, the RL theory of the reward positivity (RewP) proposes that the impact of RPE signals on anterior cingulate cortex (ACC) produces a component of the event-related brain potential termed the RewP. However, with respect to painful stimuli, evidence for the theory is mixed: whereas Talmi and colleagues reported that the RewP is elicited by stimuli that indicate forthcoming pain, we have found that stimuli that predict the omission of pain elicit a delayed RewP. Here we investigated this discrepancy by recording ERPs in a RewP task in which subjects either searched for monetary rewards or avoided pain. But in contrast to the standard version of the task, in which subjects are instructed to find as many rewards as possible or avoid as many punishments as possible, here we told them that the experiment would terminate after they found a fixed (but unspecified) number of rewards and punishments in reward and aversion conditions, respectively. We predicted that in the aversion condition stimuli that predicted forthcoming pain should elicit the RewP because each painful stimulus indicates progress toward achieving the larger task goal (i.e., ending the task as soon as possible). Preliminary results are consistent with this prediction.

Natural Sciences and Engineering Research Council of Canada (NSERC).

Poster 4-60**THE INTERRELATION BETWEEN TIME-FREQUENCY HEART RATE VARIABILITY AND PULSE TRANSIT TIME DURING PSYCHOPHYSIOLOGICAL STRESS.**

Miguel Sánchez Hechavarría¹, Ramón Carrazana-Escalona¹, & Beatriz Ricardo-Ferro²

¹Medical Science University of Santiago de Cuba, ²Medical Biophysics Center

Descriptors: time-frequency heart rate variability, psychophysiological stress, pulse transit time

Background: Pulse transit time (PTT) is a simple, non-invasive measurement and an appropriate parameter for stress measurement, but few quantitative data are available describing the factors which influence PTT.

Objective: The aim of this study was to investigate beat-to-beat the relationship between time-frequency heart rate variability, the cardiac interval (RR), PTT-onset and PTT-peak, using psychophysiological stress to generate changes in these variables.

Methods: In a crossover design, 10 subjects (19 ± 1.5 years of age) we evaluated correlation the beat-to-beat autonomic nervous system activity by testing the wavelet time-frequency heart rate variability (LH, HF, LH_HF), the interval RR, PTT-onset and PTT-peak, obtained by ECG and pulse tonometry signal in polygraph device (AD Instruments Powerlab 8®) for 5 min of rest and during 5 min of responses to mental stress (arithmetic test).

Results: Examining changes over time there found good correlation 0.66 between PTT-onset and PTT-peak, with a reduction ($r = 0.48$) in mental stress and a lower correlation between the other variable, but however in mental stress with concerning to the rest there was a increase of correlation PTT peak/LF, PTT peak/HF, PTT peak/RR, PTT onset/LF and a decrease of correlation PTT peak/LF_HF, PTT onset/HF, PTT onset/LF_HF, PTT onset/RR.

Conclusion: These results suggest that pulse transit time of pulse peak is more adequate for to show cardiovascular sympathetic changes during psychophysiological stress.

Poster 4-61**TO PLAY OR NOT TO PLAY: LONG-TERM NEUROLOGICAL CHANGES ASSOCIATED WITH SPORTS-RELATED CONCUSSIVE & NON-CONCUSSIVE HEAD IMPACTS RECEIVED DURING ADOLESCENCE**

Desiree Budd¹, Michael P.W. Donnelly², Amanda LaBode¹, Jessika Tollefson¹, Kevin DuVall¹, Paige Mullen¹, Rebecca Olson¹, Christina Scinto¹, & J. Johanna Hopp¹

¹University of Wisconsin - Stout, ²Sulcus Scientific Consulting, LLC

Descriptors: concussion, auditory oddball task, P300 event-related potential
Concussion is problematic at any age, but this may be especially true for adolescents, whose frontal lobes are still developing. It is already clear that adolescents who experience concussion will have lingering aftereffects in cortical function for many years. We wondered whether it would be possible to detect altered P300 in young adults who had played collision sports as adolescents, but who had not experienced patent concussion. We used a three tone auditory oddball task to compare P300 for three groups of male college students: two groups who had played football in high school (one group of players who had experienced concussion and one group who reported no concussions) and a third group who had no history of concussion and had only played limited contact sports. Participants performed the auditory oddball task while we measured their neural activity using EEG. Preliminary data indicate that P300 component for individuals who experienced one or more concussions was decreased in amplitude and had a longer latency compared to age-matched subjects who never played football or experienced a concussion. While not as extreme, the P300 component for football players who never experienced a concussion showed P300 effects similar to the concussed group. We believe this result indicates possible lasting effects of non-concussive impacts on neural function in young adults.

Poster 4-62**TRAIT-INFLUENCES ON NEURAL CORRELATES OF PERFORMANCE MONITORING IN A DIMENSIONAL SAMPLE OF HEALTHY INDIVIDUALS AND PATIENTS WITH OCD**

Julia Klawohn, Anja Riesel, & Norbert Kathmann
Humboldt-University Berlin

Descriptors: ERN, psychopathology, performance monitoring

Overactive performance monitoring, as indexed by increased amplitudes of error-related negativity (ERN), represents one of the most robust psychophysiological findings in patients with obsessive-compulsive disorder (OCD). But increased ERN amplitudes have also been found in other psychiatric disorders, such as general and social anxiety, as well as in healthy individuals with high levels of traits linked to anxiety, negative affect, and worry. The relation of trait influences and disorder effects on ERP correlates of performance monitoring is not fully understood and the study thus aimed at an extensive investigation of the respective contributions of traits associated with anxiety and compulsivity (e.g. habitual negative affect, worry, perfectionism, sensitivity for punishment, conscientiousness) to variations in ERN amplitudes. To this end, 75 healthy control participants were recruited stratified with regard to OC-symptoms (i.e. low, medium, and high) and parallelized to a group of 25 patients with OCD. From all participants, EEG data as well as peripheral psychophysiological measures were collected during a flanker task. Results from regression analyses indicate strongest determination of ERN amplitudes by conscientiousness and sensitivity for punishment. Analyses further showed that highly obsessive participants displayed ERN amplitudes comparable to those of the OCD patients group, but differed in dimensional trait measures such as resilience. Implications for clinical as well as performance monitoring research will be discussed, supported by the German Research Foundation (DFG; KA 815/7-1)

Poster 4-63**TRAJECTORIES OF PRE-EJECTION PERIOD ACROSS ADOLESCENCE: THE ROLE OF INTERPERSONAL RELATIONSHIPS AND INDIVIDUAL DIFFERENCES**

Ekjyot Saini, Lauren Philbrook, Margaret Keiley, Stephen Erath, & Mona El-Sheikh
Auburn University

Descriptors: adolescence, pre-ejection period, relationships

Sympathetic nervous system (SNS) activity is a marker of physiological arousal that is affected by external influences. Pre-ejection period (PEP) is a cardiovascular measure of SNS activity. Basal PEP functioning stabilizes across childhood (Hinnant et al., 2011), but little is known about developmental changes across adolescence. The present study examines how interpersonal relationships predict trajectories of PEP in addition to testing differences by race and sex.

A community sample of 251 adolescents (51% female; 65% European American (EA), 35% African American (AA)) participated in laboratory visit at ages 16, 17, and 18. Basal PEP was assessed using Mindware hardware and software and adolescent self-report on relationships with peers and parents was collected with well-established measures.

Multi-group growth modeling analyses revealed that AA youth exhibited a decrease in PEP across late adolescence, signifying increased sympathetic activity, whereas EA youth did not show change over time. For AA males, deviant peer affiliations (e.g., friends who break rules, do not attend school) predicted a decrease in PEP ($\beta = -.056, p < .05$). Hostile parental control (e.g. remind child frequently of mistakes) predicted lower PEP levels for AA females ($\beta = -.019, p = .05$). Findings suggest that AA adolescents show a developmental increase in SNS activity, with implications for later cardiovascular health risks. Furthermore, facets of negative relationships across parent and peer domains influence PEP trajectories differently for boys and girls.

Poster 4-64**TRAJECTORIES OF SLEEP AND CARDIAC-SYMPATHETIC ACTIVITY IN CHILDHOOD: AN EXAMINATION OF RECIPROCAL RELATIONS**

Lauren Philbrook, Ekjyot Saini, Benjamin Hinnant, & Mona El-Sheikh
Auburn University

Descriptors: sympathetic nervous system, sleep, children

Lower quality sleep is associated with poorer psychological and physical health, but the mechanisms of effects in these relations are not clear. One potential pathway is via sympathetic nervous system (SNS) activity. Lower quality sleep is predictive of higher SNS activity (Michels et al., 2013). At the same time, higher SNS activity may also interfere with an individual's ability to sleep (Dahl, 1996). Making a novel contribution, the present study examined the association between SNS activity and sleep quality over time in order to extricate the potential reciprocal influences between these two bioregulatory processes.

Children ($N = 336$) participated in a laboratory visit when they were 9, 10, and 11 years old. SNS activity was assessed via pre-ejection period (PEP) at rest using Mindware hardware and software. Children's sleep was examined objectively per state of the science recommendations using actigraphs for seven nights. Sleep efficiency, a key index of sleep quality, was derived and is defined as the percent of the night spent asleep (between sleep onset and wake time).

Growth modeling analyses demonstrated that sleep efficiency predicted an increase in resting PEP, signifying a decrease in SNS activity over development, $\beta = .10, p < .05$. Resting PEP did not predict change in sleep efficiency. The fit of the model was good ($\chi^2(21.62/df 10) = 2.16, p = .02$; RMSEA $< .06$). Findings suggest that better quality sleep is predictive of a developmental increase in resting PEP, with implications for better physical and mental health.

National Heart, Lung, and Blood Institute Grant Number R01HL093246 awarded to Mona El-Sheikh.

Poster 4-65**TRAUMA AND THE RUBBER HAND ILLUSION: BODY, SELF, AND SHAME**

Wesley E. Gregory¹, Nicholas Fehertoi¹, Treva Van Cleave², & Wendy D'Andrea²

¹The New School, ²The New School for Social Research

Descriptors: childhood trauma, body ownership, rubber hand illusion

The rubber hand illusion (RHI) attempts to manipulate sense of body ownership through the adoption of a false rubber hand as one's own. This task has been implicated in the sense of self, and its constituent senses of body ownership and agency. Sustained or chronic trauma, often occurring in childhood, has been thought to result in altered capacity to feel the bodies, and by extension the self. The present study used the RHI and various questionnaires to assess how childhood trauma affects the malleability of one's body schema, and how differences in subjective ratings of the RHI affect experience of shame and identity. In the RHI, change in hand temperature is interpreted as loss of body ownership. Our study ($N = 56$) found that individuals with childhood trauma ($N = 23$) had a significant drop in temperature for the replaced hand relative to those without a history of trauma, $t = 3.08, p < .001$. Additionally, individuals endorsing a history of childhood trauma rated the subjective effectiveness of the rubber hand illusion as significantly higher than those who did not, $t = -2.28, p < .05$. Further, individuals reporting a higher sense of the RHI reported a higher degree of traumatic shame, $t = .382, p < .05$, and a higher degree of identity diffusion, $t = 2.62, p < .05$, than those less susceptible to the RHI. Our results suggest that people who have experienced trauma early in life have a sense of body ownership is more easily altered, and thus a more diffuse sense of self and identity overall, paired with a higher degree of shame, which has been associated with low feelings of self-agency.

Poster 4-66**TURNING UP THE HEAT ON COLD COGNITION: TASK SWITCHING UNDER THREAT**

James R. Yancey, Colin B. Bowyer, Jens Foell, Kara Hulstrand, & Christopher J. Patrick
Florida State University

Descriptors: fear potentiated startle, threat sensitivity, task switch

Understanding the interplay between cognitive and emotional systems is crucial to a process-oriented account of adaptive and maladaptive behavior. A major question of interest is how activation in basic motivational circuits affects the capacity for cognitive control in different contexts and in people with differing attributes. A well-established procedure for studying flexible responding ('set-shifting') as a facet of cognitive control is the task-switching paradigm, in which two tasks entailing different responses to the same stimuli are performed in alternation. The current study was undertaken to examine the impact of defense-system activation prompted by physical threat on behavioral performance and physiological reactivity in a task switching procedure, in general and as a function of variations in traits of fearfulness and inhibitory control. A novel task-switching paradigm was used in which participants responded in differing ways to neutral human faces depending upon the position of the face. A threat manipulation was included involving receipt of intermittent electric shocks in some trial blocks. Results for the overall sample indicated increased accuracy and decreased reaction time on trials requiring a switch of rule set during threat versus non-threat blocks. Furthermore, these effects on flexible responding were associated both with variations in startle potentiation during threat blocks and variations in dispositional fear. Implications for understanding processes underlying variations in cognitive performance under conditions of threat will be discussed.

Poster 4-67**TWO SYSTEMS OF RECOGNITION MEMORY IN HUMAN BRAIN**

Stanislav A. Kozlovskiy¹, Anastasia K. Neklyudova¹, Alexander V. Vartanov¹, Andrey A. Kisel'nikov¹, & Julia A. Marakshina^{1,2}
¹Lomonosov Moscow State University, ²Psychological Institute of Russian Academy of Education

Descriptors: recognition memory, event-related potentials, dipole localization

Recognition memory was investigated during involuntary encoding situation. 18 healthy right-handed subjects (9 males) 18-28 y.o. participated. The experiment consists of two series. In the first series pictures of different objects were shown sequentially for 1000 ms. The subjects were instructed to classify objects as 'animated'/'inanimated'. The second series in which previously presented and new stimuli were shown quasi-randomly was conducted in 48 hours. The subjects had to decide if they had seen an object before. 19-channel EEG was registered. Event-related potentials were averaged during presentation of objects according to the answers. Then dipole sources were calculated using of BrainLoc 6.0 software (two-dipole dynamic model, $KD \geq 0.95$). The activation of right cingulate gyrus was revealed at latency 300-400 ms during the recognition of previously presented stimuli. Furthermore, activation was observed in right putamen (100 and 500 ms) and left hippocampus (200 ms) during the recognition of stimuli as new. We could hypothesize that there are two functional systems connected with recognition memory according these findings: the first one is responsible for recognition of previously presented stimuli and the second one supports recognition of objects as new. Right cingulate gyrus is involved in functioning of the first system, while combined work of right putamen and right hippocampus provides functioning of the second system. We suppose that hippocampus is responsible for the retrieval of information from episodic memory while putamen has a modulating effect on it.

The research was supported by the Russian Science Foundation (project № 16-18-00066).

Poster 4-68**UNEXPECTED ABSENCE OF REWARDS OR PUNISHMENTS AND THE FEEDBACK-RELATED NEGATIVITY**

Heather Soder, Andrew Vieira, & Geoffrey Potts
University of South Florida

Descriptors: punishment sensitivity, feedback-related negativity, worse-than-expected

According to the dominant theory of the Feedback Related Negativity (FRN), Holroyd and Coles (2002) Reinforcement Learning Theory, outcomes that are worse-than-expected should elicit an FRN. Typically studies have used monetary loss as the punishment, which is the absence of an appetitive stimulus. Few studies have employed actual punishment: the presence of an aversive stimulus. Here, participants completed two conditions of a passive S1/S2 outcome prediction design, one rewarding and one punishing. In the rewarding condition participants received expected and unexpected rewards (\$1) or withheld rewards (\$0). In the punishing condition participants received expected and unexpected punishments (white noise burst) or withheld punishments (silence). Both unexpected withheld rewards (worse-than-expected) and unexpected withheld punishments (better-than-expected) elicited a similar FRN. This challenges the Reinforcement Learning hypothesis which states that the FRN indexes valenced (good/bad) outcome prediction violation. Instead this result suggests that the FRN indexes the unexpected absence of a motivationally salient stimulus, regardless of valence. Additionally, a positivity that occurs to unexpected delivered rewards (Reward Positivity: RewP) was also found here to unexpected delivered punishments. The medial frontal neural system indexed by the FRN/RewP may respond in a bipolar manner to prediction violations, but not better or worse than expected, but rather the unexpected presence or absence of a motivationally salient stimulus regardless of valence.

Poster 4-69**USING MEMORY-GUIDED SACCADES TO UNDERSTAND THE EFFECTS OF SPORT-RELATED REPETITIVE HEAD IMPACTS RECEIVED DURING ADOLESCENCE**

Paige Mullen, Kaitlyn Rowley, Jimmy Vance, Desiree Budd, & J. Johanna Hopp
¹University of Wisconsin - Stout

Descriptors: concussion, memory-guided saccades, cognitive function

This study compares the attention and short-term memory processing of college students who played high contact (e.g. football) or low contact (e.g. track) sports in high school, either with or without past concussion. While concussion has detrimental effects on cognition, the effects of sub-concussive head impacts, particularly in the short-term, is less understood. In this study, subjects completed either a general memory-guided (MG) saccade task or a MG saccade adaptation. Memory-guided saccades utilize short-term memory processing in the frontal lobe, an area thought to be involved in MG adaptation and affected by concussion. In both experiments, subjects fixated a visual target while a peripheral target was flashed briefly in the periphery. After a short time, they looked to the location of the flashed target. In the general study, characteristics of the performance (accuracy and latency) and the subject's ability to stay attentive to the task were examined. For MG adaptation, the characteristics of the adaptation, including the degree and time course, were studied. Finally, for both experiments, subjects completed a sport demographic survey assessing their sport participation experience and concussion history. Preliminary results indicate a difference between the groups regarding attention to the task and adaptation characteristics. A detailed comparison of the behavioral performance between the different populations and the implications this has on understanding the effects of sport-related repetitive head impacts with, and without, concussion will be discussed.

Poster 4-70**USING RETRIEVAL PRACTICE TO PROTECT MEMORY AGAINST STRESS**

Amy M. Smith, & Ayanna K. Thomas
Tufts University

Descriptors: stress, memory

Stress induced prior to memory retrieval often results in substandard memory performance. In the present study, we aimed to determine whether a learning technique called retrieval practice could protect memory against the negative effects of stress. Retrieval practice involves the initial studying of information followed by repeated attempts to remember that information. This technique has been widely shown to improve memory performance relative to repeated re-studying. The present study examined whether the utility of learning through retrieval practice could extend to retrieval under stress. Prior to stress induction, participants learned pictures and words through either study practice or retrieval practice. Twenty-four hours later, we induced stress in half of the participants using the Trier Social Stress Test for Groups (TSST-G) and measured memory performance. As a manipulation check, we also measured heart rate before, during, and after the TSST-G tasks using Empatica E4 wristbands. Compared to their pre-stress values, stressed participants showed reduced heart rate variability during the TSST-G whereas those who completed the time-matched control task did not. With regard to memory performance, participants who engaged in study practice demonstrated stress-related memory deficits, whereas those who engaged in retrieval practice were immune to these deleterious effects. These results suggest that (1) our stress manipulation was effective, and (2) retrieval practice may serve to create memory representations that are resistant to stress-related retrieval impairment.

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Poster 4-71**VALIDATION OF AN EXPERIMENTAL PARADIGM FOR SIMULTANEOUS FMRI-EEG: MODULATION OF THETA OSCILLATIONS BY FEAR CONDITIONING AND EXTINCTION**

Matthias F.J. Sperl^{1,2,3}, Christian Panitz^{1,2}, Isabelle M. Rosso³, Daniel G. Dillon³, Alexis E. Whitton³, Poornima Kumar³, Andrea Hermann², Christiane Hermann², Diego A. Pizzagalli³, & Erik M. Mueller^{1,2}
¹Marburg University, ²Justus Liebig University Giessen, ³McLean Hospital/Harvard Medical School

Descriptors: fear conditioning/extinction, theta oscillations, simultaneous EEG/fMRI

Human fMRI and EEG studies as well as animal studies indicate that the amygdala and the anterior midcingulate cortex (AMC) are involved in fear expression. Moreover, AMC theta oscillations have been associated with fear expression in both animals and humans. The aim of the present study is to establish an experimental paradigm to bridge findings from prior animal, human EEG and human fMRI studies by recording fMRI and EEG simultaneously during the recall of conditioned and extinguished fear. Specifically, the goal of the current analysis is to evaluate the feasibility of the design to detect oscillatory EEG correlates when EEG is recorded during MRI. Twenty-one participants underwent a 240-trial fear conditioning and extinction paradigm. EEG and fMRI were recorded simultaneously during a 160-trial recall test 24h later. Extinguished (CS+E, CS-E) and nonextinguished conditioned stimuli (CS+N, CS-N) were compared to identify effects specific to extinction versus fear recall. SCRs and EEG activity on day 2 showed significant interactions of day 1 conditioning and extinction: Differential (CS+ vs. CS-) SCRs were stronger for nonextinguished vs. extinguished CS during the first half of the recall test. Importantly, fronto-medial theta activity was reduced for extinguished vs. nonextinguished stimuli: only nonextinguished stimuli showed a differential theta response. In conclusion, these findings show that oscillatory EEG activity within the theta frequency is a valuable tool to study fear conditioning and extinction, including in the MRI environment.

The study was supported by a grant of Justus Liebig University Giessen (Germany) to Erik M. Mueller and by a PROMOS scholarship of the German Academic Exchange Service to Matthias F.J. Sperl.

Poster 4-72**VISUAL PERCEPTION AND NEURAL SYNCHRONY DIFFERENCES BETWEEN CHRONIC CANNABIS USERS AND NON-USERS**

Brandi Emerick¹, Ashley M. Schnakenberg¹, Brian F. O'Donnell², Tom Busey¹, & Sharlene Newman¹
¹Indiana University, ²Indiana University Bloomington

Descriptors: electroencephalogram, visual perception, cannabis

Objectives: This study measured neural synchrony in chronic cannabis (CB) users and non-users during a visual recognition task, using electroencephalogram (EEG) to record steady-state visual evoked potentials (SSVEPs). We compared neural synchrony and processing of visual information across CB users and non-users to see whether participant groups would differ in strength of entrainment (measured by magnitude of SSVEPs) to image and noise before or after recognition.

Methods: 19 CB users (mean age = 21.7 years; 8 females) and 24 non-CB users (mean age = 22.3 years; 14 females) were recruited. Degraded images were embedded within visual noise and two different presentation frequencies (6.67 and 8.57 Hz) were used to frequency-tag stimuli, allowing differentiation of brain responses to image and noise. Participants were instructed to attend to images and ignore noise and to press a button once they recognized the image.

Results: There were no significant differences between current users and non-users. For both participant groups, SSVEPs to image and noise were both significantly greater once the image was recognized, and entrainment to image was significantly larger than entrainment to noise.

Discussion: Current analyses show no significant differences between groups. However, analyses limited to only heavy users (100+ times) are currently underway and may reveal differences between heavy users and non-users. Planned regression analyses will look at whether factors such as age of onset or lifetime use are predictive of entrainment strength.

Acknowledgements: This study was supported by the NIDA R21 DA035493 and a Fellowship to B.E. by the NIH UL1-TR001108 CTSA.

Poster 4-73**WHEN SLOWING DOWN DOES NOT IMPROVE PERFORMANCE: POST-ERROR SLOWING AND IMPAIRED FEEDBACK ANTICIPATION**

Xi Ren¹, Fernando Valle-Incan², & Steven A. Hackley¹
¹University of Missouri - Columbia, ²University of La Coruna

Descriptors: post-error slowing, stimulus-preceding negativity, attention

Post-error slowing (PES) is a phenomenon in which people tend to slow down their response after making an error. It is traditionally theorized as a strategy to improve performance via a speed-accuracy trade-off (Laming, 1968, *Information Theory of Choice-Reaction Times*, NY: Academic Press). This explanation is less plausible when accuracy is instead reduced, as in the present ERP study.

Sixty healthy young adults performed a motor skill-learning task with varied feedback delays. On each trial, they were instructed by a visual display to make four brief, precisely timed key-press responses with a designated hand. After a short (2.5 s) or long (8 s) delay, feedback was given via a similar display. Collapsing across delay condition, response times increased (from 908 ms to 965 ms, $p < .01$) and accuracy decreased (from 96% to 94%, $p < .001$) on trials that followed an error in both delay conditions. No interaction was found. Also, the amplitude of SPN, an index of feedback anticipation, was found to be dramatically reduced after error trials. This suggests that subjects' anticipatory processes in the current trial were compromised by negative feedback on the previous trial. These results are consistent with the theory of Notebaert, Houtman, et al. (2009, *Cognition*, 111: 275-279) that, when errors are infrequent events, they orient subjects' attention away from the task at hand.

Poster 4-74**WILLINGNESS FOR A PHYSICAL ACTIVITY INCREASE THE BACK PAIN THRESHOLD VALUES IN HEALTHY WOMEN**

Petr Kondrashkin, Daria Shibkova, Pavel Bayguzhin, & Evgenia Tolstykh
Chelyabinsk State Pedagogical University

Descriptors: pain, individual pain sensitivity

Pressure algometry is the widespread approach to pain study. Pain threshold values in paravertebral points present both a scientific and practical interest. The aim of the study was to obtain the statistical characteristics of the individual's pressure pain threshold (PPT) for healthy women and persons with minor violations in the condition of vertebral-motor segment (VMS). The two groups of students-volunteers were studied: group #1 was examined in the quiescent state (n=45); group #2 was examined in a state of agitation and willingness for a physical activity (n=145). Each group was split into 2 sub-groups depending on the availability or absence of complaints about the state of the VMSs (according to the survey). PPT was assessed using the Wagner FPXtm algometer in paired paravertebral points at the level lumbar vertebrae (L2-L3); thoracic vertebrae (D9-D10); neck (C7-D1); and trapezius muscle in its upper part. Height, weight, body mass index were measured. The following results were obtained. (1) PPTs values in the selected points were log-normally distributed. (2) Willingness for a physical activity increase the back pain threshold values by about 20-40%. (3) Complaints about the state of the VMS were accompanied by a decrease in the PPT in paravertebral points of the neck and the lower back in group #1 but not in group #2. (4) In all groups the right-side PPT values were 2-8% lower than the corresponding left-side values (test Kruskal-Wallis, $p < 0.05$). Lateralization of pain sensitivity requires further study.

Poster 4-75**WORKING MEMORY AND ATTENTION FOR AFFECTIVE FACES IN PSYCHOPATHY**

Allan Heritage, Laura McClenahan, Geoffrey Woodman, & David Zald
Vanderbilt University

Descriptors: psychopathic traits, affective faces, event-related potentials

Psychopathic individuals consistently show deficits identifying fearful faces. These deficits are important for social communication and psychopaths' ability to manipulate and harm others. There is also evidence of deficits in attention and working memory in psychopathy, and recent work has shown interactions between these affective and cognitive deficits. However, it is unclear how cognitive deficits influence the processing of affective faces in psychopathy. Therefore, we sought to identify how individuals with psychopathic traits deployed attention to affective faces, how they maintained those faces in memory, and how deficits in cognitive mechanisms were related to deficits in fear identification. Community participants completed the Psychopathic Personality Inventory (PPI) and a memory-guided visual search task for affective faces. ERP components were used to index attention (N2pc) and working memory (CDA). Results show a distinct relationship between participant's scores on the fearless dominance (FD) factor of the PPI and processing of fear faces. Participants with higher FD scores showed greater attention to initial fear targets and greater maintenance of those targets in working memory, but reduced attention to fear faces in the search array. Participants with higher FD scores also had reduced search accuracy and more difficulty labeling emotional faces. This suggests that although psychopaths may initially find fearful faces more salient, they have difficulty identifying fearful expressions in the midst of potentially distracting information.

This work was supported in part by a National Research Service Award (1F31MH02888-01) to Allan Heritage.

Poster 4-76**THE ROLE OF FILTERING-OUT MECHANISM IN THE RELATIONSHIP BETWEEN FACEBOOK USAGE AND MALADAPTIVE BEHAVIOR**

Nurit Sternberg, Roy Luria, & Gal Sheppes
Tel Aviv University

Descriptors: social-networking usage, event-related potentials

Half a billion Facebook users log in multiple times a day and spend 18 minutes each visit. This statistic raises the question whether increased usage may be associated with maladaptive consequences. Existing studies provide mixed results which suggest that whether Facebook usage is associated with maladaptive outcomes or not, likely depends on a central moderating process. We suggest that given that human processing capacity is very limited, in many situations, being on Facebook can distract from performing goal directed activities such as finishing a project at work. Accordingly, enhanced Facebook usage may lead to psychological maladaptive behavior, among individuals with impaired ability to filter-out potent Facebook information when incongruent with one's goals. In the present study, filtering-out irrelevant Facebook information was required to perform adequately on a main task. We measured the contralateral delay activity, an Event Related Potential component reflecting the total number of online representations including relevant and irrelevant information that is active in visual working memory. We found that for participants with low (but not high) Facebook neural filtering-out ability, enhanced amount of Facebook activities was related to higher symptoms of anxiety. Our results can shed light on when and why Facebook usage is related to maladaptive psychological behaviors.

Poster 4-77**INDIVIDUAL HEARTBEATS SHAPE FEELINGS OF FAMILIARITY**

Chris M. Fiacconi¹, Erika L. Peter², Sawayra Owais¹, & Stefan Köhler¹
¹University of Western Ontario, ²Queen's University

Descriptors: recognition memory, cardiac cycle, visceral feedback

The idea that bodily signals play a role in shaping mental experiences is central to many theories of emotion. Here, we examined the extent to which such signals may also contribute to feeling states that occur in association with cognitive processing. Specifically, we asked whether visceral autonomic feedback that arises from individual heartbeats informs recognition memory judgments and experiences. To investigate this issue, we used a methodological approach that leverages phasic variation in afferent baroreceptor-mediated feedback occurring across the cardiac cycle. Following exposure to novel faces during an encoding phase, we synchronized the presentation of test items in a recognition-memory task to distinct phases of the cardiac cycle and probed whether the difference in afferent signaling across these phases influences participants' recognition decisions and experiences. As predicted, faces presented during cardiac systole (i.e., when visceral feedback is maximal) were more likely to be endorsed as 'old' relative to presentation during cardiac diastole (i.e., when afferent feedback is minimal). This pattern held regardless of whether the faces had a fearful or a neutral expression. By soliciting participants' phenomenological experience on each trial, we also found that this effect is specifically tied to feelings of familiarity, and was absent for trials on which participants recollected pertinent contextual information. The current findings identify the functional role of a specific autonomic channel in feeling states that pertain to memory experience.

Poster 4-78**NEUROPHYSIOLOGICAL CORRELATES OF ANXIETY**

Kyle Woisard, Wayne Stafford, Alex Eddy, Rachel Trizna, K'Ehleyr Thai, Steven Nguyen, Grace Herrick, Benjamin DeVore, Ransom Campbell, Kelly Harrison, & David Harrison
Virginia Tech

Descriptors: anxiety, EEG, stress

Anxiety is an aversive emotional state marked by hyperarousal and cognitive impairments. Studies using Quantitative Electroencephalography (QEEG) have shown asymmetric right frontal and parietotemporal activity at resting baseline in trait anxious subjects at resting baseline. However, there has been a lack of research investigating changes in QEEG asymmetries in trait anxious subjects following stress. The current study aims to assess changes in QEEG asymmetries following stress in trait anxious subjects. Following a two minute baseline, subjects underwent two 2 minute stress periods, during which they were presented with auditory and counterbalanced unilateral motor stressors, each followed by a two minute recording period. Subjects were classified as high or low trait anxious based on their scores on the Spielberger Trait Anxiety Inventory. Asymmetry scores were calculated for the Fp1/Fp2, F3/F4, F7/F8, C3/C4, P3/P4, and P7/P8 electrode pairs by subtracting the Ln(L alpha power) from the Ln(R alpha power). Preliminary analyses have revealed statistically significant differences in asymmetry scores between the high and low anxious groups in the Fp1/Fp2, F3/F4, and F7/F8 electrode pairs at resting baseline. No differences were noted between conditions in any of the electrode pairs that were selected for analyses. These results replicate previous findings linking asymmetric right frontal activation to subjects scoring high in trait anxiety but do not support the use of changes in asymmetry score as a marker of acute stress.

Poster 4-79**EXTRACTING THE MEAN EMOTION FROM MULTIPLE FACES REQUIRES ATTENTION: EVIDENCE FROM VISUAL ERP**

Luyan Ji, & Gilles Pourtois
Ghent University

Descriptors: facial expression, spatial cueing paradigm, mean emotion

In this study, 64-channels event-related potentials (ERPs) were recorded (from 24 participants) while either a single or four faces were presented for 150 ms at an attended or unattended spatial location in the visual field (using a standard cueing technique). Across different blocks, participants were asked either to identify the emotion (happy or angry) from the single face (flanked with three scrambled faces) or extract the mean emotion (happy or angry) from the four faces shown concurrently. Behavioral results showed that performance was better for attended than unattended spatial locations, but balanced between the two tasks. ERP results revealed three non-overlapping time windows following stimulus onset during

which the processing of the average emotion differed from identifying a single emotional expression. First, the occipito-temporal N170 was larger for multiple faces compared with a single face. At 250 ms post-stimulus onset, a larger negative component at lateral occipito-temporal electrodes was found for multiple faces compared to a single face. This effect was followed by a large positive component at posterior leads that was also larger for multiple faces compared to a single face. Importantly, these three ERP components showed systematic amplitude and topographical modulations with spatial attention, equally strongly with the two tasks however. The results suggest that extracting the mean emotion from a set of facial expressions differs from identifying a single facial expression, although these two processes depend on similar attention mechanisms.

Poster 4-80**THE NEUROBIOLOGY OF SELF-PROCESSING IN DEPRESSED ADOLESCENTS WITH SELF-INJURIOUS BEHAVIOR**

Hannah Scott¹, Jodi Martin², Garry Smyda³, Jennifer Pfeifer⁴, & Karina Quevedo¹

¹University of Minnesota, ²University of Minnesota, Institute of Child Development, ³University of Pittsburgh, ⁴University of Oregon

Descriptors: neuroimaging, non-suicidal self-injury, adolescence

Youth engaging in non-suicidal self-injury (NSSI) are at risk for suicide attempt and chronic psychopathology. Neuroimaging research has yielded biomarkers of emotion dysregulation in NSSI when viewing negative images, but given the salience of disturbed interpersonal relationships and altered self-processing in NSSI, the neural basis of social processes are key to the emergence and maintenance of NSSI. Adolescents (age 12-17; N=123) were assessed and divided into groups based on depression diagnosis and NSSI (NSSI and depression=NSSI, depression only=DEP, healthy controls=HC). Participants completed an Interpersonal Self-Processing fMRI task, which includes taking direct (own) and indirect (mothers', best friends', or classmates') perspectives regarding self-related characteristics. NSSI showed higher activity in limbic and anterior and posterior cortical midline structures (CMS) across all perspectives versus DEP and HC. HC showed greater activity in rostralateral, frontal pole and occipital cortex than NSSI and DEP youth across all perspectives. Moreover, NSSI (compared to DEP and HC) showed heightened limbic activity (i.e. amygdala, hippocampus, parahippocampus, and fusiform) when taking their mothers' perspective, and greater precuneus and posterior cingulate cortex activity when taking their classmates' perspective. Findings suggest the role of disruptions in self-processing and emotion, and conflicted social relationships in the neurobiology of NSSI among depressed adolescents.

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Index to Abstract Authors

- Achtemeier, Jacob, S77
 Adalio, Christopher, S43
 Aftanas, Lyubomir, S30
 Ahles, Joshua, S80
 Ahrens, Lea, S27
 Akhmetova, Olga, S30
 Alden, Dale, S85
 Alderman, Brandon L., S13, S39, S75
 Aldrich, Jaclyn, S55, S80
 Alfini, Alfonso J., S31
 Alho, Kimmo, S78
 Alkhafaf, Farah, S53
 Allen, John J.B., S4, S53, S64, S76
 Anderson, Amy, S88
 Anderson, Elizabeth, S87
 Anderson, Ian W., S66
 Andreaggi, Christian A., S62
 Andreaatta, Marta, S9, S28
 Angrilli, Alessandro, S61
 Angus, Douglas J., S69
 Arbel, Yael, S52
 Arfer, Kodi B., S76
 Armes, Carl A., S21, S65
 Asan, Esther, S9
 Atchley, Ruth Ann, S62

 Babkirk, Sarah, S31
 Bachman, Peter, S7
 Bachrach, Isabelle, S50
 Baev, Aleksandr A., S33
 Baggio, Mary C., S46
 Bailey, Bruce W., S13
 Bailey, Kira, S89
 Bailey, Rachel, S48, S70
 Balderston, Nicholas, S36
 Banerjee, Ankur, S81
 Banthin, David, S19
 Barba, Alyssa, S51
 Barch, Deanna, S37
 Barker, Tiffany, S90
 Baron, Carolynne, S63
 Bartholow, Bruce D., S9, S15, S22, S30, S59
 Bartolomeo, Lisa A., S21, S45
 Baschnagel, Joseph S., S35
 Basedow, Christina, S78
 Bateman, Grant, S61
 Bates, Marsha, S77
 Baucom, Brian, S63
 Baucom, Katherine, S63
 Bayguzhin, Pavel, S95
 Begnel, Erin, S72
 Belleau, Emily L., S36
 Bell, Martha Ann, S11
 Bellman, Steven, S57
 Benau, Erik, S62
 Bender, Karly, S90
 Benke, Christoph, S83
 Bennett, Ken P., S54
 Benning, Stephen D., S46, S70
 Berger, Kyle, S27
 Berke, Collin K., S52, S82, S84

 Berkman, Elliot, S89
 Berman, Mitchell, S74
 Bertels, Zachary, S54, S79
 Bickel, Kelly, S68
 Bikson, Marom, S3
 Birbaumer, Niels, S3
 Birk, Samantha, S31
 Blair, James, S43
 Blair, Nicholas, S19
 Blaison, Christophe, S28
 Blanchard, Brittany E., S84
 Blanco, Cristina, S31, S84
 Blasko, Dawn G., S71
 Blanco, Noelia Do Carmo, S76
 Blonigen, Daniel, S29
 Blumenthal, Heidemarie, S40
 Bobes, Maria Antonieta, S44
 Bogomolova, Svetlana, S57
 Bolbecker, Amanda R., S6, S45
 Bornstein, Marc, S38
 Bost, Kelly K., S43
 Bourne, Stacia, S63
 Bowyer, Colin B., S36, S38, S44, S93
 Bozzay, Melanie, S50
 Brack, Ivan, S30
 Bradford, Daniel E., S12, S88
 Brar, Jaspreet, S63
 Braunstein, Laura, S18, S49
 Bresin, Konrad, S50
 Bright, Carlie, S90
 Brislin, Sarah J., S15, S29, S36, S38
 Brockett, Sally, S39
 Brooker, Rebecca J., S45, S68, S80
 Brosschot, Jos, S8
 Brown, Darin R., S17
 Brush, Christopher J., S13, S39, S75
 Buckholtz, Joshua, S16
 Buckman, Jennifer, S77
 Budd, Desiree, S91, S93
 Buetti, Simona, S54
 Buldakova, Natalia S., S33
 Burani, Kreshnik, S75
 Burdwood, Erin N., S57
 Burger, Andreas, S8
 Burleson, Mary H., S65
 Burns, Anthony, S51
 Burnside, Rebecca, S91
 Burton, Philip, S32
 Burwell, Scott, S15, S75
 Burykh, Eduard A., S59
 Busey, Tom, S94
 Busler, Jessica, S72
 Byerly, Matthew J., S65

 Calcott, Rebecca, S89
 Calderwood, Charles, S33
 Calkins, Monica, S11
 Callahan, Courtney, S50
 Calzada-Reyes, Ana, S73
 Camchong, Jazmin, S28
 Campbell, Ransom, S96
 Campling, Kylie, S69

 Canen, Mara J., S45
 Capilla, Almudena, S45
 Capraio, Adriana M., S24
 Carbine, Kaylie, S13
 Carrazana-Escalona, Ramón, S91
 Carretié, Luis, S45
 Carter, Cameron, S37
 Carter, Emma, S68
 Casanova, Manuel F., S39
 Castro-Chapman, Paula, S30
 Cavanagh, James F., S17
 Chafee, Matthew, S37
 Champod, Anne Sophie, S68
 Chandra, Sushil, S25
 Chandregowda, Adithya, S52
 Chang, Wen-Pin, S59
 Chase, Henry, S42
 Chaudhary, Ujwal, S3
 Chaves, Audra, S79
 Chen, Jerry, S86
 Chengappa, K.N. Roy, S63
 Chertkow, Howard, S14
 Chong, Sang Chul, S41
 Christensen, Edward, S13
 Cifre, Eva, S72
 Cinciripini, Paul M., S19
 Ciric, Rastko, S11
 Claiborne, Kimberly N., S19, S56
 Clark, Vince, S4
 Clark, Zachary, S90
 Clayson, Peter E., S7, S17
 Clayton, Russell, S22, S47
 Cleave, Treva Van, S42, S92
 Clementz, Brett, S23, S74
 Cloutier, Renee M., S40
 Codispoti, Maurizio, S19
 Coffman, Brian A., S6, S14, S18, S42, S62, S63
 Cohen, Neal J., S69, S74, S89
 Coleman, Todd P., S3
 Compton, Rebecca, S17
 Condy, Emma E., S55
 Conley, Alexander, S61
 Conway, Christopher M., S46
 Cools, Lisse, S8
 Cooper, Patrick, S61, S81
 Cooper, Samuel E., S23, S53, S67
 Corballis, Paul M., S29, S84
 Cordero, Evelyn, S73, S87
 Cormier, Danielle, S81
 Costa, Vincent, S38
 Crane, Natania, S51
 Crasta, Jewel E., S26, S48
 Crenshaw, Alexander, S63
 Cross, Olivia D., S24
 Crowell, Adrienne L., S20, S90
 Culoso, Ashley, S51
 Curham, Kyle J., S64
 Currie, Ariel, S76
 Curtin, John J., S12, S20, S88

 Dahlke, Lauren A.-M., S43
 Dalldorf, Charlie A., S52

 D'Andrea, Wendy, S42, S50, S62, S64, S92
 Danielmeier, Claudia, S7
 Danielson, Carla, S11
 Danilenko, Konstantin, S30
 Daou, Marcos, S22
 Davenport, Nicholas, S28, S72
 Davidson, Austin, S84
 Davies, Patricia L., S26, S48, S80
 Davila, Maria, S24
 Davis, Destiny, S90
 Díaz-Ferrer, Sandra, S52
 de Grey, Robert Kent, S63
 Degeneffe, Nikki C., S53
 DelDonno, Sophie, S51
 Delgado, Rafael, S70, S76
 Dell'Acqua, Roberto, S33
 Delli Paoli, Anthony G., S35, S44
 Demetriou, Andreas, S49
 Denke, Greg, S65
 Dennis-Tiwary, Tracy, S17, S31
 Densley, Rebecca, S82
 Dente, Pasquale, S78
 DePierro, Jonathan, S62, S64
 Detre, John, S11
 Deveney, Christen, S58
 DeVore, Benjamin, S77, S85, S96
 Deweese, Menton M., S19, S56
 Diaz, Anjolie, S11
 Dickenson, Janna, S63
 Dickmann, Jacqueline, S54
 Dierolf, Angelika M., S56
 Dieterich, Raoul, S26
 diFilipo, Danielle, S20
 Dillon, Daniel G., S94
 Dion, Catherine, S51
 Dios, Constanza de, S34
 Dirba, Danika, S56
 Disner, Seth, S28, S32
 Doan, Stacey, S66
 Dolcos, Florin, S54, S67, S79
 Dolcos, Sanda, S54, S67, S79
 Donchin, Emanuel, S52
 Donnelly, Michael P.W., S91
 Donohue, Meghan R., S53
 Doro, Mattia, S33
 Doster, Michael, S31, S84
 Doukas, Ashley, S62
 Drisdelle, Brandi Lee, S14, S47
 Drislane, Laura, S12
 Drollette, Eric S., S69, S89
 Dubey, Ashok, S25
 Duncan, C. Jessie, S65
 Durbin, C. Emily, S51
 DuVall, Kevin, S91

 Early, Amy, S87
 Eaton, Kyle W., S30
 Eddy, Alex, S96
 Egan, Christine, S39, S77
 Ehmann, Peter J., S13, S39, S75
 Eisenbarth, Hedwig, S61
 Elkins-Brown, Nathaniel, S5, S80

- Elliott, Mark, S11
 El-Sheikh, Mona, S92
 Emerick, Brandi, S94
 Engelmann, Jeffrey, S56
 Erath, Stephen, S61, S92
 Erblisch, Joel, S17
 Erdogmus, Deniz, S3
 Erickson, Craig A., S65
 Ethridge, Lauren E., S23, S65
 Ethridge, Paige, S31, S76
 Ettenhofer, Mark L., S32, S73, S87
 Everhart, D. Erik, S27, S68, S70
- Fabiani, Monica, S74, S79, S83
 Falkenstein, Michael, S56
 Farrell, Kelly N., S71
 Farwell, Lawrence A., S25
 Federmeier, Kara D., S9, S21, S34, S35, S90
 Fehertoi, Nicholas, S50, S92
 Feldman, Julia L., S47
 Fenlon, Holly, S8
 Fernandez, Nicolas, S19
 Fernan, Paul, S24
 Fernández-Santaella, M. Carmen, S52, S70, S76
 Ferrari, Thomas M., S30
 Ferri, Jamie, S86
 Fiacconi, Chris M., S47, S95
 Filion, Diane L., S24, S60, S88
 Filkowski, Megan M., S66
 Finley, Anna J., S20
 Fischer, Adrian G., S7, S91
 Fisher, Derek J., S68
 Fisher, Jacob, S84
 Fisher, Megan, S88
 Flannery, Julie, S71
 Fletcher, Mark A., S83
 Flor, Herta, S49
 Foa, Edna, S11
 Foell, Jens, S15, S44, S49, S93
 Forbes, Erika E., S42
 Ford, Judith M., S6
 Fortunato, Andrea, S50
 Foti, Dan, S10, S37, S45
 Fournier, Philippe, S85
 Fox, Andrew, S80
 Fox, Bryan D., S24
 Fox, Nathan, S81
 Freed, Steven, S62
 Freitas, Antonio L., S47
 Friedman, Bruce H., S18, S27, S49, S54, S55
 Fuentes, Nieves, S72
 Fuseda, Kohei, S39
- Gable, Philip A., S9, S10, S28, S82, S85
 Gabriel, Daniel B.K., S43
 Gaffney, John S., S23
 Gamer, Matthias, S60
 García-Rubio, María José, S45
 Garcia, Olivia, S49
 Garcia, Sarah E., S53
 Garrett-Ruffin, Sherona, S48
 Garrison, Katie E., S20, S90
 Gavin, William J., S26, S48, S80
 Gavrilis, James, S24
- Geller, Whitney N., S86
 Genheimer, Hannah, S9
 Gennatas, Efstathios, S11
 Georgiou, Dora, S69
 Gerjets, Peter, S5
 Gervilla, Carmen, S70
 Ghuman, Avniel S., S14
 Gibb, Brandon E., S14, S88
 Gibson, Linzi, S62
 Gilmore, Casey, S28
 Giménez-Fernández, Tamara, S45
 Glazer, James, S26, S41
 Goldstein, Michael R., S4
 Goodman, Marianne, S19
 Gorbunov, Andrei, S24
 Gorka, Stephanie, S55
 Grand, Kirk, S10
 Grant, Shara S., S54
 Gratton, Gabriele, S74, S79, S83
 Graur, Simona, S42
 Gray, Jackson M., S53
 Green, Michael F., S22
 Gregory, Wesley E., S92
 Grose-Fifer, Jill, S20
 Gross, James J., S43, S73
 Guerra, Pedro, S44, S70, S76
 Gulin, Shaina, S52
 Gunten, Curtis Von, S59
 Gurera, Jacob, S88
 Gur, Raquel, S11
 Gur, Ruben, S11
 Guyer, Amanda E., S33
 Gwizdala, Kathryn L., S36
- Haas, Brian W., S66
 Hackley, Steven A., S94
 Haigh, Sarah M., S6, S14, S18, S42, S62, S63
 Hajcak, Greg, S11, S12, S36, S43, S75, S86, S88
 Hameroff, Stuart, S4
 Hamilton, Holly K., S6, S7
 Hammond, Billy, S89
 Hammond, Lauren, S55
 Harmon-Jones, Cindy, S69
 Harmon-Jones, Eddie, S69
 Harper, Jeremy, S82
 Harris, Breanna N., S82
 Harrison, David, S31, S60, S77, S84, S85, S96
 Harrison, Kelly, S60, S77, S96
 Hartnell, Melissa P., S23, S53
 Hastings, Paul D., S33, S68
 Hatayama, Toshiteru, S25
 Haufler, Amy J., S24
 Haws, Kyle, S18
 Hayley, Page, S87
 Hazlett, Erin, S19
 Hébert, Sylvie, S85
 Heaton, Elizabeth, S17
 Hechavarría, Miguel Sánchez, S91
 Hecht, Holger, S29
 He, Bin, S4
 Heinrich, Angela, S49
 Heller, Wendy, S43
 Helmstetter, Fred, S36
 Helwig, Nathaniel E., S79
 Hendrickse, Joshua, S47
- Hennig, Jürgen, S60
 Henz, Diana, S19, S40, S55, S81
 Heritage, Allan, S95
 Hermann, Andrea, S94
 Hermann, Christiane, S60, S94
 Hernández-Lorca, Maria, S45
 Herrick, Grace, S77, S96
 Herring, David R., S90
 Herring, Elizabeth, S48
 Hershaw, Jamie N., S32, S73, S87
 Hessas, Eve, S56
 Hess, Ursula, S28
 Hester, Robert, S8
 Hetrick, William P., S6, S21, S45
 Hetzel-Riggin, Melanie, S90
 Hewig, Johannes, S74, S78, S85
 Heydari, Sepideh, S91
 Hicks, Brian, S15, S46
 Highsmith, Jonathan, S68
 Hill, Kaylin, S37
 Hillman, Charles H., S69, S89
 Hinnant, Benjamin, S92
 Hélie, Sebastien, S10
 Hoang, Kong, S24
 Hobbs, Diana A., S21, S65
 Hohman, Zachary P., S82
 Holland, Kate, S31, S84
 Hollowell, Christopher, S32
 Holroyd, Clay B., S91
 Hopp, J. Johanna, S91, S93
 Hopson, Ryan, S11
 Hubbard, Ryan J., S21
 Hu, Yifan, S79
 Hulstrand, Kara, S93
 Hummer, Lilian, S18
 Hunt, Christopher, S23
 Hunt, Ruskin, S15, S75
 Huskey, Alisa, S18, S49, S54
 Hutcherson, Cendri, S16, S66
 Hwang, Soonjo, S43
- Iacono, William, S15, S46, S75, S82
 Iardi, Stephen, S62
 Infantolino, Zachary P., S75, S86
 Inoue, Yusuke, S18, S37
 Inzlicht, Michael, S5, S16, S66, S67, S80
 Iordan, Alexandru D., S54, S79
 Isakova, Julia A., S33
 Ito, Tiffany A., S30
- Jabr, Mejdý M., S21, S65, S81
 Jackson, Felicia, S86
 Jaeger, Judith, S6
 Jalbrzikowski, Maria, S14
 Jaén, Irene, S72
 Jasara, Hogan, S63
 Jasperse, Lee J., S7
 Jausovec, Norbert, S49
 Jefferson, Madeline R., S53
 Jenkins, Lianne, S51
 Jennings, J. Richard, S20, S49
 Ji, Luyan, S46, S96
 Joachim, Brandon, S62
 John, Alexander, S40
 John, Ashley St., S66
 Johns, Erin, S14
 Johnson, Joseph, S16
- Johnson, Katherine, S41
 Johnson, Meredith P., S30
 Joiner, Thomas, S46
 Jolicoeur, Pierre, S14, S33, S47
 Jolly, Todd, S61, S81
 Jonas, Eva, S69
 Joormann, Jutta, S41
 Joyner, Keanan, S36
 Jozefowicz, Jeremie, S76
- Kaczurkin, Antonia, S10, S11
 Kaeppler, Alexander, S61
 Kahle, Sarah, S68
 Kaiser, C. Kit, S48, S70
 Kang, Seung Suk, S7, S32, S48, S71
 Kao, Shih-Chun, S69
 Kappas, Arvid, S78
 Karayanidis, Frini, S61, S81
 Karekla, Maria, S69
 Karmarkar, Uma, S16
 Karsten, Trisha M., S43
 Kasai, Tetsuko, S58
 Kastman, Erik, S16
 Katayama, Jun'ichi, S39, S59, S83
 Kathmann, Norbert, S26, S92
 Katsumi, Yuta, S54, S67, S79
 Kaye, Jesse T., S12, S88
 Kazmerski, Victoria A., S71, S90
 Keacher, Lisa, S72
 Keenan, Elliot, S51
 Keene, Justin R., S82, S84
 Kegel, Jessica, S73, S87
 Keifer, Cara, S51
 Keiley, Margaret, S92
 Keil, Andreas, S60
 Kelleher, Joseph, S24
 Kelley, Nicholas J., S26, S41, S90
 Kennedy, Rachel, S57
 Kent, Jerilyn S., S6, S48
 Keshavan, Matcheri, S74
 Kessel, Dominique, S45
 Kessel, Ellen M., S76
 Khan, Naiman A., S69, S89
 Khedari, Vivian, S62
 Köhler, Stefan, S95
 Kiel, Elizabeth J., S80
 Killgore, William D.S., S53
 Kim, Dae-Jin, S6
 Kim, Insub, S31
 Kim, Kye, S54
 Kimura, Tsukasa, S83
 Kiosses, Dimitris N., S43
 Kirk, Ian J., S29
 Kiryu, Shigeru, S18, S37
 Kiselnikov, Andrey A., S33, S72, S93
 Kissler, Johanna, S90
 Kizuk, Sayeed A.D., S81
 Klawohn, Julia, S92
 Klein, Daniel N., S11, S76
 Klein, Tilmann, S7
 Klineberger, Phillip, S60
 Klucken, Tim, S60
 Kneip, Chelsea, S46
 Kolnes, Martin, S36
 Kondrashkin, Petr, S95
 Kotani, Yasunori, S18, S37
 Kotchoubey, Boris, S64

- Kotov, Roman, S12, S21
 Kovalev, Artem, S90
 Koy, Kiry, S39, S77
 Kozlovskiy, Stanislav A., S33, S72, S93
 Kramer, Arthur F., S69, S89
 Kramer, Mark, S46
 Kreibig, Sylvia D., S73
 Krempely, Patricia D., S21
 Krigolson, Olav, S10
 Krishnan, Giri P., S21
 Krueger, Robert, S46
 Kuester, Dennis, S78
 Kujawa, Autumn J., S76
 Kulper, Dan, S74
 Kumar, Poornima, S94
 Kuntzelman, Karl, S38
 Kuperberg, Gina, S45
 Kurita, Satoko, S59
 Kuziek, Jonathan, S73, S81

 LaBode, Amanda, S91
 Labus, Mackenzie, S87
 Lack, Caleb, S18
 Laher, Rebecca M., S63
 Lake, Jessica I., S7
 Lamm, Connie, S21, S53, S65, S81
 Langenecker, Scott, S51
 Lang, Annie, S59, S84
 Lano, Timothy, S7
 Lapsansky, Bradford, S24
 Larsen, Ryan, S79
 Larson, Christine L., S36, S54, S71
 Larson, Michael J., S13
 Laszlo, Sarah, S4, S24, S34, S36, S87
 Lazarte, Alejandro, S72
 LeCheminant, James D., S13
 Leckey, Michelle, S90
 Lee, Kellie Ann, S62
 Lee, Yoojin, S53
 Lefebvre, Christine, S14
 Lehockey, Katie, S68
 Leibenluft, Ellen, S11
 Lenroot, Rhoshel, S81
 Lerner, Matthew D., S51
 Leshner, Glenn, S22
 Levi, Christopher, S61, S81
 Levinson, Amanda, S88
 Lewis, Gregory, S24
 Lieberman, Lynne, S55
 Ligeza, Tomasz S., S35
 Lim, Kelvin, S28
 Lim, Seung-Lark, S60
 Lina, Jean-Marc, S14
 Lin, Hause, S16, S66
 Lin, Mei-Heng, S26
 Lin, Yanli, S23, S50, S88
 Lipp, Ottmar V., S79
 Lissek, Shmuel, S23, S53, S67
 Liu, Jiawei, S48, S70
 Lleras, Alejandro, S54
 Loersch, Chris, S30
 Lo, Sharon, S15, S51
 Lohse, Keith R., S22, S85
 Loktev, Konstantin, S30
 Lomoriello, Arianna Schiano, S85
 Loof, Travis, S52, S82, S84

 Louis, Courtney, S17
 Low, Kathy A., S74, S83
 López, Raúl, S72
 Lucas, Ignacio, S44, S72
 Luck, Camilla C., S79
 Luehring-Jones, Peter, S17
 Luking, Katherine R., S75
 Luna, Beatriz, S14
 Lundin, Nancy B., S21
 Luria, Roy, S95
 Lynn, Peter A., S49
 Lysne, Paige, S77

 MacDonald, Angus, S37
 Machida, Keitaro, S41
 Machmer, Elizabeth Jackson, S35
 Maclin, Edward L., S79, S83
 Madian, Nicholas, S86
 Madison, Anna, S54
 Magruder, Katherine P., S20
 Malone, Stephen, S15, S75, S82
 Manbeck, Adrienne, S67
 Marakshina, Julia A., S33, S72, S93
 Marell, Paulina S., S63
 Marquardt, Craig, S32, S71
 Marschark, Marc, S35
 Martin, Frances H., S69
 Martin, Jodi, S96
 Martínez-Huertas, José Ángel, S45
 Maruo, Yuya, S56
 Masaki, Hiroaki, S56
 Mascitelli, Kathryn, S19
 Mash, Clay, S38
 Mata-Martín, Jose Luis, S52
 Mathalon, Daniel H., S6, S22
 Mathersul, Danielle, S11
 Mathewson, Kyle E., S73, S81
 Matsuhashi, Takuto, S56
 Matthews, Karen, S20
 Maus, Johanna, S55
 McCathern, Alexis G., S42, S62
 McCleery, Amanda, S22
 McClenahan, Laura, S95
 McCloskey, Michael, S74
 McCorkle, Sasha, S89
 McDaniel, William, S24
 McDonald, Julia B., S90
 McDowell, Jennifer, S74
 McGinley, Jared J., S27
 McGowan, Amanda L., S36
 McGreevy, Catherine, S62
 Mckay, Nicole S., S29
 McKeamey, Katelyn, S68
 McKinnis, Sydney A., S40
 McKinzie, Sarah E., S65
 McNeil, Kathryn, S68
 Meadows, Caroline C., S22, S85
 Mechin, Nicole C., S28
 Meconi, Federica, S85
 Meffert, Harma, S43
 Menshikova, Galina, S90
 Mensink, Michael C., S77
 Merz, Christian, S19
 Meurs, Brian Van, S67
 Meyer, Alexandria, S11, S12
 Mezulis, Amy, S55, S80
 Mühlberger, Andreas, S78
 Miccoli, Laura, S70, S76

 Michel, Jena, S53
 Michie, Patricia, S61, S81
 Miller, Gregory A., S7, S43
 Miller, Holly, S8
 Miller, Jonas G., S33
 Miller, Matthew W., S9, S10, S13, S22, S85
 Miltner, Wolfgang, S29
 Minshew, Reese, S62
 Miskovic, Vladimir, S14, S34, S36, S38
 Miskovich, Tara A., S36, S71
 Müller, Mathias, S78
 Moelter, Stephen, S66
 Mohanty, Aprajita, S21
 Molina, Stephany M., S70
 Moody, Shannin, S53
 Mooney, Rachel, S71
 Moore, Matthew, S67, S79
 Moore, Tyler, S11
 Morato, Cristina, S44
 Mormann, Milica, S16
 Mosconi, Matthew W., S23, S65
 Moser, Jason S., S23, S35, S44, S46, S50, S51, S88
 Moser, Jason, S15
 Mueller, Bryon, S32
 Mueller, Erik M., S60, S94
 Muldrow, Adrienne, S48
 Mullen, Paige, S91, S93
 Murohashi, Harumitsu, S58
 Murphy, Timothy K., S6, S14, S18, S42, S62, S63
 Murphy, William G., S88

 Nadig, Ajay, S26
 Nagano, Yuichiro, S56
 Nagornova, Zhanna V., S59
 Najjar, Reema, S68
 Naka, Sanae, S83
 Nayak, Srishti, S66
 Neal, Lauren B., S82
 Neklyudova, Anastasia K., S93
 Nelson, Brady D., S12, S75, S86
 Nencycz-Thiel, Magda, S57
 Newman, Sharlene D., S6, S94
 Ng, Jennifer, S19, S56
 Nguyen, Steven, S96
 Niedbala, Elizabeth, S82
 Nieuwenhuis, Sander, S9
 Nikelski, Jim, S14
 Nikolenko, Ekaterina, S30
 Nolan, Zachary, S43
 Novak, Keisha, S45
 Nowlan, Luke, S16
 Nuechterlein, Keith H., S7
 Nusslock, Robin, S26, S41
 Nutting, Brandon H., S52

 O'Brien, Kelly, S24
 O'Brien, Margaret M., S54
 O'Donnell, Brian F., S6, S21, S45, S94
 O'Hare, Amina, S62
 Ohgami, Yoshimi, S18, S37
 Okumura, Yasuko, S58
 Olivari, Benjamin, S79
 Olson, Rebecca, S91

 Olson, Ryan L., S13, S39, S75
 Omori, Shunya, S59
 Orr, Scott, S30
 Ortega-Roldán, Blanca, S52
 Osinsky, Roman, S85
 Oumeziane, Beel Ait, S10, S37
 Owais, Sawayra, S95
 Owen, Adrian, S47
 Ozer, Emily, S17

 Palumbo, Isabella, S15, S29, S44, S49
 Panayiotou, Georgia, S69
 Pane-Farre, Christiane, S83
 Panitz, Christian, S60, S94
 Pardini, Dustin, S20
 Parisi, Elizabeth A., S86
 Parker, David, S74
 Parkhurst, David, S65
 Parks, Andrew C., S35, S44
 Parsons, Mark, S61, S81
 Pastor, M. Carmen, S52, S72
 Patrick, Christopher J., S12, S15, S29, S36, S38, S44, S46, S49, S93
 Paul, Marcus, S56
 Pauli, Paul, S9, S27, S28
 Pavlov, Yuri G., S54, S64
 Payne, Brennan R., S35
 Pearson, Godfrey, S74
 Pearson, Catlin, S60, S88
 Pedersen, Walker, S36
 Peng, Ling, S50
 Penner, Elizabeth, S43
 Perez, Veronica B., S6
 Perez-Muñoz, Andrea, S64
 Perkins, Emily R., S12, S15, S36, S49
 Perry, Nicholas, S63
 Peter, Erika L., S95
 Petrone, Eric, S21
 Peysakhovich, Alexander, S16
 Pfeifer, Jennifer, S77, S96
 Phan, K. Luan, S55
 Phillbrook, Lauren, S92
 Phillips, Mary L., S42
 Phillips, Natalie, S14, S61
 Piasecki, Thomas, S22
 Picard, Rosalind, S51
 Pierce, Meghan E., S70
 Pine, Daniel, S11
 Pineles, Suzanne, S30
 Pizzagalli, Diego A., S94
 Pogue, Jamie R., S40
 Polon, Nora, S22
 Pontifex, Matthew B., S13, S35, S36, S44, S69
 Popov, Vladimir V., S33
 Poppe, Andrew, S37
 Pornpattananangkul, Narun, S26, S41
 Potts, Geoffrey, S34, S93
 Pourtois, Gilles, S46, S96
 Puhalla, Alexander, S74

 Quevedo, Karina, S39, S76, S77, S96
 Quintero, Jean, S31

 Ragland, Daniel, S37
 Raine, Adrian, S11, S20

- Raine, Lauren B., S69, S89
 Ramos-Murguialday, Andre, S3
 Rangel, Antonio, S16
 Rasmussen, Eric, S82
 Rawls, Eric, S21, S65, S81
 Ren, Xi, S94
 Rennie, Jaime, S61, S81
 Renzi, Lisa, S89
 Reutter, Mario, S85
 Revers, Hans, S9
 Reynolds, Kary, S28
 Rhoads, Jence A., S22
 Rhodes, L. Jack, S34
 Ricardo-Ferro, Beatriz, S91
 Richards, Christine, S54
 Riesel, Anja, S92
 Rimeikyte, Vaida, S16
 Ritz, Thomas, S27
 Roach, Brian J., S6, S22
 Roalf, David, S11
 Roberson-Nay, Roxann, S33, S52
 Roberts, Melody, S60
 Roberts, Nicole A., S65
 Roberts, Sean, S50
 Robinson, Gabriella G.N., S42
 Robinson, Jennifer, S72
 Rodríguez-Ruiz, Sonia, S52, S70, S76
 Rodrigues, Johannes, S78
 Rogers, James W., S43, S64
 Roisman, Glenn I., S43
 Romeo, Zaira, S61
 Rommers, Joost, S34
 Root, Amy E., S68
 Rosa, Alana, S31, S84
 Rosansky, Joseph A., S42
 Rosenfield, David, S27
 Rosso, Isabelle M., S94
 Rowley, Kaitlyn, S93
 Rubin, Kenneth, S68
 Ruiz-Blondet, Maria, S3, S24, S87
 Ruparel, Kosha, S11
 Ruscio, Ayelet, S11
 Russo, Matt J., S40
 Ryan, Kelly, S51
- Sabatinielli, Dean, S44
 Sabharwal, Amri, S21
 Sable, Jeffrey J., S43, S64
 Sacchi, Elizabeth, S34
 Sackett, Katey, S35
 Safford, Ashley, S73, S87
 Saini, Ekjyot, S92
 Sakakibara, Masahito, S40
 Salam, Amritha Abdul., S25
 Salisbury, Dean F., S6, S14, S18, S42, S62, S63
 Salmela, Viljami, S78
 Salmi, Juha, S78
 Salo, Emma, S78
 Salomon, Kristen, S30
 Samson, Andrea C., S73
 Samuel, Douglas, S37
 Sánchez-Adam, Alicia, S70
 Sandre, Aislinn, S31
 Sanguinetti, Joseph L., S4
 Sano, Akane, S51
 Sato, Toshihiko, S25
- Satterwaite, Theodore, S11
 Sauder, Colin L., S75
 Sauder, Mitchell, S39, S76, S77
 Saunders, Blair, S5, S16, S66, S67, S80
 Saylor, Ellen, S88
 Scanlon, Joanna, S81
 Schembre, Susan, S56
 Schindler, Sebastian, S90
 Schlicht, Patricia, S63
 Schöllhorn, Wolfgang I., S19, S40, S55, S81
 Schmall, Lisa J., S80
 Schmeichel, Brandon J., S20, S90
 Schmid, Andria, S50, S64
 Schmidt, Barbara, S29
 Schmidt, Mark S., S87
 Schnakenberg, Ashley M., S94
 Schneider-Garces, Nils, S83
 Schoofs, Daniela, S56
 Schroder, Hans S., S23, S35, S44
 Schryer-Praga, Jacqueline, S37
 Schubert, Torsten, S5
 Schwartz, Joshua, S17, S31
 Scinto, Christina, S91
 Scolaro, Ashley, S89
 Scott, Annabelle, S42
 Scott, Hannah, S39, S76, S77, S96
 Scott, J. Cobb, S11
 Scudder, Mark R., S69
 Secharan, Rachel, S47
 Segalowitz, Sidney, S56, S72
 Semin, Gün, S28
 Sergeev, Arkadiy A., S72
 Sessa, Paola, S85
 Shackman, Alexander, S11
 Shafer, Andrea, S79
 Shankman, Stewart A., S55
 Sharinger, Christian, S5
 Sharma, Kanishka, S25
 Shear, Will, S68
 Sheerin, Christina, S52
 Shemyakina, Natalia V., S59
 Sheppes, Gal, S95
 Shibkova, Daria, S95
 Shin, Eunsam, S25, S41
 Shinohara, Russell, S11
 Shirtcliff, Elizabeth, S53
 Shiryaev, Dmitry I., S54
 Shors, Tracey J., S13
 Siamata, Michaela, S69
 Siegle, Greg, S62, S64
 Silverstein, Steven, S37
 Simmonds, Lucy, S57
 Simmons, Alysha, S71
 Simon, Talar, S27
 Simons, Robert F., S57, S71
 Singhal, Anthony, S79
 Singh, Gurpreet, S77
 Singh, Sonia, S46
 Smith, Amy M., S94
 Smith, Cynthia, S11
 Smith, Elizabeth, S38
 Smith, Ezra, S4
 Smith, Grace M., S24
 Smith, J. Carson, S13, S31
 Smith, Laura, S68
 Smith, Theresa J., S31
- Smyda, Garry, S76, S77, S96
 Soder, Heather, S93
 Sokhadze, Estate M., S39
 Sommer, Werner, S56
 Soroko, Svyatoslav I., S59
 Southern, Morgan, S24
 Soutschek, Alexander, S5
 Sowards, Sarah, S44
 Sowell, Jonathan P., S82
 Spangler, Derek P., S18
 Spanoudis, George, S49
 Speed, Brittany C., S43
 Sperl, Matthias F.J., S94
 Spironelli, Chiara, S61
 Sponheim, Scott R., S6, S7, S28, S32, S48, S49, S67, S71
 Stafford, Erin, S62
 Stafford, Wayne, S60, S96
 Stahura, Elle, S32
 Starkey-El, Jaime Arribas, S24
 Stefano, Lisa De, S23
 Steindl, Christina, S69
 Stephenson, Alexandra, S27, S68, S70
 Sternberg, Nurit, S95
 Stewart, Hannah L., S19, S56
 Stillwell, Elizabeth E., S30
 Stites, Mallory C., S4
 Stout, Daniel M., S71
 Strowger, Megan, S66
 Subotnik, Kenneth L., S7
 Suchan, Boris, S56
 Suchotzki, Kristina, S60
 Sutton, Bradley P., S79, S83
 Suzuki, Takakuni, S37
 Sweeney, John A., S23, S65
 Szewczyk, Warren, S22
- Takahashi, Kento, S25
 Takeya, Ryuji, S58
 Tamminga, Carol, S74
 Tan, Chin Hong, S83
 Tang, Rongxiang, S58
 Tang, Yi-Yuan, S58
 Tanovic, Ema, S41
 Tarullo, Amanda, S66
 Tasman, Allan, S39
 Tate, Lindsey R., S23
 Taylor, Brittany K., S80
 Taylor, Jeanette, S78
 Taylor, Sara, S51
 Thai, K'Ehleyr, S96
 Thaut, Michael H., S26
 Thayer, Julian, S8
 Thijs, Lise, S8
 Thomas, Ayanna K., S94
 Thomas, Kathleen, S15, S75
 Thomas, Samantha, S28
 Thom, Nathaniel J., S87
 Thornton, Laura C., S43
 Threadgill, Hunter, S10
 Thurm, Audrey, S38
 Timko, C. Alix, S66
 Tollefson, Jessika, S91
 Tolstykh, Evgenia, S95
 Tomko, Rachel, S22, S47
 Tona, Klodiana-Daphne, S9
 Tountas, Andrea M., S53
- Tourva, Anna, S49
 Townsend, Kimberly, S81
 Trivedi, Richa, S25
 Trizna, Rachel, S96
 Trubacheva, Vera, S24
 Trubachev, Vladimir, S24
 Trueba, Ana, S27
 Trull, Timothy, S22, S47
 Tucker, Larry A., S13
 Tukaiev, Sergii, S82
 Tulenina, Nadezhda V., S54
 Tully, Erin C., S53
 Tumulalis, Alexey, S30
 Tusche, Anita, S16
 Tyler, William J., S4
- Ullsperger, Markus, S7, S91
 Ulrich, Natalie, S74
 Uusberg, Andero, S36
- Valadez, Emilio A., S57, S71
 Valentin, Taylor, S20
 Valle-Incan, Fernando, S94
 van der Does, Willem, S8
 van Diest, Ilse, S8, S9
 van Duppen, Lisse, S8
 Vance, Jimmy, S93
 Vandekar, Simon, S11
 Vanuk, John R., S53
 Vartanov, Alexander V., S33, S72, S93
 Vaschillo, Bronya, S77
 Vaschillo, Evgeny, S24, S77
 Venables, Noah C., S12, S46
 Ventura, Joseph, S7
 Verkuil, Bart, S8, S9
 Verona, Edelyn, S50
 Versace, Francesco, S19, S56
 Vervliet, Bram, S8
 Vieira, Andrew, S93
 Vila, Jaime, S44, S52, S70, S72, S76
 Vinitzky, Dmitry A., S72
 Vinkova, Anna, S29
 Virk, Sardeep, S73
 Vogel, Pia, S27
 Vogeti, Sreekari, S84
 Vogt, Sarah E., S53
 Vohra, Hanna, S49
 Volpert, Hannah I., S22, S30
 Voorhis, Abraham Van, S48
 Vrana, Scott, S33, S52
- Walker, John A., S74
 Walk, Anne, S46, S89
 Wallace, Rachel, S33
 Wanger, Timothy, S44
 Wang, Jun, S23, S65
 Wang, Tianjiao, S48, S70
 Ward, Kayla L., S6, S14, S18, S42, S62, S63
 Warren, Stacie L., S43, S86
 Watson, Eric, S27, S68, S70
 Weinberg, Anna, S26, S31, S76
 Weissflog, Meghan, S72
 Weiss, Lauren R., S31
 Weissman, David, S33
 Wessel, Jan R., S7

Westfall, Daniel R., S69
West, Gregory, S47
Westhelle, Felipe, S24
White, Justin B., S54
White, Stormi P., S23, S65
White, Stuart, S43
Whitton, Alexis E., S94
Wielgus, Madeline, S55
Wiese, Andrew D., S60
Wieser, Matthias J., S27, S85

Wild, Alexa N., S71
Wilkes, Amanda J., S24
Wilson, Jamonté D., S43, S64
Wlotko, Edward, S45
Woisard, Kyle, S60, S96
Wolf, Daniel, S11
Wolf, Oliver T., S56
Womelsdorf, Thilo, S8
Woodman, Geoffrey, S95
Woodruff, Nick, S23

Woody, Patrick L., S64
Wrehe, Zach B., S24
Wright, Ashley L.T., S53
Wyczesany, Mirosław, S35
Wynn, Jonathan K., S22

Yamamoto, Naohiro, S25
Yancey, James R., S12, S29, S36,
S38, S44, S46, S93
Yang, Xiao, S18, S49

Yanson, Jessica, S30
Yee, Cindy M., S7
Ye, Shengxuan, S16
Yoshida, Nobukiyo, S18, S37

Zald, David, S95
Ziegler, Keith, S35
Zimmerman, Benjamin, S83
Zimmerman, Rachel, S90
Zyma, Igor, S82

Index to Abstract Descriptors

- a dot-probe task, S25
 accessory stimulus effect, S49
 acetaminophen, S90
 acoustic startle, S85
 action, S48
 addiction, S19
 adolescence, S55, S77, S86, S92, S96
 adolescent alcohol use, S82
 adolescent, S39
 adolescents, S20
 adult health, S20
 advertising, S30
 affect regulation, S18
 affect, S31, S38, S51, S64, S71, S85
 affective computing, S78
 affective faces, S95
 affective picture processing, S59
 affective priming, S28
 affective ratings, S72
 agency, S50
 aggression, S74
 aging, S56, S61, S83
 alcohol, S17, S20, S28, S30, S77
 alpha oscillations, S73
 alpha, S81
 ambivalence, S82
 ambulatory assessment, S47
 amygdala dysfunction, S43
 amygdala, S36, S79
 anhedonia, S80
 animacy information processing, S43
 anticipation, S37, S41
 anticipatory anxiety, S55
 anticipatory stress, S84
 antioxidant, S63
 anxiety sensitivity, S23
 anxiety/depression, S40
 anxiety, S18, S23, S27, S35, S40, S41, S44, S45, S54, S65, S96
 approach motivation, S85
 arousal, S77
 associative learning, S76
 attachment and trauma, S43
 attention, S20, S24, S26, S32, S35, S36, S38, S43, S46, S47, S55, S64, S66, S73, S76, S78, S80, S88, S94
 attention bias, S69
 attention network, S25
 attentional bias modification, S17
 attentional bias, S25, S85
 attentional blink, S65
 attentional control, S25, S89
 attentional flexibility, S89
 attentional performance, S19
 attention-deficit disorder, S29
 attitudes about touch, S65
 audiovisual, S38
 auditory integration training, S39
 auditory motor entrainment, S26
 auditory oddball task, S91
 auditory perception, S18, S42, S62, S63
 auditory research, S85
 auditory steady-state, S74
 autism, S55
 autism spectrum disorder, S23, S39, S59
 autism spectrum disorders, S48
 autonomic activity, S18
 autonomic function, S75
 autonomic responses, S61
 autonomic, S27
 aversive conditioning, S34
 avoidance, S23
 badminton, S19
 baroreflex, S77
 basal ganglia, S56
 BDNF, S29
 bed nucleus of the stria terminalis, S36
 behavioral performance effects, S36
 behavioural addiction, S69
 binaural beats, S60
 binocular rivalry, S45
 biometrics, S24, S87
 bipolar disorder, S21, S74
 body ownership, S92
 brain activity, S58
 brain entrainment, S60
 brain fingerprinting, S25
 caffeine, S54
 callousness, S38
 callous-unemotional traits, S43
 cannabis, S94
 cardiac autonomic balance, S75
 cardiac cycle, S95
 cardiac feedback, S47
 cardiac timing effect, S49
 cardiorespiratory fitness, S83
 cardiorespiratory plasticity, S24
 cardiovascular, S54
 cardiovascular reactivity, S30, S50
 cerebral white matter, S81
 cerebrovascular reactivity, S83
 cerebrovascular risk factors, S61
 child maltreatment, S31
 childhood trauma, S92
 children, S24, S38, S51, S62, S66, S82, S92
 classical music, S82
 CO₂ challenge, S33
 coactivation, S82, S84
 cognition, S22, S24, S39, S50, S54, S65, S69
 cognitive aging, S81
 cognitive conflict, S35
 cognitive control, S17, S20, S21, S33, S37, S43, S59, S71, S81, S82, S89
 cognitive development, S89
 cognitive effort, S59
 cognitive function, S93
 cognitive processing, S40
 cognitive reappraisal, S33, S73
 cognitive resources, S73
 cognitive tasks, S59
 color, S72
 competition, S53
 complex PTSD, S18
 comt val158met, S60
 concealed information test, S25
 concussion, S91, S93
 conditioning, S64
 conflict monitoring, S59
 conflict, S66
 congruence-sequence effect, S47
 connectivity, S51, S53, S64
 contrast avoidance, S23
 coping, S68
 corollary discharge, S48
 correct-related negativity (CRN), S26
 corrugator, S80
 couples, S57
 co-viewing, S82
 creativity, S54
 cycling, S19, S40
 deaf/hard of hearing, S35
 deception, S60
 decision-making, S24, S38, S62, S66, S91
 defense cascade, S83
 defensive-reactivity, S44
 delta-beta coupling, S68
 depression, S19, S30, S39, S40, S51, S61, S62, S75
 developing intelligence, S49
 development, S20, S75, S80
 development of memory, S74
 developmental psychophysiology, S31
 developmental, S21
 dipole localization, S93
 direct current stimulation, S89
 disinhibition, S46
 disorders of consciousness, S64
 disruptive behavior disorders, S43
 distraction effect, S83
 distraction, S64
 DLPFC, S89
 dopamine, S85, S89
 dyadic psychophysiology, S63
 dysaffiliative tendencies, S36
 dyspnea, S83
 eating disorders, S47
 educational media content, S82
 EEG, S19, S26, S27, S36, S38, S40, S41, S49, S54, S55, S57, S59, S60, S62, S65, S73, S74, S81, S82, S88, S90, S91, S96
 EEG: alpha frequency, S78
 EEG/ERP, S38, S48, S90
 EEG/MRI, S94
 EEG slow wave/fast wave ratios, S48
 effective connectivity, S35
 efference copy, S48
 effortful control, S51
 electrodermal activity, S40, S47, S51
 electrodermal responding, S79
 electroencephalogram, S94
 electroencephalograph, S25
 electroencephalography, S17, S65
 electrophysiology, S51, S53, S73
 EMG, S78
 emotion, S17, S19, S27, S31, S42, S43, S44, S45, S47, S56, S61, S67, S68, S69, S70, S72, S76, S82, S84, S86
 emotion processing, S46, S50
 emotion recognition, S66, S88
 emotion regulation, S31, S41, S43, S53, S54, S60, S73, S79, S80
 emotion/affect, S30, S90
 emotional burnout, S82
 emotional control, S35
 emotional distraction, S79
 emotional eating, S65
 emotional engagement, S90
 emotional reactions, S52
 emotional regulation, S72
 emotional response, S48
 empathy, S33, S48, S85
 energy density, S48, S70
 engagement, S22
 entrainment, S81
 ERN, S17, S44, S45, S46, S92
 erotica, S64
 ERP measurement, S17
 ERP/EEG, S84
 ERP, S20, S29, S32, S35, S39, S42, S45, S58, S64, S66, S68, S69, S71
 ERPs, S20, S22, S29, S37, S45, S67, S71
 error monitoring, S44, S50
 error positivity (Pe), S36
 error positivity, S56
 error-monitoring, S17
 error-related negativity, S51, S56
 error-related negativity (ERN), S36, S37
 errors, S46
 estradiol, S46
 event-related potential, S36, S43, S71, S79, S80
 event-related potentials, S20, S22, S33, S34, S39, S46, S47, S56, S58, S59, S78, S86, S93, S95
 executive functioning, S37
 executive function, S24, S61, S66
 exercise, S31, S44
 expectation, S83
 externalizing psychopathology, S50
 externalizing, S49
 eye blink artifacts, S36
 eye-tracking, S54

- face morphing, S88
 face space, S84
 facial activity, S78
 facial expression, S38, S96
 facial mimicry, S28
 facial processing, S46
 fatigue, S24
 fear conditioning, S27, S28, S60, S67, S79
 fear conditioning/extinction, S94
 fear generalization, S23, S53, S67
 fear potentiated startle, S93
 fear response, S68
 fear-potentiated startle, S53
 feedback, S42
 feedback processing, S22
 feedback-related negativity, S93
 filtering, S24
 financial decision making, S67
 first-episode, S42, S62
 first-episode schizophrenia, S63
 flow, S52
 fMRI, S31, S33, S43, S44, S49, S66, S76, S86
 food, S70, S76
 fragile x syndrome, S65
 fm, S74, S91
 frontal asymmetry, S78, S82
 functional connectivity, S72, S75
 functional magnetic resonance imaging, S78
 functional MRI, S67
- gambling task, S42
 gambling, S68
 gamma, S65
 generalizability theory, S17
 genetics, S32
- health, S62
 heart rate, S20, S33, S52
 heart rate variability, S40, S52, S53, S74, S77
 heart rate variability (HRV), S30
 hemispheric dominance, S52
 hostility, S77
 HRV, S53, S57
 hypnosis, S29
 hypoxia, S59
- IAPs, S88
 IBMT, S58
 ICA components, S36
 identity recognition, S44
 idiographic stimuli, S43
 imagery, S90
 immune function, S58
 immune system, S27
 impulsivity, S78
 individual differences, S25, S29, S69, S70, S79
 individual pain sensitivity, S95
 information-processing conflict, S47
 inhibitory control, S36, S56, S57
 insular cortex, S18
 internal family systems, S30
 interoception, S66
- interoceptive sensitivity, S49, S56
 interoceptive threat, S83
 interpersonal distress, S50
 interpersonal violence, S50
 irrelevant probe technique, S39
 irritability, S58
- just noticeable differences, S34
- lab stressors, S65
 language, S21, S71, S90
 language comprehension, S45
 language impairment, S46
 language laterality, S61
 language processing, S35
 language/emotion, S90
 late positive potential, S23, S31, S86, S90
 late positive potential (LPP), S19, S26, S43
 latency variability, S26
 laterality, S77
 learning, S64
 light exposure, S53
 listening effort, S35
 long term meditation, S25
 long-term potentiation (LTP), S22
 LORETA, S73
 LPP, S17, S29, S44, S60
 LRPs, S52
 lutein, S89
 lying, S60
- maltreatment, S39, S77
 marketing applications, S57
 mass media, S57
 mathematical performance, S40
 media, S52, S84, S85
 mean emotion, S96
 media multitasking, S25
 medial-frontal negativity, S34
 MEG, S23
 memory, S21, S54, S77, S94
 memory-guided saccades, S93
 mental imagery, S86
 message processing, S22
 meta-analysis, S32, S59
 methodology, S54
 mild traumatic brain injury, S32
 military, S72
 mindfulness intervention, S58
 mindfulness, S58, S88
 mirror exposure, S52
 mismatch negativity, S59, S62, S63
 mismatch negativity in auditory oddball task, S39
 mobile EEG, S81
 monetary reward, S76
 mood, S78
 motivation, S26, S28, S36, S70, S82, S84
 motor learning, S19, S56
 motor praxis, S52
 multilevel modeling, S33
 multimodal, S17
 multimodal imaging, S79
 multimodality, S61
 multiple facial expressions, S46
- multisensory interaction, S83
 multitasking, S81
 music therapy, S26
- N170, S29
 N1, S28
 N2 event related potential, S47
 N200, S53
 N2pc, S76, S85
 narrative engagement, S52
 near miss, S74
 network, S64
 neural correlates of intelligence, S49
 neural oscillations, S81
 neuroeconomics, S66
 neuroimaging, S77, S96
 neuroticism, S79
 non-suicidal self-injury, S96
 nonverbal behavior, S67
 novelty, S36
 NPU, S88
 numerosity perception, S87
- obesity, S76
 observational learning, S91
 olfaction, S51
 optimal foraging, S70
 opto-kinetic nystagmus, S90
- P3, S42, S91
 P3b, S29, S62
 P300 event-related potential, S91
 P300, S25, S30, S68, S70, S83, S89
 paced breathing, S24
 pain, S95
 panic disorder, S55
 parafoveal processing, S35
 perception, S37, S38, S44
 performance monitoring, S67, S92
 peripheral physiology, S73
 personality, S37, S61, S82
 phase, S64
 phase-locking factor, S21
 phobias, S69
 physical activity, S69
 physical attractiveness, S39
 positive emotions, S44, S72
 postauricular reflex, S70
 post-concussive symptoms, S87
 post-error slowing, S94
 posture control, S55
 power pose, S50
 prediction, S21, S45
 pre-ejection period, S80, S92
 pregnancy, S80
 preparedness theory, S79
 primary motivation, S48
 principal components analysis, S71
 problem gambling, S74
 prodrome, S63
 prosocial behavior, S33
 prosody, S85
 prospective memory, S89
 psychometrics, S17
 psychoneurometric, S46
 psychopathic traits, S72, S95
 psychopathology, S30, S92
 psychopathy, S46, S70
- psychophysiological, S85
 psychophysiological stress, S91
 psychotic disorders, S21
 PTSD (combat stress), S30
 PTSD, S28, S32, S67, S71
 puberty, S86
 pulse transit time, S91
 punishment sensitivity, S93
 pupil dilation, S36
 pupillary indices, S73
 pupillometry, S32, S87
- qEEG, S61, S73
 qi-gong, S81
- reaction time, S60
 reactivation, S74
 reading ability, S46
 reading the mind in the eyes, S50
 reading, S35
 real-world attention, S72
 recognition memory, S29, S93, S95
 regional homogeneity, S28
 relational memory, S74
 relationships, S92
 reliability, S75, S80
 repetition suppression, S62
 resilience, S87
 respiration, S27
 respiratory sinus arrhythmia, S18, S55, S77
 response inhibition, S33
 response monitoring, S50
 response time variability, S41
 resting-state fMRI, S21, S32
 resting-state, S75
 reward, S18, S26, S56, S71, S75
 reward anticipation, S41
 reward positivity (RewP), S76
 reward positivity, S69, S85, S88, S91
 reward processing, S37
 reward sensitivity, S48
 right hemisphere activation, S31, S84
 risk factors for depression, S53
 RSA, S65, S68
 rubber hand illusion, S92
- saccade, S23
 safety vs. relief, S28
 salivary alpha amylase, S40
 salivary cortisol, S40
 schizophrenia, S18, S21, S32, S42, S45, S49, S62, S63
 SCR, S28
 selection bias, S41
 self-control, S20, S58
 self-face processing, S76
 self-forgiveness, S30
 self-injurious thoughts and behaviors, S55
 semantics, S72
 sensation seeking, S84
 sensory gating, S48
 sentence comprehension, S34
 sequence processing, S46
 sequential effect, S83
 sex difference, S75
 sex differences, S31, S66

- short-term plasticity (STP), S22
 shyness, S52
 simultaneous EEG/MRI, S94
 skin conductance, S47, S78
 skin conductance response, S25
 sleep, S27, S51, S70, S88, S92
 smoothing spline, S79
 social anxiety, S52, S61, S69, S85, S86
 social attitudes, S66
 social awareness, S55
 social cognition, S67
 social engagement, S65
 social feedback, S90
 social multimedia, S81
 social neuroscience, S67
 social perception, S22
 social reward, S76
 social/affective, S85
 social/monetary reward, S37
 social-networking usage, S95
 social, S20
 spatial attention, S58
 spatial cueing paradigm, S96
 spatial transformation, S23
 spectral power, S21
- SSVEP, S27, S38
 stability, S80
 startle, S75, S88
 startle blink reflex, S70
 startle eyeblink reflex, S47
 startle eyeblink, S19
 startle reflex, S72, S86
 startle response, S28
 state anxiety, S71
 statistical methods, S63
 steady state visual evoked potentials, S34
 stimulus preceding negativity, S41, S69, S94
 stimulus-preceding negativity (SPN), S18, S37
 stress, S27, S56, S72, S80, S94, S96
 substance use, S51, S75
 suicidal behavior, S46
 suicide attempts, S76
 suicide, S19
 sustained potential, S18, S42
 syllable deviant, S63
 sympathetic nervous system, S55, S92
- synchrony, S38
 syntax, S90
- task switch, S93
 task-switching paradigm, S81
 taylor aggression paradigm, S74
 temperament, S68
 temporal processing, S85
 text comprehension, S77
 the claustrum, S32
 the late positive potential, S31
 theta, S45, S82
 theta oscillation, S26
 theta oscillations, S94
 threat sensitivity, S46, S93
 threat-of-shock, S54
 threat, S44
 time-frequency heart rate variability, S91
 tobacco, S22
 trait anxiety, S31, S79, S84
 trait fear, S53
 transcranial direct current stimulation (tDCS), S26
 translational research, S37
 trauma, S62, S64
- traumatic brain injury, S28, S73
 trial history, S41
- uncertainty, S41, S54
 unpredictability, S75, S86
 unpredictable threat, S55
- vection illusion, S90
 violent game exposure, S59
 virtual reality, S78, S90
 visceral adipose tissue, S89
 visceral feedback, S95
 visual attention, S41
 visual ERPS, S72
 visual perception, S32, S94
 visual spatial attention, S47
 visual word processing, S58
 visual word recognition, S34
 visuospatial attention, S33
- working memory, S18, S21, S49, S86
 worse-than-expected, S93
- Young children, S53