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THE INTERNATIONAL JOURNAL OF THE
SOCIETY FOR PSYCHOPHYSIOLOGICAL RESEARCH

PSYCHOPHYSIOLOGY

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Information for subscribers

Psychophysiology is published in 12 issues per year. Institutional subscription prices for 2023 are: Online: US\$1010.00(US), US\$1558.00 (Rest of World), €1,010.00 (Europe), £800.00 (UK). Prices are exclusive of tax. Asia-Pacific GST, Canadian GST/HST and European VAT will be applied at the appropriate rates. For more information on current tax rates, please go to <https://onlinelibrary.wiley.com/library-info/products/price-lists/payment>. The price includes online access to the current and all online backfiles for previous 5 years, where available. For other pricing options, including access information and terms and conditions, please visit <https://onlinelibrary.wiley.com/library-info/products/price-lists>. Terms of use can be found here: <https://onlinelibrary.wiley.com/terms-and-conditions>

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2023 Annual Meeting of the Society for Psychophysiological Research

Pre-Conference Workshops: Wednesday, September 27, 2023
Annual Meeting: Wednesday, September 27-Saturday, October 1, 2023
Website: www.sprweb.org

This Supplement contains the abstracts from each presentation in the Symposia, Discussion Panels, Open Topic Symposia, and Poster Sessions being presented at the 2023 SPR Annual Meeting scheduled for September 27-October 1.

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

The 2023 Annual Meeting Program includes three Pre-Conference Workshops, three Invited Addresses, one Presidential Address, three Open Topic Symposia, three Discussion Panels, two Early Career Award Addresses, and multiple Symposia. Specific research topics will be covered in the Symposia. The majority of the research reports will be discussed at the three Poster Sessions.

I would like to thank all contributors for sharing their research and making this year's Annual Meeting a rich and stimulating event!

Marta Andreatta
 2023 Program Committee Chair

Program Committee (2022–2023)

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 Anna Weinberg, McGill University

Program Highlights

Wednesday, September 27, 2023

9:00 a.m.–4:30 p.m.

Pre-Conference Workshop 1 (available at an additional fee)

Methods for Analyzing Neural Oscillations and Aperiodic Activity

Andrew Bender, Dillan Cellier, Quirine van Engen, Ryan Hammonds, Eena Kosik, Michael Preston, and Sydney Smith
 University of California, San Diego

9:00 a.m.–4:30 p.m.

Pre-Conference Workshop 2 (available at an additional fee)

An Introduction to Machine Learning in Python Using Eye-Tracker Data

Thomas Hartmann
 University of Salzburg, Salzburg, Austria

9:00 a.m.–4:30 p.m.

Pre-Conference Workshop #3 (available at an additional fee)

Deciding How Much to Bet on an Idea: Bayesian Data Analysis

Charles Green
 University of Texas Medical School at Houston, Houston, TX

7:00 p.m.-9:00 p.m.

Opening Reception and Poster Session I

Thursday, September 28, 2023

8:30 a.m.-10:00 a.m.

Open Topic Symposium: Interventions and Therapeutic Approaches

8:30 a.m.-10:00 a.m.

Open Topic Symposium: Neuropathology

10:35 a.m.-11:30 a.m.

Invited Address

Enhancing Recovery of the Prefrontal Cortex in Human Drug Addiction: What Does Language Have to Do with it?

Rita Z. Goldstein

Icahn School of Medicine at Mount Sinai, New York

1:05 p.m.-2:00 p.m.

Invited Address

Neural Code of Speech Sounds

Edward F. Chang

University of California, San Francisco

2:30 p.m.-4:00 p.m.

**Discussion Panel: Translating Models of Appetitive Motivation: From Rodents to Humans (and Vice-Versa),
A Friendly Controversial Thematic Session**

2:30 p.m.-4:00 p.m.

Open Topic Symposium: Methodological Aspects in Psychophysiology

4:30 p.m.-6:00 p.m.

Open Topic Symposium: Psychopathology and Treatment Strategies

4:30 p.m.-6:00 p.m.

Discussion Panel: Language: New Approaches and New Ideas

6:00 p.m.-8:00 p.m.

Poster Session II

Friday, September 29, 2023

8:30 a.m.-10:00 a.m.

Open Topic Symposium: Neuropsychological Mechanisms of the Life-Span

10:30 a.m.-12:00 p.m.

President's Symposium: The Psychophysiology of Music

1:30 p.m.-3:00 p.m.

President's Symposium on Diversity, Equity, and Representation

3:15 p.m.-4:45 p.m.

Faces of the Future Flash Talks

5:00 p.m.-6:30 p.m.

Open Topic Symposium: Psychopathology and Individual Differences

6:30 p.m.-8:30 p.m.

Poster Session III

10:00 p.m.

Student Social

Saturday, September 30, 2023

8:30 a.m.-9:00 a.m.

Early Career Award Address

Reevaluating Psychophysiology: The Imperative of Psychometric Rigor

Peter E. Clayson

University of South Florida

9:00 a.m.-9:30 a.m.

Early Career Award Address

Reward Responsiveness and Depression Vulnerability: Translational Insights from Event-Related Potentials

Autumn Kujawa

Vanderbilt University

9:50 a.m.-10:45 a.m.

Invited Address

The Entangled Brain: Integration of Emotion, Motivation, and Cognition

Luiz Pessoa

University of Maryland, Baltimore

11:00 a.m.-12:00 p.m.

Presidential Address

Vision and Emotion: The Secret Life of a Control Area
Andreas Keil
University of Florida

12:15 p.m.-2:30 p.m.

SPR Business Meeting and Awards Luncheon
(ticketed event)

9:00 p.m.

Saturday Night Social with the SPR Blues Band

ABSTRACT

Symposia Abstracts

SYMPOSIUM 1.1

THREAT PROCESSING AT CENTRAL AND PERIPHERAL PROCESSING LEVELS IS MODULATED BY CONTEXTUAL AND INDIVIDUAL FACTORS

Session Chair: Stephan Moratti
Complutense University of Madrid
Discussant: Stephan Moratti
Complutense University of Madrid

Descriptors: threat processing, context, individual differences

How the individual processes threat stimuli has been a subject of research for a long time. Responses of the central and autonomous nervous system (ANS) to threat reflect different strategic response patterns mediated by the sympathetic and parasympathetic branches of the ANS. These response patterns also determine how the brain processes the threat relevant information and prepares for action. In this symposium we will present work that shows how contextual factors heavily influence the processing of threat relevant information and how it biases the organism's response strategy such as parasympathetically driven orienting or sympathetically driven action preparation. For example, Stegmann, Wieser and Gamer will present data that illustrates how aversive contexts enhance fear conditioned responses at the ANS and visual sensory cortex level. Klaassen et al. adopted another approach by manipulating the rewarding or punishing prospect of an event and measured approach and avoidance behavior and its associated heart rate patterns. Further, using classification analysis on the MEG data they quantified per trial how neural reward and punishment information is represented over time. Finally, de Echegaray and Moratti will show how the same threat related stimuli elicit different response strategies as a function of perceived threat imminence. Thereby, they show how the variance of neural oscillatory brain activity in visual sensory and motor relevant brain areas is explained by the degree of orienting

or defense action preparation as indexed by corresponding heart rate changes.

FUNDING: Ministry of Science and Innovation, Spain: PDI2021-126074-NB-I00.

PREPARE FOR TROUBLE, MAKE IT DOUBLE: AVERSIVE CONTEXTS ENHANCE DEFENSIVE RESPONSES TO CONDITIONED THREAT

Yannik Stegmann¹, Matthias Wieser², Matthias Gamer¹
¹University of Würzburg, ²Erasmus University Rotterdam

Adaptive responses to aversive events typically involve a cascade of physiological, sensory, and behavioral processes. Previous research demonstrated different defensive strategies in response to potentially threatening situations compared to immanent threat. How these strategies interact, however, remains elusive. To address this gap, the present studies examined the impact of contextual threat on defensive responses to acute threat cues. In total, 141 participants completed a differential fear conditioning paradigm followed by a cue-in-context test phase in which the fear-conditioned cues were presented orthogonally in front of inherently or conditioned aversive vs neutral contexts. To capture defensive responding, we recorded subjective, physiological (electrodermal and cardiovascular), and electrocortical measures (steady-state visual evoked potentials, ssVEPs) to the conditioned stimuli as a function of contextual threat. Results demonstrated successful fear conditioning in all measures. In addition, threat and US- expectancy ratings, cardiac deceleration, skin conductance, and ssVEP responses were enhanced to conditioned cues presented in aversive compared to neutral contexts. This effect was more pronounced for inherently aversive compared to conditioned contextual stimuli. These results are in line with the notion that defensive strategies in response to potential and acute threat are not mutual exclusive but interact to optimize adaptive behavior in life-threatening situations.

TRACKING THE TEMPORAL DYNAMICS OF REWARD AND PUNISHMENT INFORMATION DURING APPROACH-AVOIDANCE DECISION-MAKING UNDER THREAT

Felix Klaassen¹, Bob Bramson¹, Jan-Mathijs Schoffelen¹, Linda de Voogd^{1,2}, Karin Roelofs¹

¹Radboud University, ²Leiden University

When deciding whether to approach or avoid in acutely threatening situations, it is important to process and compare the potential positive and negative outcomes of the decision. Additionally, the presence of threat might trigger an automatic defensive freezing response characterized by physiological changes such as heart rate deceleration (bradycardia). Previous work has shown that the psychophysiological state associated with freezing affects information processing, action preparation, and approach-avoidance decision-making, by acting on an extensive amygdala-striatal-prefrontal circuit. However, most previous studies used fMRI, and so the temporal dynamics of the neural processing of reward and punishment information that informs approach-avoidance remains largely unknown. To shed more light on the temporal dynamics of approach-avoidance decision processes, we opted for a strong within-subject design using magnetoencephalography (MEG). We recruited 10 human participants for 5 MEG sessions (total 100 hrs) and used custom-made headcasts. In each session, participants approached or avoided targets associated with varying reward and punishment prospects (0-5 euros/shocks). Using classification analysis on the MEG data, we quantified per trial how neural reward and punishment information is represented over time. Behaviorally, participants traded off reward and punishment information: threat of shock was associated with avoidance and bradycardia, while higher monetary prospects led to increased approach. We will present behavioral and ongoing neural classification analyses.

FUNDING: European Research Council (ERC_CoG - 2017_772337).

THREAT IMMINENCE AS INDEXED BY HEART RATE CHANGES MODULATES SENSORY AND MOTOR CORTEX ACTIVITY IN HUMANS

Javier De Echegaray¹, Stephan Moratti²

¹University of Leipzig, ²Complutense University

Central and peripheral nervous system activity modulations by the presence of threat stimuli have been investigated for a long time. Usually, these studies report findings at a group level in healthy participants. However,

individuals may perceive different levels of threat imminence for the same threat. Defense cascade model frameworks predict different response patterns in the central and autonomous nervous system depending on the perceived threat imminence. Here, we use heart rate (HR) response patterns as a proxy for perceived threat imminence when watching threat relevant scenes. Individuals could be subdivided in HR decelerators and accelerators. Critically, HR decelerators showed increased neuromagnetic oscillatory stimulus driven activity in posterior visual cortex as recorded by MEG. This is in line with the notion that HR deceleration indexes an orienting response. Orienting responses have been also associated with attentional motor inhibition. In accordance with this idea, HR decelerators showed increased event related synchronization of beta band activity in cortical motor areas that has been associated with the inhibition of motor circuits. Critically, HR accelerators were characterized by an opposite modulation pattern of neural activity in sensory and motor areas. HR acceleration was associated with decreased stimulus driven oscillatory neural activity in visual brain areas, whereas these individuals showed increased event related desynchronization of beta band activity in cortical motor circuits indicating lower thresholds for action initiation.

DEFINITE THREAT VS POTENTIAL THREAT: A HUMAN OSCILLATORY BRAIN ACTIVITY INVESTIGATION

Arash Mirifar¹, Hannah Engle¹, Yannik Stegmann², Matthias Gamer², Andreas Keil¹

¹University of Florida, ²Julius-Maximilians-University of Würzburg

Descriptors: Defensive behaviors, Conditioning

The ability to efficiently detect and respond to threat—as well as potential threat—is essential to ensuring well-being and self-preservation. Much of the work into the psychophysiological correlates of threat cue perception has emphasized passive viewing of visual cues varying in threat content. As a consequence, less is known about active defensive behaviors such as avoidance. In the present study dense-array EEG was recorded from N=46 participants (43 right-handed, 38 females, mean age of 21 years, SD 1.4). The paradigm consisted of 3 conditions of 60 trials each, presented in pseudo-random order, intermixed. Each trial consisted of a white cross (4.5 seconds duration), which changed color to either red, green, or yellow (for another 2 seconds), followed by a naturalistic image (8 sec). Based on the color cues, three outcomes occurred then: Participants (a) received an annoying electric shock (threat, red cue) regardless of any response; (b) could avoid the shock if

they hit the space key fast enough (potential threat, yellow cue) or (c) no shock at all (safe, green cue). Time-frequency analyses of EEG data focused on posterior and central oscillatory activity in the alpha range. We found substantial posterior alpha reduction throughout the trial. Heightened reduction in the avoidance/potential threat condition was observed in response to the cue, and also prior to the motor response. A negative correlation was also found between spectral power in the alpha/mu range and avoidance response time suggesting that alpha reduction is functionally linked to avoidance behavior.

SYMPOSIUM 1.2

BEYOND CONVENTIONAL LAB SETTINGS: INVESTIGATING THE BENEFITS OF VIRTUAL REALITY IN PSYCHOPHYSIOLOGICAL RESEARCH

Session Chair: Benjamin Schöne
Norwegian University of Science and Technology

Descriptors: VirtualReality, EEG, UltrasonicNeuromodulation
This symposium investigates how virtual reality (from virtual environments on a desktop to real-life like setups) can benefit psychophysiological research on cognitive and affective processes. Marike Johnsdorf will present evidence on the influence of different degrees of reality on object perception, interaction, and mnemonic processing. By comparing a matching-to-sample task in real-life, virtual reality, and 2D laboratory conditions, she elucidates the aspects of real-life processing that may be missed by conventional lab settings. Johannes Rodrigues argues that the capability model of frontal asymmetry needs to be extended to an inversely U-shaped model, including overly strong motivational induction leading to a decline of trait activation. The strength of motivational induction is utilized with movies, mental imagery, and a virtual T-maze. Philipp Ziebell utilized a virtual T-maze to objectively validate prior work on ultrasonic neuromodulation via mid-frontal theta inhibition. This approach allowed showing ultrasonic effects on continuous behavior close to real life in approach-avoidance and exclusive avoidance events, characterized by distinct electroencephalographic topographies. Concluding the session, Merle Sagehorn presents findings from two studies examining the neural correlates of face perception in 2D and more realistic conditions. Not only does the N170, the most established marker for

face perception, lose discriminatory power under realistic conditions, but further markers emerge beyond the classic time frames.

REVEALING THE LIMITATIONS OF CONVENTIONAL LABORATORY RESEARCH FOR CAPTURING COMPLEX COGNITIVE MECHANISMS: A COMPARATIVE EEG ANALYSIS INVESTIGATING OBJECT PERCEPTION AND MEMORY PROCESSING IN REALISTIC VIRTUAL, REAL-LIFE, AND LABORATORY ENVIRONMENTS

Marike Johnsdorf¹, Joanna Kisker¹, Thomas Hofmann², Thomas Gruber¹, Benjamin Schöne^{1,3}

¹Osnabrück University, ²University of Applied Sciences Osnabrück, ³Norwegian University of Science and Technology

Cognitive processes are evolutionary optimized to function within complex three-dimensional environments. Until now, these mechanisms have been investigated mainly in the conventional laboratory under simplified conditions. First research using realistic virtual reality (VR) environments suggests that complex natural cognitive mechanisms within their entire interconnected network cannot comprehensively be captured in these conventional settings. In particular, distinct functional properties of perceptual and mnemonic processing have been observed between conventional two-dimensional and realistic three-dimensional environments. To determine the influence of different degrees of reality on cognitive processing, we investigate neuronal correlates of object perception and subsequent memory processing under conventional laboratory, realistic virtual and real-life conditions using a matching to sample task as well as a cued recall task. Event-related potentials (ERPs) and frequency band analyses are compared between the three conditions and discussed in regard to the involvement of an intertwined cognitive network including somatosensory processes as a function of the degree of reality in the respective condition. This study highlights the relevance of extending conventional laboratory research to real-life conditions in order to reveal complex natural cognitive mechanisms.

FUNDING: This research is funded by the MWK Niedersachsen and the VolkswagenStiftung (11-76251-14-1/21).

○ CAN HANDLE THIS! EVIDENCE FOR A SITUATIONAL INDUCTION STRENGTH BASES QUADRATIC EXTENSION TO THE CAPABILITY MODEL

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The capability model of anterior asymmetry integrates trait-related and state-related frontal asymmetry research by proposing that frontal asymmetry is dependent on relevant traits if they are activated by a situation. Hence, it emphasizes the importance of a relevant situation in contrast to resting state to find trait related behavior. However, differences in experimental design, and EEG recording methods and the strength of the induced situational context have been neglected so far. We investigated 56 participants under three different situational paradigms (virtual T-maze, mental imagery, movies), varying the stimulus, strength of motivational induction and type of measurement concerning frontal asymmetry. We predicted that “strong” situational manipulations (virtual T-maze, frontal asymmetry measured as event-related desynchronization) would eclipse relationships between frontal asymmetry and relevant traits, whereas “weaker” task manipulations, measured during longer time periods, would enhance relationships to relevant traits compared to frontal asymmetry at rest. The results confirmed these expectations, stressing the importance of stimulus characteristics and recording methods concerning the trait relations of frontal asymmetry to personality traits with respect to the capability model. Additionally, a revision of the capability model to an inverse U-shaped quadratic relationship might be advisable.

BEYOND AMBIGUITY: EFFECTS OF TRANSCRANIAL ULTRASOUND NEUROMODULATION OF MIDFRONTAL THETA AND RELATED APPROACH VERSUS WITHDRAWAL BEHAVIOR IN UNAMBIGUOUS EVENTS OF A VIRTUAL T-MAZE

Philipp Ziebell¹, Johannes Rodrigues¹, André Forster¹, Joseph Sanguinetti², John Allen², Johannes Hewig¹

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Recently, we demonstrated that low-intensity transcranial focused ultrasound (LITFUS) to the right prefrontal cortex (RPFC) can modulate electroencephalographic (EEG) midfrontal theta (MFT) and related behavior, complementing studies on mood enhancement and anxiety/

worry reduction. Here, we expand previously presented findings from a preregistered double-blind within-subjects study with a large dataset ($N = 152$) and a virtual T-maze task. Originally, we showed RPFC LITFUS inhibition of conflict-related MFT, significantly predicting heightened approach versus lowered withdrawal in ambiguous T-maze events. Now, we focus on T-maze events without ambiguity that still provided potential for conflict between approach and withdrawal, namely approach-avoidance and exclusive avoidance situations. RPFC LITFUS inhibition of MFT significantly predicted heightened approach and reduced withdrawal in unambiguous approach-avoidance and exclusive avoidance T-maze events. Both event types showed distinct EEG-behavior prediction patterns in scalp topography. Notably, RPFC LITFUS MFT inhibition not only predicted increased approach via joystick pushing but also heightened approach-towards-safety via 180-degree turn and joystick pushing versus lowered withdrawal via joystick pulling. The EEG-behavior prediction patterns for unambiguity differed to some extent from those for ambiguity, potentially reflecting differing underlying mechanisms. As LITFUS can also be effective in less ambiguous, more rigid situations, this ultimately opens room for various applications such as supporting psychotherapy.

FUNDING: Funding from Alexander von Humboldt Foundation, Society for Psychophysiological Research Training Grant, and University of Würzburg Faculty of Human Sciences. The text reflects solely its authors' views.

FACE PERCEPTION IN VIRTUAL REALITY: A COMPARISON OF ELECTROPHYSIOLOGICAL MARKERS IN VR AND THE CONVENTIONAL LABORATORY

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¹Osnabrück University, ²Norwegian University of Science and Technology

Faces are inherently important social cues, making face perception one of the most specialized visual processes in the brain. However, most research on face perception has been conducted in the conventional laboratory, i.e., on monitors providing a fairly distal representation of faces as planar 2D images. The introduction of virtual reality (VR) as a complementary method in the laboratory allows for the presentation of life-size 3D subjects at a personal distance from participants, creating a sense of social involvement and adding self-referential value to the faces. In two studies, the perception of persons under conventional laboratory conditions was compared with realistic

conditions in VR. Following standard designs, images of unknown persons and standard perceptual and object control images were presented both modalities. To investigate the extent to which face perception mechanisms differ under realistic conditions from those in the conventional laboratory, typical face-specific N170 and subsequent components were analyzed, complemented by response-related analyses in the ERP and frequency domains. Stimulus-locked analyses revealed a loss of discriminative power of the N170 when transferred to realistic conditions, while the later component showed more discriminative face-specific processing in VR. Response-locked analyses revealed distinct post-decisional processing of faces under realistic conditions. Taken together, the results of both studies show that face-specific neural mechanisms beyond the time frame of the N170 are applied under realistic conditions.

SYMPOSIUM 2.1

DYADIC PSYCHOPHYSIOLOGY WITH CLINICAL POPULATIONS

Session Chair: Wendy D'Andrea
The New School

Descriptors: Dyadic Physiology, Physiological Synchrony, Clinical Groups

Social relationships play a central role in wellbeing, and these relationships are often impacted in clinical groups. Furthermore, despite compromised relational functioning, social interactions are leveraged across settings in the service of reducing suffering. Prior work has established that even our physiology may become aligned when in relationship with others, whether with partners, children, or care providers. Does synchrony facilitate improvement or wellbeing in clinical groups—or does it exact a toll on the other person? In this symposium, three talks will explore dyadic physiology within a clinical context. In the first talk, K.H. Chen examines the influence of physiological synchrony on emotion recognition and regulation in dyads where one partner is experiencing dementia. In the next, W. D'Andrea examines how partner physiology influences emotional reactivity to threat paradigms when one member of the dyad has posttraumatic psychopathology. In the third, N. Pole examines the dynamics of physiological synchrony between client and therapist, throughout the course of psychotherapy. Taken together, these three talks which derive from a diverse array of contexts and populations demonstrate that our connections

with others—manifested in physiological synchrony—can impact important aspects of our emotional and social lives, including within clinical groups.

DIMINISHED PHYSIOLOGICAL LINKAGE WITH SPOUSAL CAREGIVERS IS ASSOCIATED WITH IMPAIRED EMOTION RECOGNITION IN PERSONS WITH DEMENTIA

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People with dementia (PWD) often develop profound emotional impairments that can lead to reduced social connectedness with their loved ones. Physiological linkage, which refers to the degree that people's peripheral physiological responses change in coordinated ways, can serve as a proxy measure for social connectedness. Physiological linkage has been found to be reduced during interactions between PWDs and spousal caregivers; however, the associated PWD emotional impairments have not been determined. In a sample of 42 PWD-spousal caregiver dyads, we quantified physiological linkage as the correlations (either positive or negative) between the PWD's and caregiver's physiological responses (using a composite score of six peripheral physiological measures) during a 10-minute conflict conversation in the laboratory. Aspects of PWD emotional impairments were evaluated via informant reports that assessed: (a) emotion recognition—the ability to recognize emotions in others; and (b) emotional reactivity—the ability to generate emotion reactions to positive and negative stimuli. Lower physiological linkage during the conversation was associated with lower emotion recognition in PWDs ($\beta = 0.38$, $p = .048$), but not with PWD emotional reactivity to either positive ($\beta = -0.03$, $p = .88$) or negative ($\beta = 0.07$, $p = .67$) stimuli. Linking PWD deficits in emotion recognition to diminished physiological linkage during conversations with their caregivers may provide a basis for understanding PWD problems in establishing social connections with others.

DYADIC REGULATION IN THE TIME OF TRAUMA: HOW POSTTRAUMATIC STRESS REACTIONS INFLUENCE PHYSIOLOGICAL THREAT REACTIVITY BETWEEN PARTNERS

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Social support has an established soothing impact on threat reactivity. However, for people who have experienced childhood interpersonal violence and its attendant posttraumatic stress reactions (PTSRs), closeness to another person may signal threat, rather than reduce sensitivity to it. Indeed, PTSRs have a noted deleterious impact on relationships, which may be a barrier to leveraging interpersonal resources. We examined whether social support, via handholding by one's romantic partner, mitigated autonomic reactivity to threat of shock, relative to comparison solo emotion regulation conditions, among romantic dyads with and without PTSRs. 51 couples were stratified into 3 groups: both partners with PTSD, one partner with PTSD, or neither partner with PTSD. Several dyadic findings emerged. All individuals regardless of PTSD showed evidence of better regulated threat reactivity (via SC, HR change, and self report) when with their partner than when alone. However, actor-partner interaction modeling demonstrated that, regardless of condition (solo vs. with partner), physiological threat reactivity was influenced by the extent of their partner's trauma, such that people with *partners* with more trauma had stronger SC reactivity and early HR deceleration (betas .13 and -1.03, $p < .05$). SC and HR reactions in the PTSD- partner were in turn predicted by the SC responses of the PTSD+ partner. These findings imply that people with PTSRs do benefit from handholding, which bodes well for socially-anchored interventions; but physiology within trauma-exposed dyads is nonetheless complex.

THE BOND BETWEEN CLIENT AND THERAPIST IS MORE THAN SKIN DEEP

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Positive psychotherapy outcomes have been consistently associated with common factors such as empathy (i.e., therapists who know what a client is feeling) and strong therapeutic alliance (i.e., a close emotional bond between the therapist and client). Prior research suggests that physiological linkage may be a substrate of both empathy

and close relationships. We examined continuous physiological recordings simultaneously drawn from three therapy dyads who each completed sixteen sessions of successful psychotherapy. Physiological linkage was operationalized by calculating the lagged correlations between continuous therapist and client physiology during each session using five measures: cardiac interbeat interval, skin conductance level, somatic activity, finger pulse amplitude, and finger pulse transit time, which were aggregated into a physiological linkage composite score. Repeated measures analyses of variance showed statistically significant change in composite linkage across the course of therapy for all three cases: Case 1, $F(13, 11206) = 26.41$, $p < .001$; Case 2, $F(13, 12961) = 48.18$, $p < .001$; and Case 3 ($13, 12077$) = 55.75, $p < .001$). Follow-up comparisons of early and late sessions showed that in each case, physiological linkage increased with time: Case 1, $t(1034) = 9.33$, $p < .001$, $d = .29$; Case 2, $t(1045) = 2.97$, $p = .003$, $d = .09$; Case 3, $t(1020) = 10.32$, $p < .001$, $d = .32$. Physiological linkage may provide an objective indicator of psychotherapy progress.

SYMPOSIUM 2.2

IDENTIFYING THE NEURAL GENERATORS OF THE REWARD POSITIVITY: MULTIMODAL SOURCE LOCALIZATION TECHNIQUES

Session Chair: Joyce Oerlemans

University of Ghent

Discussant: Travis Baker

Rutgers University

Descriptors: reward processing, ERP, fMRI

The Reward Positivity (RewP) is a frontocentral ERP component sensitive to reward processing that emerges approximately 250-350ms after feedback stimuli. Despite widespread interest in the neurocognitive mechanisms underlying this component, the neural source of the RewP remains unknown because of the inverse problem. In this symposium, researchers will present results of RewP source localization studies using non-traditional, cutting-edge experimental techniques on data obtained from a wide range of human participants. First, Jaleesa Stringfellow will talk about the application of Representational Similarity Analysis in EEG-fMRI studies to ameliorate common issues encountered in source localization studies, using the RewP as a case in point. Thereafter, Chris Pirrung will talk about a study using concurrent EEG and MEG to establish the source of the RewP in both control participants and participants with Major Depressive Disorder. In the third talk, Joyce Oerlemans will present intracranial RewP data obtained from epilepsy patients

(including five patients with electrodes located over the anterior cingulate cortex). Finally, Eric Rawls will present simultaneously recorded EEG-fMRI data that identified a network of spatially separated cortical generators of the RewP. In this symposium we aim to determine the source of the RewP using an integrative approach based on converging measures.

FINDING REWP: A POTENTIAL SOURCE OF THE REWARD POSITIVITY REVEALED BY THE APPLICATION OF REPRESENTATIONAL SIMILARITY ANALYSIS OF EEG-FMRI DATA

Jaleesa Stringfellow-James¹, Malte Güth¹, Yang Yang², Clay Holroyd², Travis Baker¹

¹Rutgers University, ²Ghent University

While over two decades of EEG and neuroimaging data have indicated that the Reward Positivity (RewP), a positive-going deflection in the ERP elicited by reward feedback but not negative feedback, is produced in or near the anterior cingulate cortex, its origin is still a matter of contention. A complicating factor is that neuroimaging techniques have relied on modality-dependent analyses, which present fundamental limitations to any interpretation. For example, EEG/MEG source localization studies are complicated by the inverse problem, whereas conventional fMRI analyses reveal the activation of several areas but lack the necessary temporal information to link such activations to the RewP. And combining EEG-fMRI data using massunivariate techniques are limited in its ability to analyze multidimensional information. In this talk, we argue that such issues can be ameliorated by the application of a Representational Similarity Analysis (RSA). This multivariate technique links disparate data types based on a shared structure in their similarity matrices. We reasoned that an RSA of simultaneous EEG-fMRI data recorded during a task that elicits robust RewPs would provide insight into the neural origin of the RewP, or any ERP component. In other words, if a reward stimulus can be predicted or decoded solely from the pattern of EEG activity, there must be some information about that stimulus represented in the fMRI data where the pattern was identified. The goal of this talk is to provide a practical guide to implementing RSA in EEG-fMRI studies using the RewP as a case in point.

FUNDING: NIGMS of the National Institutes of Health under award number 5T32GM140951.

MEG REVEALS MULTIPLE SOURCES TO THE REWARD POSITIVITY, ONLY ONE OF WHICH IS AFFECTED BY MAJOR DEPRESSION

Christopher Pirrung, Garima Singh, Davin Quinn, Jeremy Hogeveen, James Cavanagh
University of New Mexico

Anhedonia is a primary symptom of Major Depressive Disorder (MDD). In order to better understand this phenotypic dimension, we investigated a marker of reward that is sensitive to information content and valence, the Reward Positivity (RewP). This study used concurrent EEG and MEG to establish the source of the RewP in control and MDD participants. The RewP emerged as a distributed network involving ventromedial prefrontal cortex (vmPFC), anterior midcingulate cortex (aMCC), and bilateral insulae. Only the vmPFC differed between groups, whereas the aMCC/insula "salience network" areas were similarly responsive to reward prediction error. This suggests specific deficits in affective valuation in MDD. To further understand this pattern, we examined fMRI resting state functional connectivity analysis of these regions in the same participants. While vmPFC and aMCC were positively correlated at rest, this coupling was anticorrelated with depressive symptom scores within the MDD+ group. These findings suggest that, in addition to hypoactivation of vmPFC in response to reward, heavily depressed individuals may have a deficit in their ability to effectively balance the relative contributions of value and salience networks.

FUNDING: NIHR01MH119382.

IDENTIFYING THE SOURCE OF THE REWARD POSITIVITY: INTRACRANIAL ERP-ANALYSIS IN HUMAN EPILEPSY PATIENTS

Joyce Oerlemans^{1,2}, Ricardo Alejandro¹, Alfred Meurs^{1,2}, Paul Boon^{1,2}, Veerle De Herdt^{1,2}, Clay Holroyd¹
¹Ghent University, ²University Hospital Ghent

The Reward Positivity (RewP) is an ERP-component occurring 250-350ms after reward feedback presentation with a frontocentral scalp distribution. Although indirect evidence suggests the RewP is produced in the anterior cingulate cortex (ACC), this inference remains inconclusive because of the inverse problem. The goal of this study is to identify the neural source of the RewP using intracranial ERP-analysis recorded in human epilepsy patients. Patients who were hospitalized for invasive video-EEG monitoring at the University Hospital Ghent performed the virtual T-maze task, known to elicit the RewP. We

performed ERP-analysis to identify the RewP for both scalp and intracranial EEG. A personalized head model was created for every subject to visualize the intracranial electrodes. The average value of every intracranial electrode for a 30ms time-window around the peak of the individual RewP was projected onto the head model. Of the sixteen epilepsy patients recruited, five had intracranial electrodes located over ACC (*ACC-subjects*). The other eleven patients (*control-subjects*) had electrodes located elsewhere in the brain. The ACC-subjects showed a RewP on scalp EEG with an average maximum value of $-3.67 \mu\text{V}$, 360ms after feedback. Preliminary analysis showed a polarity reversal for intracranial electrodes located ventral vs. dorsal to the rostral anterior cingulate sulcus, indicating this as a possible source of the RewP. Current work entails merging the data of all the subjects, including the control-subjects, into a single head model for more robust localization.

FUNDING: This project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme, grant agreement no. 787307.

THE REWARD POSITIVITY REFLECTS ACTIVATION OF A NETWORK OF SPATIALLY SEGREGATED VALUE- AND SALIENCE-SENSITIVE CORTEX

Eric Rawls¹, Caroline Demro¹, Bryon Mueller¹, Angus MacDonald III¹, Scott Sponheim^{1,2}

¹University of Minnesota, ²Minneapolis VA Healthcare System

The Reward Positivity (RewP) is an event-related potential that peaks ~300 ms following reinforcing feedback and correlates with reward prediction errors (RPEs), often considered a common currency underlying value-based learning. Despite research detailing the representational content of the RewP, little research has estimated the neuroanatomical source(s) of the RewP, making translational interpretation of this potential difficult. We leveraged simultaneously recorded EEG and fMRI while $n=33$ subjects completed a 3-armed bandit task to characterize BOLD correlates of single-trial RewP fluctuations. We fit Rescorla-Wagner models to each subject's choice and reward delivery sequences, from which we generated trial-level regressors consisting of signed positive and negative reward prediction errors (RPEs). Single-trial regressions revealed robust RewP correlations with signed positive and negative RPEs. Within clusters showing significant

RPE correlations, we extracted trial-by-trial RewP voltages and used these single-trial voltages as parametric regressors for an EEG-informed fMRI analysis. The BOLD correlates of the RewP were distributed over a network of value- and salience-sensitive cortical generators, including orbitofrontal and ventromedial, superior and middle frontal, and superior and lateral parietal cortices, but this analysis revealed no striatal or other subcortical sources linked to the RewP. We conclude that the distributed central scalp signature of the RewP arises from coactivation of a network of spatially separated cortical generators.

FUNDING: This work was supported by the National Institutes of Mental Health, grant P50MH119569, and by the National Institutes of Health, grants P41 EB015894, P30 NS076408, S10OD017974, and S10OD021721. ER is supported by the National Institutes of Health's National Center for Advancing Translational Sciences, grants TL1TR002493 and UL1TR002494.

SYMPOSIUM 3.1

PSYCHOPHYSIOLOGICAL MECHANISMS OF THE IMPACT OF EARLY ADVERSITY ON STRESS RESPONSE AND EMOTION REGULATION

Session Chair: Annie Ginty

Baylor University

Discussant: Mustafa al'Absi

University of Minnesota

Descriptors: *Stress Responses, Emotion Regulation, Trauma*
Exposure to early life adversity is a major risk factor for many health problems later in life including psychopathology and substance use disorders. One of the proposed psychophysiological mechanisms mediating this risk is a dysregulated stress response and emotion processing. Alterations in important brain systems that subserve stress response, reward, and emotion regulation are impacted by early adversity especially during development. This is likely to contribute to subsequent vulnerability to the effects of ongoing and acute stress leading to increased likelihood to engage in high risk behaviors, including substance use. In this symposium we plan to showcase recent evidence of the dysregulated stress response in multiple populations and address issues related to multiple parameters of exposure to adversity including context, frequency, and age of exposure. Presentations will cover 1) the link between history of physical trauma in women and impaired ability to adaptively respond to stress exposures in adulthood,



regardless of emotion regulation ability; 2) the role of inappropriate behavioral and emotional responses to social challenges in linking between peer victimization and depression; and 3) challenges and opportunities in the measurement approaches used to establish the links between early life adversity with emotional and psychophysiological processing. In light of the important role of these adverse early experiences on health, it is important to define the precise processes that carry this risk to adverse health outcomes during adulthood.

EMOTION REGULATION DIFFICULTIES MODERATE THE ASSOCIATION BETWEEN EARLY LIFE ADVERSITY AND CARDIOVASCULAR HABITUATION TO REPEATED ACUTE STRESS

Alexandra Tyra, Annie Ginty
Baylor University

Exposure to early life adversity (ELA) is associated with the development of cardiovascular disease (CVD) through maladaptive cardiovascular responses to psychological stress. Difficulty with emotion regulation may be a consequence of ELA and is also implicated in risk for CVD. However, no research to date has examined the interaction between emotion regulation and ELA on cardiovascular responses to repeated stress. In the present study, 453 healthy young adults (62% female) completed a repeated stress paradigm, consisting of two 10-minute baselines and two identical 4-minute stress tasks. Heart rate (HR) and systolic/diastolic blood pressures (S/DBP) were measured throughout. Emotion regulation was examined as a latent variable, composed of subscales from the Emotion Regulation Questionnaire and Difficulties in Emotion Regulation Scale. Participants also completed the Childhood Trauma Questionnaire. Multigroup structural equation modeling revealed emotion regulation significantly moderated associations between physical ELA and habituation of SBP ($\beta = 0.15$, $p = .01$), DBP ($\beta = 0.16$, $p < .001$) and HR reactivity ($\beta = 0.20$, $p < .001$) in women, but not men. Women with low physical ELA and low emotion regulation difficulties displayed the best habituation across the stressors. However, at high levels of physical ELA, low emotion regulation difficulties did not buffer against poor habituation. Results suggest that women with a history of physical trauma will have an impaired ability to adaptively respond to stress exposures in adulthood, regardless of emotion regulation ability.

DIFFERENTIAL PHYSIOLOGICAL RESPONSES TO SOCIAL-EVALUATIVE STRESS IN DEPRESSIVE PATIENTS WITH VARIOUS DEGREES OF PEER VICTIMIZATION

Benjamin Iffland, Hanna Kley, Frank Neuner
Bielefeld University

Relational peer victimization is associated with an increased risk for the development of major depressive disorders. However, the mechanisms underlying this association remain poorly understood. It has been suggested that psychophysiological changes associated with experiences of maltreatment may link victimization to the development of psychopathology. Therefore, this study examined whether peer victimization alters physiological and affective responses to potentially threatening social stimuli in depressive patients and healthy controls. In a social conditioning task, we studied heart rate responses to unconditioned socially negative and neutral evaluative video statements, followed by the event related potentials to conditioned stimuli, i.e., photographs of the faces of the protagonists. Diagnosis of depression and peer victimization were both associated with a more pronounced heart rate deceleration in response to unconditioned stimuli, irrespective of valence. The effect of peer victimization was stronger in depressive patients than in healthy controls. Across diagnoses, participants with higher levels of peer victimization showed more pronounced P100 amplitudes in reaction to negative and neutral conditioned stimuli, and attenuated P200 amplitudes specifically to negative stimuli. The results indicate a hypervigilant early processing of social stimuli in peer victimization related depression. This distinct processing may be associated with inappropriate behavioral and emotional responses to social challenges, putting individuals at risk for depressive symptoms.

FACING THE AFTERMATH: UNCOVERING THE ASSOCIATION OF EARLY LIFE ADVERSITY WITH EMOTIONAL PROCESSING, PSYCHOPHYSIOLOGY AND MEASUREMENT HETEROGENEITY

Alina Koppold¹, Alexandros Kastrinogiannis¹, Manuel Kuhn^{1,2}, Mana Ehlers¹, Julia Ruge¹, Maren Klingelhöfer-Jens¹, Tina Lonsdorf¹

¹University Medical Center Hamburg-Eppendorf,

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Exposure to adverse experiences is a major risk factor for affective psychopathology. The vulnerability of deleterious sequelae is assumed in maladaptive processes

of the defensive system, particularly in emotional processing. Early adversity (EA) and recent adversity (RA) are associated with recruitment of distinct defensive response profiles. Preregistered study 1 investigated the impact of exposure to EA and RA on emotional processing in 685 healthy adults with the “Affective Startle Modulation” Paradigm. We replicated higher trait anxiety and depression levels in individuals exposed to both types of adversity. We observed generally increased skin conductance reactivity in individuals exposed to RA but not EA. Individuals exposed to EA showed reduced, while individuals exposed to RA showed increased SCR discrimination between pictures of negative and neutral valence, compared to non-exposed individuals- suggesting distinct response profiles. As a first step to investigate operationalizational heterogeneity we revealed moderate dimensional and categorical agreement between two EA questionnaires. Study 2 was a content analysis of 23 EA questionnaires derived from a systematic literature review on threat and reward learning. 50 distinct exposure types. Mean overlap across questionnaires was moderate ($M=0.28$, range: 0.16–0.37). This substantial heterogeneity in the assessment and operationalization of EA emphasizes the pressing need for methodological agreements to promote comparability, replicability and foster cumulative science on this important topic.

FUNDING: German Research Foundation to Tina Lonsdorf DFG LO1980/4-1, INST 211/438-4, INST 211/633-2 and INST 211/633-1.

SYMPOSIUM 3.2

ADVANCEMENTS IN CLOSED-LOOP NEUROSTIMULATION TECHNIQUES FOR CREATING PERSONALIZED STIMULATION PROTOCOLS FOR RESEARCH AND THERAPY

Session Chair: Malte Güth

Rutgers University

Discussant: Miles Wischniewski

University of Minnesota

Descriptors: Real-time EEG, Neurostimulation, Personalized treatment

Neuromodulation is an important tool within fundamental research and therapeutic application. By altering brain signals causal functional implications can be made. Also, abnormal signals related to brain disorders can be remedied. However, the brain is a dynamic system and the effects of brain stimulation depend on the current state.

For example, it has been shown that effects of non-invasive neuromodulation depend on both phase and power of ongoing cortical oscillations. In order to understand the effects of neurostimulation as well as to provide personalized treatment, it is paramount to monitor brain signals in real time and adjust stimulation parameters accordingly. Recent cutting-edge developments have made this possible by designing closed-loop approaches, where neurostimulation and ongoing electrophysiological measurements, such as electroencephalography (EEG), are combined. In this symposium, a group of early-career international scientists will talk about state-of-the-art closed-loop research. We will present how various neurostimulation methods, such as transcranial magnetic stimulation (TMS) and transcranial alternating current stimulation (tACS) can be informed by the read-out of concurrent EEG. Further, we will discuss how the temporal precision of closed-loop techniques allow for making causal inferences. Finally, we will show how closed-loop approaches allow for truly personalized neurostimulation treatments, by giving examples of studies relating to stroke, obsessive-compulsive disorder and major depressive disorder.

REAL-TIME STIMULATION OF THETA OSCILLATIONS UNDERLYING SPATIAL MEMORY ENCODING USING CLOSED-LOOP EEG-TMS

Malte Güth, Drew Headley, Travis Baker

Rutgers University

In rodents spatial navigation relies on goals and motivationally salient locations to be represented prominently by the firing of grid cells in the parahippocampal cortex (PHC). Discovering such information including landmarks and rewards elicits a phase-reset of the ongoing theta rhythm, increasing the likelihood of long-term potentiation. Recently, we found evidence that right posterior theta (RPT) power recorded in human EEG is linked to successful memory encoding and BOLD activity in the PHC. To test whether RPT is causally related to memory encoding, we used a newly developed real-time closed-loop (RT-CL) EEG-TMS system to track and stimulate peaks, troughs, ascending, and descending phases of RPT during a virtual navigation task. Subjects were instructed to search for and memorize the locations of rewards along a linear track. Single TMS pulses were delivered over individualized diffusion-based scalp targets in the right precuneus at the targeted phase

and dominant theta frequency within a few milliseconds after rewards were discovered. Preliminary analyses are currently focused on assessing the effects of phase specific and non-specific stimulation on memory performance and RPT power. In summary, we aim to test the causal relationship between the phase of RPT oscillations in the EEG and spatial memory encoding. If this study is successful, RPT in combination with the RT-CL could be used as an EEG indicator of memory encoding, offering a direct access point to modulating human memory in traumatic brain injury, Alzheimer's disease, and other memory-related disorders.

FUNDING: Behavioral and Neural Sciences Program, Rutgers Busch Biomedical Grant, Rutgers Research and Development Grant.

INDIVIDUALIZED SPATIOTEMPORAL TARGETING OF THE FRONTAL-PARIETAL THETA NETWORK

Justin Riddle
Florida State University

Observational studies where humans prioritize relevant information found increased activation of the frontal-parietal network using functional MRI and increased amplitude of theta oscillations using EEG. But to establish a causal relationship between neural circuitry and temporal dynamics requires precision spatial targeting as well as individualized frequency targeting. In our previous study, we found theta-frequency rhythmic transcranial magnetic stimulation (TMS) to fMRI-guided anterior middle frontal gyrus (amFG) improved working memory capacity relative to control TMS. In a follow-up study with concurrent EEG, we discovered that this effect was explained by frontal-parietal theta phase alignment. However, individualized TMS simultaneously delivered to both regions is required to establish a causal relationship. In the current study, we used fMRI to localize the region in amFG that displayed increased activation for prioritization and the region with maximal task-based functional connectivity to amFG in the superior parietal lobule (SPL). Using EEG, we localized the frequency in the theta band with peak phase alignment during prioritization. In the subsequent sessions, we delivered dual-coil TMS to individualized amFG and SPL at individual theta-frequency. We hypothesized to find increased working memory capacity from in-phase theta-TMS relative to anti-phase theta-TMS

and arrhythmic-control TMS conditions. This experiment provides a spatially and temporally precise causal test for the role of theta-connectivity within the executive control network in cognitive control.

FUNDING: MHK99126121.

REAL-TIME NEUROMODULATION OF OSCILLATORY BRAIN SIGNALS IN NEUROLOGICAL AND PSYCHIATRIC PATIENTS

Miles Wischniewski, Zachary Haigh, Alexander Opitz
University of Minnesota

Transcranial magnetic stimulation (TMS) has proven as a valuable tool within cognitive neuroscience and in the treatment of brain-related disorders. However, given the dynamic nature of the brain TMS effects are variable. To overcome this problem, real-time read-out of ongoing neural signals can inform TMS timing. By using a closed-loop approach, we apply TMS at specific phases of brain oscillations, which are measured by concurrent electroencephalography (EEG). We conducted two experiments using closed-loop TMS (clTMS). First, we used clTMS to identify the oscillation phase that yields optimal motor output in stroke survivors (N=7). We found larger motor cortex responses at the trough of the Mu (8-13 Hz) oscillation, compared to the peak ($p=0.05$). As such, stimulation targeting the trough of the mu oscillation may lead to larger therapeutic benefits and recovery from motor dysfunctions. Second, clTMS is used in obsessive-compulsive disorder (OCD) patients in a repetitive manner. Repetitive TMS can yield lasting after-effects, but without considering brain state effects are variable. Therefore, we investigate whether phase-specific repetitive clTMS applied at the peak or trough of prefrontal beta oscillations modulates OCD symptoms and cognition. As such, a battery of cognitive tests (go no-go, n-back, reversal learning, approach-avoidance task), as well as resting state EEG, is measured before and after a repetitive clTMS intervention. It is hypothesized that phase-specific clTMS is more effective than regular TMS in reducing OCD symptoms.

FUNDING: Brain and Behavior Research Foundation, Young Investigator Award.

CLOSED-LOOP INDIVIDUALIZED TRANSCRANIAL ALTERNATING CURRENT STIMULATION FOR THE TREATMENT OF DEPRESSION

Tobias Schwippel¹, Leah Townsend^{2,3}, Christopher Walker³, David Rubinow¹, Flavio Fröhlich¹

¹University of North Carolina at Chapel Hill, ²Electromedical Products International, Inc., ³Pulvinar Neuro LLC

A 5-day intervention of transcranial alternating current stimulation (tACS) in the alpha frequency alleviated symptoms in people with major depressive disorder (MDD). In a next step, we utilize closed-loop tACS at the individualized alpha peak frequency to improve engagement of endogenous oscillatory activity as dictated by the mechanism of action of tACS (Arnold tongue). Epochs of tACS are triggered by fluctuations in individual alpha power. This closed-loop approach leverages the dynamical interaction between brain state and stimulation and is hypothesized to improve clinical efficacy through enhanced target engagement. We conducted a pilot study in healthy controls applying closed-loop tACS for a single session. We will enroll 20 participants with MDD (HDRS-17 >8) in a single-site, open-label study. Participants receive bifrontal closed-loop alpha-tACS (4mA peak-to-peak) at individual peak alpha frequency for 5 consecutive days. Follow-up assessments are administered after 7 and 14 days. Primary outcome is the change in HDRS-17 score, secondary outcomes include remission/response rates and change in depression self-report questionnaires. In the sham-controlled pilot study with healthy controls, closed-loop tACS significantly modulated alpha oscillation power ($B=8.90 \times 10^{-2}$, $t(258.89)=2.815$, $p=.005$, $N=6$). Data from the ongoing open-label trial in MDD will be presented in tandem. Together, these results lay the foundation for subsequent double-blind, placebo-controlled clinical trials of tACS personalized by closed-loop control.

FUNDING: Electromedical Products International, Inc.

SYMPOSIUM 4.1

EMOTION GENERATION AND REGULATION IN DEPRESSION: NEUROBIOLOGICAL ABNORMALITIES AND RELATION TO TREATMENT OUTCOME

Session Chairs: Kayla Wilson, Annmarie MacNamara
Texas A&M University

Discussant: Annmarie MacNamara
Texas A&M University

Descriptors: internalizing psychopathology, ERPs, fMRI BOLD
This symposium will examine neurobiological evidence of abnormalities in emotion generation and regulation

in depression. First, Nicola Sambuco will present work examining fMRI BOLD response across a mixed internalizing sample, suggesting that greater defensive engagement during negative emotional imagery is associated with increased transdiagnostic distress psychopathology. Next, Kayla Wilson will show that depression is associated with reduced ability to savor positive and neutral imagined scenes/imagery, as measured using the late positive potential (LPP). Then, Lindsay Dickey will show that adolescents who are depressed are characterized by impairments in using reappraisal to reduce the LPP to negative pictures, and that these impairments are linked to cognitive behavioral therapy (CBT) treatment outcomes. Finally, Jurgen Kayser will present findings from a randomized controlled trial on cognitive behavioral therapy and mindfulness in depressed patients that suggests differences in top-down regulation of emotion processing are linked to treatment response. Discussant, Annmarie MacNamara, will highlight points of convergence in these data, and their implications. Collectively, this work serves as new evidence of negative and positive emotional abnormalities in depression, and identifies links between these abnormalities and treatment outcome.

AVERSIVE IMAGERY IN INTERNALIZING DISORDERS: A TRANSDIAGNOSTIC ANALYSIS OF FUNCTIONAL BRAIN ACTIVITY AND CONNECTIVITY

Nicola Sambuco, Margaret Bradley, Peter Lang
University of Florida

The research domain criteria (RDoC) framework proposes assessing emotional reactivity as it varies transdiagnostically across specific DSM diagnoses (e.g., major depressive disorder, specific phobia, social anxiety, general anxiety disorder, post-traumatic stress disorder). In this study, functional brain activity and connectivity was assessed in a large sample of patients diagnosed with anxiety and mood disorders ($N=271$) using a narrative imagery paradigm in which patients imagined personal idiographic threatening events and neutral events. Increased blood-oxygen-level-dependent (BOLD) activity in the posterior cingulate cortex (PCC) when imagining threatening, compared to neutral, events covaried with distress symptoms, such that increased distress symptomology was associated with increased BOLD activity in PCC. Furthermore, functional connectivity analyses (using PCC as a seed region) indicated that the patients with the largest BOLD changes during threat imagery also showed the largest functional connectivity in a network activated during emotional narrative imagery that includes the default mode network

(DMN), as well as the supplementary motor area (SMA) and lateral cerebellum. Taken together, these findings suggest that defensive engagement during emotional imagery is transdiagnostically associated with distress psychopathology.

DIFFICULTY SAVORING MENTAL IMAGERY IN DEPRESSION

Kayla Wilson, Lauren Jackson, Annmarie MacNamara
Texas A&M University

Internalizing psychopathology might be characterized by abnormalities when attempting to imagine emotional stimuli, as well as difficulty regulating response to imagined emotional stimuli. In our prior work, we showed that individuals with increased intolerance of uncertainty, a risk factor for anxiety and depression, had smaller late positive potentials (LPPs) when asked to imagine negative scenarios [$r(44) = -.30, p = .04$]. This might be due to avoidance and/or reduced “bottom-up” engagement with emotional stimuli. Here, we set out to determine whether individuals with higher levels of depression would show impaired ability to savor positive and neutral pictures after their offset. On each trial, participants ($N = 49$) viewed a positive or neutral picture that was followed by a fixation cross. Depending on the color of the fixation cross, they either simply imagined the previously presented picture (“imagine”) or savored and imagined the picture (“savor”). Results showed that the LPP was larger on savor compared to imagine trials, but only when controlling for depression. That is, individuals with higher levels of depression failed to show enhanced LPPs when savoring imagined pictures [correlation between depression and savor versus imagine LPP, $r(47) = -.32, p = .02$]. Therefore, people with average levels of depression can upregulate the electrocortical processing of imagined stimuli. However, abnormalities in generating and regulating response to emotional imagery might contribute to impaired emotional wellbeing in disorders like depression.

FUNDING: This work was supported in part by: NIMH R01MH125083 (MacNamara).

NEUROPHYSIOLOGICAL MARKERS OF EMOTION REGULATION IN ADOLESCENCE: DIFFERENCES IN CLINICAL DEPRESSION AND DEPRESSION RISK

Lindsay Dickey, Anh Dao, Samantha Pegg, Autumn Kujawa
Vanderbilt University

Incidence rates for depression increase in adolescence and impairments in emotion regulation are linked to the onset and maintenance of depression. Currently depressed ($n = 94$) and never depressed ($n = 107$) adolescents (age 14-17; 60.7% female) at varying risk for depression completed diagnostic interviews and an emotion regulation task while electroencephalogram (EEG) was recorded. Traditional LPP (i.e., mean amplitude) and temporospatial principal component analysis (PCA) scoring approaches were compared. Mixed ANOVA results converged across both approaches, revealing a significant condition (passive viewing; reappraisal; neutral) X group (currently depressed; never depressed) interaction for a late frontal LPP, $p = .02$. The LPP during reappraisal was reduced relative to passively viewing dysphoric images in never-depressed adolescents, $p < .01$, but no difference emerged in currently depressed adolescents, $p = .18$. This effect was larger among low-risk adolescents, $p = .01$, partial eta squared = .13, compared to high-risk, $p = .05$, partial eta squared = .09. A subset ($n = 70$) of the depressed sample also participated in an 8-week group CBT intervention. Analyses examining predictors of treatment response showed less attenuation of the LPP during reappraisal (i.e., more emotion regulation difficulty) predicted greater clinician-rated improvement for treatment completers, $\beta = -.38, p = .02$. The results demonstrate the utility of the LPP as a novel, objective method for capturing emotion regulation processes in adolescent depression that could inform targeted intervention and prevention efforts.

TARGETING MECHANISMS OF EMOTION REGULATION DURING COGNITIVE BEHAVIOR THERAPY IN DEPRESSION: PRELIMINARY FINDINGS LINKING MINDFULNESS, TREATMENT RESPONSE, AND ERPS TO EMOTIONALLY-AROUSING STIMULI

Jurgen Kayser^{1,2}, Yifan Gao², Tayler Wilson², Rocco Rinaldi-Rose², Christopher Aceto², Steven Hollon³, Gerard Bruder¹, Ronit Kishon^{1,2}

¹Columbia University, ²New York State Psychiatric Institute, ³Vanderbilt University

We aimed to elucidate the neurobiological mechanisms by which change occurs during cognitive behavior therapy (CBT) for major depressive disorder (MDD). Emotion regulation is deemed critical for CBT success. Event-related potentials (ERPs) to salient affective pictures reflect different stages of emotion processing (stimulus-driven categorization to cognitive appraisal). MDD is characterized by blunted ERPs to emotionally-arousing stimuli. We examined if these stages are moderated by treatment response and/or meta-cognitive processes of self-observation, such as mindfulness. Using an emotional hemifield paradigm with negative/neutral pictures, 72-channel ERPs were recorded from 39 depressed patients before and after cognitive-behavioral or nonspecific-supportive therapy. Reference-free current source density (CSD) transformations of ERPs were quantified by temporal principal components analysis, confirming three distinct stages of emotion processing (negative-greater-than-neutral): early N2 sink, P3 source, and late centroparietal (CP) source. Mixed-effects models (MLMs) provided continuous estimates of treatment response (symptoms) and mindfulness change (time-by-score=slope). These slopes were used as predictors in MLMs evaluating each CSD-PCA component. Symptom and mindfulness slopes were 1) inversely correlated, and 2) interacted with emotional effects in a complex fashion, involving treatment arm and testing session. Findings are consistent with hypothesized differences in top-down regulation of bottom-up emotion processing that are linked to MDD treatment response.

FUNDING: Supported by NIMH grant MH121915.

SYMPOSIUM 4.2

ONE SIZE DOES NOT FIT ALL: THE CRITICAL ROLE OF SEX DIFFERENCES IN PSYCHOPHYSIOLOGICAL RESEARCH

Session Chair: Cristina Ottaviani

Sapienza University of Rome

Discussant: Bruce Friedman

Virginia Tech

Descriptors: Sex differences, Heart rate variability

Despite the call for precision psychiatry, it is common practice to advance the field neglecting psychophysiological scientific advances. For example, in spite of well-known sex differences in the incidence of depression and its association with cardiovascular disease (CVD), treatment guidelines do not differ by sex. Increasing evidence, however, suggests that while depressed males have reduced vagal function indicated by lower tonic heart rate variability (HRV), a known biomarker for CVD mortality, depressed women have higher tonic HRV, a cardioprotective factor. The symposium adopts a translational approach and leverages multidisciplinary techniques to highlight the importance of incorporating sex differences in psychophysiological studies. Prof. Thayer will first present compelling multidimensional evidence that women have higher HRV associated with higher HR with an attempt to unravel the neurobiological substrates of such sex differences. Dr. Carnevali will then illustrate that the same pattern is also evident in rodents, further highlighting that differences between male and female rats also extend to stress-induced cardiac remodeling. Dr. Sigrist will conclude by elucidating linear and non-linear interactions between early life adversities and HRV predicting depressive symptoms in a large sample of female adolescents and adults, with implications for putative etiopathogenetic mechanisms. The symposium aims to deliver the message that adopting a “one size fits all” approach is precluding clinicians to take advantage from actual psychoneurobiological evidence.

SEX DIFFERENCES IN THE BRAIN-HEART CONNECTION: A NEUROVISCERAL INTEGRATION PERSPECTIVE

Julian Thayer

University of California, Irvine

Over 150 years ago Darwin stated that the brain and heart were connected via the vagus nerve. In our Neurovisceral Integration Model we have tried to build on this pioneering



work. In the course of investigating this brain-heart connection it has become clear that there are significant sex differences. In a meta-analysis we reported that women had higher vagally-mediated heart rate variability (vmHRV) and higher heart rate. This seeming paradox was further clarified by a recent study of over 600 men and women. In this study we found that at any given heart rate, women had more vmHRV than men. This effect was most pronounced at lower levels of HRV. We have also reported sex differences in the neural concomitants of HRV. In one PET study we reported that activity in the amygdala was positively correlated with HRV in women but negatively correlated in men. In another fMRI study we reported sex differences in the relationship between HRV and cerebral blood flow. The characterization of these sex differences in the brain-heart connection has important implications for our understanding of sex differences in both physical and mental health.

SEX DIFFERENCES IN RESTING HEART RATE VARIABILITY AND IN THE CARDIOVASCULAR EFFECTS OF VICARIOUS SOCIAL STRESS IN RATS

Luca Carnevali, Margherita Barbetti, Andrea Sgoifo
University of Parma

Epidemiological data suggest that women may be at higher risk of psychosocial stress-related cardiac disorders despite having greater resting heart rate variability (HRV), an index of cardiac vagal modulation and a putative biomarker of stress resilience, than men. To explore this issue, we investigated sex differences in resting HRV and in the cardiovascular effects of vicarious social defeat stress in rats. Adult male and female rats vicariously experienced the social defeat bout of a male conspecific for 10 consecutive days. ECG signals were recorded before and after vicarious social defeat stress for HRV analysis. Cardiac remodeling was evaluated both at the cellular and organ level. Female rats showed higher vagally-mediated HRV at rest than males, replicating human findings. The vicarious experience of social defeat induced greater cardiac sympathetic responses (e.g., increased heart rate, reduced HRV) and anxiety-like burying in females than males. However, while similar signs of poor contractile performance (e.g., slower contraction and relaxation rates) and intracellular Ca^{2+} derangement (e.g., slower Ca^{2+} clearing) were found in cardiomyocytes of stressed rats of both sexes, preliminary findings indicate that systolic ventricular function and myocardial performance were more severely affected in male than female rats. This

study in rats provides data illustrating a sex-dependent association between resting measures of HRV and social stress-induced cardiac remodeling, which could inform mechanistic investigations of stress-related cardiac disorders in both sexes.

FUNDING: Italian Ministry of Health (GR-2019-12369743).

STRESS EXPOSURE AND DEPRESSION: SEX DIFFERENCES IN PSYCHOPHYSIOLOGICAL MECHANISMS

Christine Sigrist¹, Cristina Ottaviani^{2,3}, Luise Baumeister-Lingens¹, Silvia Bussone², Chiara Pesca², Michael Kaess^{4,5}, Valeria Carola^{2,3}, Julian Koenig^{1,4}
¹University of Cologne, ²Sapienza University of Rome, ³IRCCS Santa Lucia Foundation, ⁴Heidelberg University, ⁵University of Bern

Psychophysiological research has focused on alterations in the functioning of the autonomic nervous system (ANS) as a potential mediator of the negative mental and physical health outcomes associated with early chronic and severe stress (ELS). Autonomic vagal activity, indexed by vagally-mediated heart rate variability (vmHRV), is of particular interest in the context of depression and may moderate the relationship between ELS and depressive symptoms. Lower vmHRV may lead to higher levels of depressive symptoms in the context of more severe ELS exposure, in particular in forms of emotional maltreatment. Of note, recent work suggests a quadratic relationship between vmHRV and maladaptive emotional outcomes. Importantly, sex differences in these nonlinear functions have been observed, such that the relationship between vmHRV and depression is likely nonlinear in females but not males. Here, we present our findings of significant linear and non-linear interactions between emotional maltreatment and vmHRV predicting depressive symptoms in both female adolescents and adults. These findings contribute to our understanding of the psychological and physiological mechanisms by which ELS acts as a risk factor for the development of depressive symptoms. The different psychophysiological mechanisms through which ELS acts as a risk factor for the development of depressive symptoms in men versus women need to be thoroughly investigated in future studies, which will point us toward targeted and effective interventions to mitigate the consequences of ELS.

FUNDING: The study was funded by the Dietmar Hopp Foundation and by Sapienza Progetti Ateneo 2019 (RG11916B50652E41).

SYMPOSIUM 5.1

**TRANSLATIONAL PSYCHOPHYSIOLOGY:
PSYCHOPHYSIOLOGICAL MEASURES
IN ANIMAL MODELS CAN INFORM
UNDERSTANDING OF HUMAN PSYCHOLOGY**

Session Chair: Jeffrey Sable

Christian Brothers University

Discussant: Bruce Cuthbert

National Institute of Mental Health

Descriptors: Translational, Comparative, RDoC

As psychophysiologicalists, our interest generally is in the relationship between psychological and physiological processes in humans. It is easy to overlook non-human species in which certain aspects of these processes are more accessible than in humans. Furthermore, certain animal models allow us to examine variables of interest in ways not practical in humans. Research plans with increased levels of analysis—which may be facilitated by including animal studies—may appeal to funding agencies (e.g., the NIMH Research Domain Criteria—or RDoC—Initiative). This symposium features four presentations, each of which includes psychophysiological studies in non-human animals that address human psychology: Neal McNeal will discuss the association between social stress and biological function, focusing on animal models to investigate neurobiological mechanisms of autonomic control relevant to human health. Jennie Gardner will present research on understanding exercise-induced hippocampal plasticity from both animal and human perspectives. Logan Brewer will present research using auditory event-related potentials to examine automatic attention in a proposed genetic knockout model and a selectively bred rat model of ADHD. Lauren Harms will present research on mismatch negativity, a robust electrophysiological finding in schizophrenia, using rat models to study the effects of drug challenge and environmental risk factors. Finally, Bruce Cuthbert will serve as a discussant on the presented research and how it may be of interest to funding agencies, particularly the RDoC initiative.

**PRAIRIE VOLES AS AN ANIMAL
MODEL TO BETTER UNDERSTAND THE
NEUROBIOLOGICAL MECHANISM LINKING
STRESS AND HEALTH IN ISOLATED
ENVIRONMENTS**

Neal McNeal

Naval Submarine Medical Research Laboratory

This presentation will discuss the association between stress and biological function, focusing on the value of utilizing animal models to investigate neurobiological mechanisms. Social stress, particularly isolation, is a growing public health concern associated with poor physical and mental health. It is a risk factor for increased morbidity and mortality and reduced quality of life. There are numerous aspects of military life that exert unique stresses on Service members, particularly in the undersea environment. For example, submarine deployments are marked by the disruption of social bonds and isolation. The socially monogamous prairie vole (*Microtus ochrogaster*) offers excellent translational relevance in studying behavioral, neural, and physiological consequences of social stress, especially isolation. Prairie voles are highly sensitive to the disruption of social bonds, exhibiting several examples of altered behavior, cardiovascular dysregulation, and disruptions in neuroendocrine and autonomic responses to stressors. Importantly, these negative effects mirrors those observed in humans and are linked with degraded performance (e.g., behavioral/physiological regulation). Autonomic system input is a key factor controlling heart rate variability and is gaining interest as an indicator of adverse health states, particularly fatigue, which is a high priority for undersea medicine. Improved understanding of how autonomic control deleteriously changes during stress and then recovers during treatment will lead to improved detection and care for Sailors and civilians alike.

**UNDERSTANDING EXERCISE-INDUCED
HIPPOCAMPAL PLASTICITY FROM A
COMBINED ANIMAL AND HUMAN
PERSPECTIVE**

Jennie Gardner¹, Samantha Rubenstein¹, Kelsey Canada², Samaah Saifullah², Svyatoslav Dvoretzkiy¹, Yanyu Yang¹, Sanjana Venkataraman¹, Dominica Lange¹, Shiping Lia¹, Alexandria Bopp¹, Noah Kim¹, Catarina Rendeiro^{1,3}, Marni Bopp¹, Justin Rhodes¹, Ana Daugherty¹, Bradley Sutton¹, Gabriele Gratton¹, Monica Fabiani¹

¹University of Illinois, Urbana-Champaign, ²Wayne State University, ³University of Birmingham

Exercise is an effective way to maintain physical and cognitive health throughout life. Although memory and other cognitive functions decrease with age, exercise counteracts this decline. This may be tied, in part, to the effects of exercise on the hippocampus (which is critical for memory). In animals, aerobic exercise increases hippocampal volume and hippocampal neurogenesis.

However, the mechanisms underlying these changes remain unknown. One theory states that the muscle contractions associated with exercise release peptides into the blood, which cross the blood-brain barrier and influence the brain. Another theory proposes that these effects are due to improved arterial function in highly fit older adults. We tested the first hypothesis in mice, which were exposed to bilateral muscle contractions for 8 weeks. As a result, hippocampal volume increased by 10%. Although there was no increase in hippocampal neurogenesis or memory performance, there was a 75% increase in hippocampal astroglialogenesis. Although animal studies allow researchers to explore the cellular underpinnings of hippocampal plasticity, the results are not directly translatable to human research. For instance, there is no clear evidence for adult hippocampal neurogenesis in humans. In study 2, we bridged the gap between animal and human research by comparing hippocampal volumes, arterial health, and memory performance in adults aged 25-75, differing in cardiorespiratory fitness to determine whether arterial health plays a role in maintaining hippocampal volume in older adults.

FUNDING: This work was supported by NIH NINDS R21 NS104293 to J.S. Rhodes and M.D. Boppart and NIA grants R01AG059878 and RF1AG062666 to M. Fabiani and G. Gratton.

AUDITORY ERPS IN A NOVEL GENETIC KNOCKOUT MODEL AND A PHENOTYPIC MODEL OF ADHD – EVIDENCE OF INATTENTION

Logan Brewer¹, Jankiben Patel¹, Frank Andrasik¹, Jeffrey Sable^{1,2}, Samantha Regan^{3,4}, Michael Williams^{3,4}, Charles Vorhees^{3,4}, Helen Sable¹

¹University of Memphis, ²Christian Brothers University,

³University of Cincinnati, ⁴Cincinnati Children's Research Foundation

The auditory N1, an event-related potential (ERP), is a measure of automatic attention. Humans with attention deficit hyperactivity disorder (ADHD) have been found to have a reduced N1 to salient sounds during a passive paradigm. We examined two animal models of ADHD. The first involved genetic knockout (KO) of the latrophilin-3 (*Lphn3*) gene, variations of which have been linked to ADHD in humans. Deletion of this gene causes learning and memory deficits and hyperactivity. The second rat model, the Spontaneously Hypertensive Rat (SHR) is a more established behavioral rodent model of human ADHD. Rats from each line were compared to controls. Frontocentral EEG was recorded with

subdermal needle electrodes while the freely-moving rats heard 5-tone trains (50-ms tones, 400-ms tone onset asynchronies) with varying short (1-s) and long (5-s) inter-train intervals. In humans, the initial tone in each train—especially after the 5-s interval—elicits the largest N1. This N1 is reduced in adults with ADHD. There were no ERP differences between *Lphn3* KOs and their controls. Thus, lack of *Lphn3* expression in KOs does not appear to cause notable deficits in automatic attention (only hyperactivity and learning deficits). Relative to all other lines, however, SHRs had significantly reduced peak P1 and P1-N1 amplitudes to the initial tones after the 5-s interval, reflecting deficits in automatic attention that are analogous to those found in humans with ADHD. This further validates SHRs as a rodent model of ADHD, including an inattentive phenotype.

THE EFFECT OF SCHIZOPHRENIA RISK FACTORS ON MISMATCH RESPONSES IN A RAT MODEL, AND THE IMPORTANCE OF CONTEXT AND SEX

Lauren Harms, Jaishree Jalewa, Juanita Todd, Deborah Hodgson, Pat Michie
University of Newcastle

There is a growing interest in mismatch negativity (MMN), an event related potential, as a preclinical biomarker for schizophrenia due to the robust findings of reduced MMN amplitude in individuals with schizophrenia in comparison to healthy controls. Given the rat brain is capable of generating human-like mismatch responses (MMRs), we investigated whether risk factors for schizophrenia can produce schizophrenia-like reductions in the size of MMRs in rats. MMRs were assessed in awake adult male and female Wistar rats that were offspring of pregnant dams exposed to maternal immune activation (MIA) using poly I:C, or saline control. During adolescence, subgroups of the prenatal treatment groups were exposed to either the synthetic cannabinoid HU-210 (adolescent cannabinoid exposure: ACE) or vehicle. In adulthood, we found a significant MMR amplitude reduction in rats exposed to each of the risk factors for schizophrenia (MIA, ACE or both), relative to controls but only in males and only in one specific testing paradigm, where the probability of the stimuli was altered, demonstrating the importance of context and sex. Our findings suggest that the contextual factors induced by paradigm manipulations and sex are salient elements to be considered for modelling schizophrenia-like MMN impairments in rodents.

SYMPOSIUM 5.2

THE HEART DOES NOT LIE: NEWS ABOUT EFFORT INTENSITY

Session Chair: Guido Gendolla
University of Geneva

Descriptors: cardiovascular, effort, task engagement

This symposium presents new insights in the role of the cardiovascular system in effort—the mobilization of resources in goal striving—during the execution of cognitive and physical tasks. Bringing together researchers from four laboratories located in three countries, the contributions highlight how different psychologically relevant variables like ambient light, experienced fatigue, implicit affect, and subjectively perceived effort influence and interact with cardiovascular adjustments during human goal striving. Ruta Lasauskaite sets the stage presenting a series of experiments that investigated the effect of ambient light on effort-related cardiovascular response during the performance of cognitive tasks. Next, Christopher Mlynski will present work on fatigue and its effect on the active, effortful resistance against an unwanted behavior urge using effort-related cardiovascular measures as correlate of effortful resistance. Third, Guido Gendolla discusses recent studies showing that personal task choice does—in contrast to external task assignment—efficiently shields against implicit affective influences on effort-related cardiac response. Finally, Samuele Marcora highlights the role of subjectively experienced effort and its interplay with cardio-metabolic fitness during an effortful physical task. Taken together, the four contributions advance the understanding of the psychological factors underlying effort exertion and related adjustments in the cardiovascular system.

EFFECTS OF CORRELATED COLOR TEMPERATURE OF LIGHT ON EFFORT-RELATED CARDIOVASCULAR RESPONSE

Ruta Lasauskaite¹, Michael Richter², Christian Cajochen¹
¹*University of Basel*, ²*John Moores University*

In this talk, we will present experimental studies investigating how ambient light affects mental effort. Effort is defined as mobilisation of resources to carry out a certain behaviour and operationalized as beta-adrenergic sympathetic nervous system impact on the heart. Light's non-visual functions include effects on circadian entrainment, sleep, hormones, mood, alertness, or attention. Based on these functions, we proposed that light should also affect mental effort. More specifically, we predicted that a

higher correlated colour temperature of light (containing a higher proportion of short-wavelength light), by inducing higher alertness, should lead to lower effort compared to a lower color temperature of light. The first study (N=74) confirmed these predictions: during a 5-min modified Sternberg task, preceded by a 15-min light exposure period, higher color temperature of light led to stronger cardiac pre-ejection period (PEP) reactivity indicating stronger effort. The second study (N=71) showed that by decreasing light exposure to 4 minutes this effect disappeared. Finally, the third study (N=77) demonstrated that the effect of light on effort-related cardiovascular response can be replicated for an auditory task. Light affected PEP as well as systolic blood pressure reactivity. These findings shows, that non-visual effects of light on mental effort hold for visual as well as auditory sensory inputs during cognitive tasks. Finally, possible underlying mechanisms for light's impact on mental effort will be discussed.

FUNDING: Swiss National Science Foundation.

THE INTERACTIONAL INFLUENCE OF FATIGUE, URGE MAGNITUDE, AND IMPORTANCE ON EFFORT-RELATED CARDIOVASCULAR RESPONSE TO A SELF-CONTROL CHALLENGE

Christopher Mlynski, Leopold Roth, Veronika Job
University of Vienna

A recent analysis concerned with fatigue's influence on self-control implies that fatigue should consistently impair control only under certain restraint conditions. The analysis argues that fatigue should not impact self-control performance directly but should do so indirectly by determining how intensively people resist urges to act. It argues further that fatigue's influence on restraint intensity is multifaceted, depending on the level of fatigue, the perceived difficulty of the restraint challenge, and the perceived importance of resisting the urge. In theory, fatigue can prompt three distinct outcomes: (1) it can lead people to resist more forcefully, (2) it can lead people to disengage and give in to the urge, or (3) it can confirm people's pre-existing inclination not to resist. In this talk, we will discuss a series of experimental studies (N = 240) designed to manipulate the level of fatigue, the perceived difficulty of the restraint challenge, and the perceived importance of resisting the urge to illustrate their influence on restraint performance and intensity. Restraint intensity was operationalized as pre-ejection period reactivity, which is commonly recognized as the gold standard for measuring effort-related cardiovascular response to a performance challenge. Results consistently indicated the

ability of fatigue to prompt these three distinct outcomes and, in doing so, have addressed key concerns that have been raised about the fatigue component of Baumeister's influential limited resource model of self-control.

TASK CHOICE SHIELDS AGAINST IMPLICIT AFFECTIVE INFLUENCES ON EFFORT-RELATED CARDIAC RESPONSE

Guido Gendolla¹, David Framorando¹, Johanna Falk¹, Peter Gollwitzer², Gabriele Oettingen²

¹University of Geneva, ²New York University

Based on a recent action shielding model (Gendolla et al., 2001), two experiments ($N=255$ university students) tested whether personal task choice can immunize against implicit affective influences on effort-related cardiac response. Participants could ostensibly either personally chose the type of an upcoming cognitive task or the task was externally assigned. In Experiment 1, replicating previous research, priming fear led to stronger cardiac pre-ejection period (PEP) responses in a moderately difficult cognitive task than priming anger when the task was assigned. Importantly, this affect prime effect disappeared in the chosen task condition. In Experiment 2, priming anger resulted in stronger PEP responses than priming sadness in an assigned objectively difficult memory task. Also, this replicated affect prime effect disappeared when the task could ostensibly be personally chosen. These implicit affect and action shielding effects match other recent evidence showing that personal action choice shields against incidental affective influences on action execution and especially on effort-related cardiovascular response (e.g., Bouzidi & Gendolla, 2023; Falk et al., 2022a, 2022b). Importantly, our present findings provide evidence that personal action choice can even shield against implicit influences on action execution and underlying physiological adjustments.

FUNDING: Swiss National Science Foundation.

RUNNING STYLE AND ENDURANCE PERFORMANCE: PERCEPTION OF EFFORT OR CARDIOMETABOLICAL FITNESS?

Samuele Marcora¹, Borja Martinez-Gonzalez¹, Federico Nigro¹, Marco Simoni², Simone Ciacci¹, Masanori Sakaguchi³, Satoru Abe³, Norihiko Taniguchi³

¹University of Bologna, ²Associazione Sportiva Francesco Francia, ³Asics Corporation

Performance differences in events like the marathon have been explained by differences in three physiological

variables: maximal oxygen consumption (VO_{2max} , an index of cardiorespiratory fitness), running economy (how efficiently energy is converted into running speed), and the ventilatory or lactate threshold (the point at which glycolytic muscle fibres starts to be recruited). Accordingly, running style affects endurance performance by influencing the running economy. However, various lines of research suggest that perceived effort, not energy expenditure, is the variable optimized by the neuromuscular control system. We investigated the effects of running style on perceived effort (RPE), cardiometabolic variables including heart rate, and running performance. We tested 30 competitive distance runners and classified them into aerial (AER) or terrestrial (TER). Participants were then matched for gender for a final grouping of 12 AER runners (10M/2F) and 12 TER runners. All three indicators of endurance performance (3K time trial, 5K personal best, and peak treadmill speed) were significantly better in AER runners. However, no significant differences were found for VO_{2max} , running economy, and ventilatory thresholds. The only variable that differed significantly between AER and TER runners was RPE during high-intensity running. These findings suggest that an AER running style may benefit the performance of competitive distance runners by reducing perceived effort rather than by providing an advantage in terms of running economy.

FUNDING: Asics Corporation.

SYMPOSIUM 5.3

UNDERSTANDING THE ROLE OF GENES, NEUROBIOLOGY, AND DEVELOPMENT IN HUMAN BEHAVIOR AND ITS PATHOLOGIES: THE CONTRIBUTIONS OF PSYCHOPHYSIOLOGIST WILLIAM G. IACONO

Session Chair: Christopher Patrick
Florida State University

Descriptors: Neurobiology, Genetics, Psychopathology

This symposium session would feature renowned researchers invited to the discuss the diverse contributions Dr. William Iacono, who recently announced his retirement from the Psychology Department at the University of Minnesota, has made to the psychophysiological and neurobiological study of individual differences and psychopathology. The session would provide an opportunity for Society members to learn about the important work he has done over his 45-year career in psychophysiology, on topics ranging from lie detection, to physiological indicators (biomarkers) of mental health problems of various types (including

substance abuse, antisocial behavior, depression, anxiety, eating disorders, and schizophrenia), to the behavioral and molecular genetics of physiological biomarkers, to developmental understanding of physiological measures and their relations with psychological traits and disorders.

BILL IACONO'S LEADERSHIP IN SPR AND IN OUR FIELD

Gregory A. Miller

University of California, Los Angeles, University of Illinois, Champaign-Urbana

Bill Iacono's stellar career as a clinical researcher and mentor is widely known. That he has accomplished so much as a scholar is all the more remarkable because of the less well known extent of his exceptional contributions in protecting and advancing the aspirations and operations of important institutions, including the Society for Psychophysiological Research. Sharing some elements of his personal and professional history at SPR and beyond, this talk will attempt to convey his leadership style and the depth of his integrity, in itself an invaluable contribution to our Society and our field.

BILL IACONO, THE MINNESOTA CENTER FOR TWIN AND FAMILY RESEARCH, AND CHARTING THE DEVELOPMENT OF SUBSTANCE ABUSE AND RELATED DISORDERS

Matt McGue

University of Minnesota

In 1988, Bill Iacono and colleagues launched the Minnesota Twin Family Study, a study of substance use and abuse in a sample of adolescent twins and their parents. This modest beginning would ultimately transition into a longitudinal study that is still going strong today and provide the foundation for what would become the Minnesota Center for Twin and Family Research (MCTFR). Over the years, the MCTFR expanded to include high-risk twin samples, and adoptive as well as non-adoptive families. More recently, it has played a key role in landmark national studies like ABCD. Bill's work with the MCTFR has helped to establish our current understanding of substance use disorders as genetically influenced, biologically grounded features of more generalized psychopathology spectra. Through the MCTFR, Bill has made fundamental contributions to clinical science and psychopathology research that extend well beyond substance use disorders to include depression, eating disorders, personality and

personality disorders and especially psychophysiological indicators of psychopathology risk. He has trained scores of young clinical researchers, ensuring that the field will continue to benefit from the incisive and rigorous approach to research he championed.

BILL IACONO, THE MINNESOTA EMPIRICIST TRADITION, AND DEVELOPMENTAL PSYCHOPATHOLOGY RESEARCH

Dante Cicchetti

University of Minnesota

In 1972, University of Minnesota Regent's professor Paul Meehl published a paper in the *American Psychologist* (27, 932-940), entitled "Second Order Relevance," in which he stated that psychologists were best trained to become researchers. In that same year Bill Iacono and I both matriculated into the University of Minnesota Clinical Psychology program. Our cohort was known as "The Research Class." My advisor was Paul Meehl and Bill's was David Lykken. Bill and I became close friends due to our mutual passion for scientific research. Bill went on to a distinguished scholarly career, producing innovative and important work in a range of areas. In this talk, I will focus in particular on Bill's contributions in the area of developmental psychopathology. These include: multigenerational family studies of schizophrenia and other disorders; integration of psychophysiological methods into behavior genetic and developmental research; identification of physiological indicators of risk for psychopathology; investigation of effects of alcohol use on brain structure and function in adolescents; and examination of gene-environment interactions.

FOLLOW THE DATA: IACONO'S CONTRIBUTIONS TO DELINEATING ETIOLOGIC BASES FOR PERSONALITY AND ITS LINK TO STRUCTURAL DIMENSIONS OF PSYCHOPATHOLOGY

Robert F. Krueger

University of Minnesota

Bill Iacono's interests are far reaching, yet united by a relentless and unsparing focus on data. This focus on collecting and making sense of the most informative data characterizes Iacono's many contributions to understanding the public health importance of personality and its role in conferring risk to psychopathology across development. Much of the literature on personality and

psychopathology consists of fascinating conjectures that go well beyond the evidence. Bill took the necessary and difficult next steps in translating psychological speculations into evidence, by creating longitudinal and genetically informative samples covering key developmental periods. In this presentation, I will briefly describe some of Bill's most critical contributions to the now incontrovertible evidence for the fundamental role of personality in understanding risk, resilience, and the dimensional structure of psychopathology throughout development.

PSYCHOLOGICAL SCIENCE IN THE PUBLIC INTEREST AND THE INDEFATIGABLE BILL IACONO: TELLING THE TRUTH ABOUT "LIE" DETECTION

John J.B. Allen
University of Arizona

Science should be relevant to the world in which we live, and while the translational impact of Bill's work is apparent in so many domains, it is perhaps apparent no more so than in his role as a tireless spokesperson for the scientific study of deception detection, and as the voice that points out the egregious problems in the use of field polygraphy. Throughout his career, Bill conducted empirical research, testified before legislative bodies, served as an expert witness in myriad cases involving polygraph tests, wrote numerous reviews and summaries for scientific and lay audiences, and supported the development of new and valid methods for using psychophysiological tools for deception detection. In our collaborative work during my years as a graduate student, we developed an ERP-based assessment tool and a general Bayesian approach for combining information across response channels. I will provide an overview of this approach, and I will highlight how Bill has been a model scientist, mentor, and public servant whose dedication and commitment to his work has had a profound impact on the lives and careers so many others.

MORE THAN MEETS THE EYE: BILL IACONO'S CONTRIBUTIONS TO SCIENTIFIC INVESTIGATION OF SCHIZOPHRENIA

Diane C. Gooding
University of Wisconsin, Madison

As a PhD advisee of Bill's at the University of Minnesota, I worked with him on studies of smooth pursuit eye tracking

performance as an indicator of risk for schizophrenia – a major focus of Bill's own doctoral research at the U of M. In this talk, I will highlight Bill's contributions in this area of study, including his work with twin participants demonstrating a genetic basis for the association between eye tracking dysfunction and proneness to the development of schizophrenia-related disorders. In addition, I will discuss other investigative work Bill did that helped to advance our understanding of disorders of this type – including neuroimaging studies testing for brain-anatomic differences, research spotlighting the need for effective comparison-control groups in biological studies of schizophrenia, and contributions in areas of diagnostic nosology and differential diagnosis. On a more personal note, I will also share my impressions of Bill as a scholarly mentor and career advocate.

BILL IACONO AND THE COLLISION OF GOOD THEORY WITH DUSTBOWL EMPIRICISM IN THE HUNT FOR PSYCHOPHYSIOLOGICAL ENDOPHENOTYPES

Scott Vrieze
University of Minnesota

Endophenotypes ("endos") are thought to be highly heritable yet "genetically simpler" laboratory measures of physiological/biological traits that greatly predispose to a complex disease. Endos have been promoted for decades as a way to improve power and clarity in the mapping of diseases to genes. Bill Iacono spent a better part of his career in the development of theory around psychophysiological endos and how they relate to psychopathology. Over the years, Bill and colleagues devised many strong tests of the endo conjecture, assembling a longitudinal twin family study of ~1500 families (N~5000 including parents and their twin children). In this presentation, I will discuss just one of these strong tests, a genome-wide association study of 17 psychophysiological endos. I will describe the results of this genetic research but, also the process by which those results were obtained and the scientific integrity with which Bill led this program of research.

DON'T BE AFRAID TO BE BOLD: LESSONS LEARNED FROM BILL IACONO WHEN SEEKING TO DISENTANGLE CAUSE FROM CONSEQUENCE OF SUBSTANCE USE ON THE BRAIN

Sylia Wilson
University of Minnesota

The intersections of scientific truth, utility, and implications for public policy can at times become complicated. Bill Iacono has never shied away from the individual and societal complexities inherent in substance use research. In this presentation, I will briefly describe a series of studies that challenge dominant brain models of addiction to show that, yes, heavy, chronic substance use is associated with structural brain deviations and neurocognitive dysfunction, but that many of these deviations are actually evident well before the onset of substance use and reflect pre-existing risk for the development of substance use in the first place, rather than a neurotoxic effect on the brain. Bill's expansive scientific legacy includes an extensive network of mentees conducting research built upon a foundation of methodological rigor and systematic scientific progression that are not afraid to be bold, tackling complex and emergent issues with fundamental implications for how we understand substance use and its development, and how we as a society can best address it.

FINDINGS YOU CAN TRUST AND BUILD ON: THE EXAMPLE OF P300 AND EXTERNALIZING PSYCHOPATHOLOGY

Christopher J. Patrick
Florida State University

Bill Iacono's Twin Family Study at the University of Minnesota confirmed and greatly extended prior research reporting associations of reduced amplitude of oddball-P300 with alcohol problems and other clinical conditions associated with it. Bill and his group demonstrated relations between P300 amplitude and multiple externalizing disorders assessed within the same large participant sample – and showed that reduced P300 in late adolescence predicted later emergence of such disorders, in early adulthood. As a colleague of Bill's at Minnesota during the 2000s, I was lucky enough to collaborate with him on follow-up studies demonstrating that reduced P3 operates as an indicator of latent proneness to externalizing problems in general, largely owing to shared genetic influences. Since then, it has been possible to move toward a multi-modal approach to assessing latent liability for externalizing problems, combining self-report measures and

differing variants of P3 along with cognitive performance measures. The progression of this work illustrates the pivotal importance of large-sample studies and systematic replication in psychophysiological research on individual differences.

SYMPOSIUM 6.1

PSYCHOPHYSIOLOGY'S ROLE IN ADVANCING MENTAL HEALTH NOSOLOGY: INTEGRATION WITH THE HIERARCHICAL TAXONOMY OF PSYCHOPATHOLOGY

Session Chairs: Samuel Cooper¹, Emily Perkins²
¹*University of Texas, Austin*, ²*University of Pennsylvania*

Descriptors: dimensional psychopathology, neuroimaging, startle
Research on psychophysiology and mental health has been stymied by a reliance on categorical diagnoses (e.g., DSM-5). Recent efforts such as the Hierarchical Taxonomy of Psychopathology (HiTOP) seek to overcome the myriad issues inherent in this consensus-based diagnostic system through empirically modeling symptom dimensions at varying levels of generality and specificity to improve reliability and validity. Thus far, however, the potential for HiTOP to change the nature of nosology is limited by its reliance on report-based measures (e.g., questionnaires and interviews). These talks will demonstrate how psychophysiology can refine and clarify the current HiTOP model. (Introduce talks, then my final sentence) First, MacNamara et al. will present relations between anxiety dimensions and ERPs (SPN) and startle EMG during predictable/unpredictable threat. Perkins et al. will discuss blunted ERPs (P300) during adolescence predicting the development of externalizing pathology. Cooper et al. will link broadband internalizing and protective positive affect traits to conditioned threat generalization, measured via startle EMG. Joyner et al. will relate daily longitudinal HiTOP symptom data to novelty-oddball P300 at within and between-subject levels. Kaczurkin et al. will demonstrate, in a large multi-site sample, interactions between environmental stress and neural (MRI) measures to predict youth psychopathology. Collectively, these talks will provide cutting-edge evidence that the evolution of mental health nosology would benefit from psychophysiological inputs and validation.

PREDICTABLE AND UNPREDICTABLE THREAT RESPONDING AS TRANSDIAGNOSTIC CORRELATES AND PREDICTORS OF FEAR AND ANXIETY

Annmarie MacNamara, Kayla Wilson
Texas A&M University

Animal work has suggested that defensive behaviors can be organized into phasic fear versus sustained anxiety. Differences in threat reactivity might underlie these dimensions and could reflect distinct pathophysiological processes. For example, elevated response to predictable threat is hypothesized to underlie fear symptomatology, whereas increased response to unpredictable threat may underlie anxiety. Here, we used the no-threat, predictable threat and unpredictable (NPU) threat of shock task to examine cross-sectional correlates and prospective predictors of transdiagnostic fear and anxiety in a mixed, internalizing sample ($N = 52$). Participants performed the NPU threat task at baseline (time 1), while EEG and startle eyeblink were recorded. Transdiagnostic fear and anxiety were assessed at time 1 and approximately 1.5 years later (time 2). Individuals with larger time 1 stimulus-preceding negativities (SPNs) to predictable threat were characterized by increased time 1 fear ($B = -.120, p = .03$). Moreover, larger time 1 SPNs to unpredictable threat predicted greater increases in anxiety at time 2 ($B = -.016, p = .04$). Elevated time 1 startle to predictable threat predicted larger increases in fear symptomatology at time 2 ($B = .056, p = .04$). Results validate predictable and unpredictable threat responding as psychophysiological processes that are uniquely associated with transdiagnostic fear and anxiety. Moreover, transdiagnostic variation along these dimensions might be relevant for understanding the underlying structure of psychopathology.

FUNDING: NIMH K23MH105553 (MacNamara) and NIMH R01MH125083 (MacNamara).

P300 AND THE EXTERNALIZING SPECTRUM: THE PROMISE OF INCORPORATING PSYCHOPHYSIOLOGY INTO CLINICAL SCREENING

Emily Perkins¹, Jeremy Harper², Jonathan Schaefer³, Stephen Malone³, William Iacono³, Sylvia Wilson³, Christopher Patrick⁴

¹University of Pennsylvania, ²St. Paul, ³University of Minnesota, ⁴Florida State University

Psychophysiology holds great promise for improving the precision of early clinical screening and elucidating the structure and mechanisms of psychopathology across

development. The P300 event-related potential has been proposed as a marker of genetic vulnerability for externalizing problems, but its prospective association with individual differences in psychopathology is unclear and may vary by sex. The current study sought to resolve discrepant prior findings about the relationship of P300 to a general externalizing factor versus syndrome-specific manifestations within the externalizing and internalizing spectra, and test for sex differences. Participants ($Ns = 855$ to 962; 51.6% female) contributed psychophysiological and clinical data at age 14 and follow-up clinical data at age 17. Blunted P300 at age 14 was prospectively associated with higher latent externalizing (but not depression) at age 17, and this relationship accounted for lower-order associations between P300 and specific externalizing syndromes. Sex did not moderate any observed effects. Taken together, the results indicate that P300 can be used to identify adolescent boys and girls at heightened genetic risk for externalizing psychopathology prior to the onset of such symptoms. These findings are discussed in the context of adolescent development, the empirical structure of psychopathology, and ongoing debate about the future of multi-modal assessment.

FUNDING: NIH grants R01DA013240, R01DA036216, and F31MH122096; U.S. Army grant W911NF-14-1-0018.

APPLYING EMPIRICAL PSYCHOPATHOLOGY DIMENSIONS TO THE PSYCHOPHYSIOLOGY OF THREAT CONDITIONING

Samuel Cooper¹, Robert Krueger², Shmuel Lissek²
¹University of Texas, Austin, ²University of Minnesota, Twin Cities

Empirical efforts to map the structure of dimensional psychopathology (e.g., HiTOP) hold great promise as explanatory individual differences underlying variability in psychophysiological measures and related psychological mechanisms. Threat conditioning paradigms using psychophysiological measures to quantify human threat acquisition, generalization, and extinction are commonly used to study mental disorder, but with mixed success and with minimal input from dimensional psychopathology – a missed opportunity for both fields. In the current study ($N = 314$, 66% women), we integrated a threat conditioning paradigm with HiTOP-conformant measurements of normative/maladaptive personality. Notably, this included potentially protective traits not normally tested in threat conditioning studies, which typically focus on anxiety and fear related constructs. Our primary measure of threat acquisition and generalization was startle EMG. Multiple negative affect traits predicted

increased threat generalization. Higher extraversion and lack of pathological detachment predicted decreased threat generalization and showed the overall strongest predictive values in this effort. We also related latent psychopathology variables to startle EMG outcomes. We discuss findings in the context of expanding models of threat conditioning to consider interactions between negative affect and protective traits, optimizing analyses to contribute psychophysiological data to lower-level HiTOP constructs, and continued cross-talk between experimental threat psychophysiology and dimensional psychopathology models.

FUNDING: NIH grant F32MH129136.

CONNECTING PSYCHOPHYSIOLOGICAL MEASURES TO WITHIN-AND BETWEEN-SUBJECT HIERARCHICAL MODELS OF PSYCHOPATHOLOGY

Keanan Joyner, Danielle Jones
University of California, Berkeley

The Hierarchical Taxonomy of Psychopathology (HiTOP; Kotov et al., 2017) seeks to characterize the hierarchical nature of mental illness. Almost exclusively, our examination of the HiTOP structure happens 1) at the between-person level (i.e., across persons), and 2) only in the self-report domain. However, psychopathology is experienced at the within-subject level (i.e., within an individual), and several important neural correlates of psychopathology have been established in the literature. To begin to bridge between and within-person structures of psychopathology and examine relevant neural correlates, we collected a baseline HiTOP survey, EEG/ERP battery, and daily HiTOP symptom data in a 21-day ecological momentary assessment (EMA) protocol (N=133). Multilevel structural equation modeling was used to examine the within vs between-subject structure of HiTOP, as well as relations of HiTOP dimensions and the P300 component from a novelty-oddball task. Results indicated differing number of within vs between-subject factors in a multilevel exploratory factor analysis, highlighting the importance of characterizing psychopathology at both levels of analysis. Furthermore, P300 amplitude differentially related to externalizing derived from baseline surveys versus during the EMA period, and more strongly predicted daily internalizing than externalizing

during the EMA period. This work highlights the nuances of relationships between psychopathology and psychophysiology as a result of differing levels of analysis, and how HiTOP can be informed by consideration of psychophysiology.

FUNDING: NIDA grant R36DA050049.

ENVIRONMENTAL STRESS, BRAIN DEVELOPMENT, AND PSYCHOPATHOLOGY SYMPTOMS IN YOUTH

Antonia Kaczurkin, Hee Jung Jeong, E. Leighton Durham, Gabrielle Reimann, Camille Archer
Vanderbilt University

Substantial progress has been made to uncover the hierarchical structure of psychopathology symptoms in adults and youth. Refinement of such symptom-based models would benefit considerably from the integration of neurobiological measures. One framework that elucidates the role of neural mechanisms in the development of psychopathology differentiates between liabilities (risk factors), neural indicators of manifest symptoms (time-varying associations), and neural consequences of psychopathology ("scarring"). In this talk, data will be presented to demonstrate the utility of applying such a framework for understanding the neurobiological mechanisms underlying clinical symptoms in youth, with an emphasis on structural and functional magnetic resonance imaging measures. Hierarchical modeling was used to uncover the neural substrates of psychopathology using multimodal neuroimaging data from the Philadelphia Neurodevelopmental Cohort (N=1,601) and the Adolescent Brain Cognitive Development Study (N=11,876). These results demonstrate the common and dissociable neurobiological correlates of symptoms in youth. We then extended this work by defining a hierarchical model of environmental influences that we associated with neural measures to understand the impact of environmental factors on the developing brain and clinical symptoms. Taken together, these findings illustrate the advantages of harnessing neurobiological measures to refine our understanding of the structure of psychopathology symptoms and associated risk factors.

FUNDING: NIH grants R00MH117274 and T32-MH18921; NSF grant number 1937963.

SYMPOSIUM 6.2

TRANSCUTANEOUS AURICULAR VAGUS NERVE STIMULATION (TAVNS) AS A VERSATILE NEUROMODULATORY TOOL: BIOMARKERS OF NEUROTRANSMISSION AND EFFECTS ON BEHAVIOR

Session Chairs: Anna Marzecová, Lina Skora
Heinrich Heine University Düsseldorf

Descriptors: transcutaneous vagus nerve stimulation, non-invasive neurostimulation, neuromodulation

Transcutaneous auricular vagus nerve stimulation (taVNS) is a non-invasive neurostimulation technique receiving growing attention in psychophysiological research. Stimulating vagal afferents using taVNS has been proposed to affect neuromodulatory systems, and impact behavior in a range of tasks. Yet, the precise neural mechanisms remain disputed. Differences in tasks and stimulation protocols across studies and laboratories are important confounding factors to consider. In this symposium, we provide a critical overview of the state-of-the-art psychophysiological taVNS research across several international laboratories, through the lens of biomarkers of neurotransmission and behavioral effects. Promising findings of taVNS enhancing decision-making and learning will be discussed, providing evidence that taVNS influences learning processes in a reward task (Cecilia Vezzani), as well as lexical tone learning (Stefanie Kuchinsky). Martina D'Agostini and Franz Wurm will in turn focus on putative biomarkers of catecholaminergic mechanisms: pupil size, P3b/P3a components in the auditory oddball task, alpha power, and salivary alpha amylase. These studies report inconclusive evidence for the previously postulated modulatory effects of taVNS on catecholaminergic activity and its behavioral manifestations. This symposium highlights the current challenges with the use of targeted taVNS for fine-grained neuromodulation, yet promising broader effects on adaptive behavior. Recommendations for optimizing taVNS protocols and future orchestrated research efforts will be discussed.

FUNDING: This work is supported by the Deutsche Forschungsgemeinschaft (DFG) grant JO-787/6-1.

EMULATED SIGNALS FROM THE BODY: VAGUS NERVE STIMULATION TO MODULATE LEARNING AND DECISION-MAKING

Cecilia Vezzani¹, Anne Kühnel¹, Sophie Müller²,
Alessandro Petrella², Nils Kroemer^{1,2}

¹University of Bonn, ²University of Tübingen

To ensure survival, learning and decision-making processes are tuned by interoceptive signals. For example, food intake is driven by reward signals such as taste, but those preferences are trained by post-ingestive feedback signals generated in the gut and then projected to the brain via vagal afferents. Consequently, stimulating vagal afferents has been shown to exert motivational effects in animals and humans, even with non-invasive transcutaneous auricular vagus nerve stimulation (taVNS). Here, we will present recent translational studies from our lab supporting preclinical findings of effective modulation of reward learning and motivation by vagal afferent stimulation. To demonstrate the interaction with food reward, we show that taVNS at the right ear increases milkshake liking and subjective value attributed to food in a Willingness-to-Pay task. Moreover, we will present preliminary data using novel pulsed taVNS as an interoceptive teaching signal, targeting two different phases of a reward task that may show differential sensitivity to emulated interoceptive signals: action and outcome. Crucially, we will discuss how taVNS-induced changes in learning and decision-making are related to physiological signals such as pupil dilation and speed of the digestive tract. To conclude, taVNS is a promising method to study causal effects of vagal afferent signals on physiology and behavior. Identifying optimized protocols for phasic monoaminergic effects may also enhance the effectiveness of non-invasive treatments with taVNS for common reward dysfunctions across disorders.

FUNDING: The studies were supported by the University of Tübingen, Faculty of Medicine fortune grant #2453-0-0, the Daimler and Benz Foundation #32-04/19, and

the Deutsche Forschungsgemeinschaft (DFG) grant KR 4555/7-1.

ENHANCEMENTS IN LEXICAL TONE LEARNING WITH TRANSCUTANEOUS VAGUS NERVE STIMULATION DEPEND ON TASK AND STIMULATION TYPE

Stefanie Kuchinsky^{1,2}, Michael Johns², Valerie Karuzis², Ian Phillips¹, Nick Pandža², Regina Calloway²

¹Walter Reed National Military Medical Center,

²University of Maryland

Adult native English speakers find it challenging to learn languages like Mandarin Chinese in which lexical tone is contrastive (i.e., a word's pitch changes its meaning) even after many training sessions. A growing literature suggests that performance on auditory and cognitive tasks may be improved through neuromodulatory changes driven by transcutaneous auricular vagus nerve stimulation (taVNS). Using a double-blind design, we have observed taVNS-related enhancements (vs. sham) in performance, lexico-semantic encoding, and listening effort across two sessions of Mandarin lexical tone training. Critically, taVNS-effects depended on the training task and nature of stimulation: 10 minutes of taVNS before a task ("priming"), or a burst of taVNS at word onset ("peristimulus"). This talk will present our more recent work examining the robustness of taVNS-enhanced learning with three stimulation parameterizations (priming, peristimulus, periresponse), double the number of training sessions, and double the number of to-be-learned words. Performance improvements were observed on trained and untrained stimuli one-day and one-month post training, again depending on the task and taVNS type. We will discuss the importance of optimizing taVNS delivery with the long-term goal of enhancing training outcomes for individuals with and without speech, language, cognitive, and hearing impairments.

FUNDING: This material is based upon work supported by the Naval Information Warfare Center and Defense Advanced Research Projects Agency under Cooperative Agreement No. N66001-17-2-4009. The views expressed in this abstract are those of the author and do not reflect the official policy of the Department of Army/ Navy/Air Force, Department of Defense, or U.S. Government.

AN ATTEMPT TO REPLICATE THE NEUROMODULATORY EFFECTS OF TRANSCUTANEOUS VAGUS NERVE STIMULATION

Franz Wurm, Beth Lloyd, Sander Nieuwenhuis
Leiden University

Transcutaneous vagus nerve stimulation (tVNS) is a non-invasive brain stimulation method with promising applications for the treatment of clinical syndromes like pharmaco-resistant epilepsy and depression. tVNS is hypothesized to take effect via pathways through the locus-coeruleus/noradrenaline neuromodulatory system. However, the specific mechanisms underlying its efficacy are still elusive, with experimental studies showing contradicting findings. In this talk, I will provide insights from two experiments, replicating published studies that have shown a direct impact of tVNS stimulation on putative noradrenergic biomarkers. These markers include pupil size, electroencephalography (EEG) alpha power, and reward-seeking behaviors. Using short bursts (3.4 s), one of these previous studies found that pupil size increased and alpha power decreased for tVNS compared to sham stimulation. In another study, reward-seeking behaviors were upregulated after long-term (30 s) tVNS but not sham stimulation. Contrary to our expectations, we could not fully replicate these results in our studies. These inconsistent findings put into question the underlying mechanisms for the efficacy of tVNS on locus-coeruleus/noradrenaline neuromodulation and require

an in-depth discussion of the possible reasons for the partially reproducible findings.

FUNDING: This work is supported by the Netherlands Organization for Scientific Research (grant No. VI.C.181.032).

NOT THERE YET: INCONCLUSIVE EVIDENCE FOR A NORADRENERGIC MECHANISM OF TRANSCUTANEOUS AURICULAR VAGUS NERVE STIMULATION

Martina D'Agostini, Andreas Burger, Valentina Jelinčić, Andreas von Leupoldt, Ilse Van Diest
KU Leuven

Transcutaneous auricular vagus nerve stimulation (taVNS) is a non-invasive neurostimulation tool believed to increase central noradrenergic activity. Previous studies have reported mixed evidence in favor of a noradrenergic mechanism of taVNS. Suboptimal stimulation parameters and insufficient statistical power are believed to underlie such inconsistent results. This study aimed to further investigate the noradrenergic mechanism of taVNS. For this purpose, we tested if continuous taVNS at the maximum intensity below pain increases two noradrenergic

biomarkers: salivary alpha-amylase (sAA; tonic noradrenergic marker) and the P3b component of the event-related potential (ERP; phasic noradrenergic marker). We also explored if taVNS alters P3a, an ERP believed to reflect dopaminergic activity. 44 healthy participants received taVNS (cymba concha) and sham (earlobe) stimulation on two separate days, in a counterbalanced order. An auditory oddball task was used to assess P3b and P3a. During each experimental session, we administered the stimulation ten minutes before the task till the end of the experiment. sAA was measured twice: at baseline and at the end of the stimulation. We found no evidence for an effect of taVNS on either P3b/P3a or sAA. These findings further question whether taVNS reliably activates the vagus nerve and boosts noradrenergic activity. Implications of the results and necessary steps to advance the field of taVNS will be discussed.

FUNDING: This work was supported by the following research grants: postdoctoral mandates PDM/19/051 (AB) and PDMT2/22/020 (MD) of the KU Leuven; the Asthenes long-term structural funding (METH/15/011) - Methusalem grant of the Flemish Government (IVD, AvL, AB); FWO Strategic basic research PhD fellowship [1SC1719N] (MD, IVD); and by an infrastructure grant from FWO [AKUL/19/06] (AvL, IVD).

ABSTRACT

Open Topic Symposia

INTERVENTIONS AND THERAPEUTIC APPROACHES

MODULATING ESCAPE MOTIVATION IN THE ANXIETY DISORDER SPECTRUM: EFFECTS OF REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION OF MEDIAL PREFRONTAL CORTEX ON STARTLE REACTIVITY DURING ESCAPE PREPARATION

Christopher Sege, Lisa McTeague, Samantha LaPorta, Cameron Robins, Thomas Uhde, Mark George
Medical University of South Carolina

Descriptors: Escape/Avoidance Behavior, Neuromodulation, Anxiety and Related Disorders

Our lab has developed an experimental task with established sensitivity to anxiety-related exaggerated fear expressivity (startle potentiation) during preparation to escape aversive exposure. Since this contextual reactivity change could help drive avoidant habits that maintain anxiety/related disorders, this study tested if it also can be reduced via repetitive transcranial magnetic stimulation (rTMS) to medial prefrontal cortex (mPFC) – a cortical fear expression modulator. 21 anxiety/related disorder treatment seekers completed our task wherein electromyography indexes blink reactivity to startle probes during cues that predict aversive images that can be avoided (response before image onset), escaped (response after image onset), or not controlled. Across two sessions, each subject did the task before and after rTMS to mPFC or supplementary motor area (SMA; active control site). Using this approach, pre-stimulation data replicated findings of inhibited startle in an avoid context and similarly enhanced startle in escape and no control contexts. Testing rTMS effects on blink enhancement during escape and no control (relative to avoid) cues, then, analyses revealed attenuated enhancement in escape, $t(20)=2.2$, $p=.04$, and no control, $t(20)=2.1$, $p=.05$, contexts after mPFC rTMS, but no change in escape- ($p=.92$) or no-control- ($p=.52$) related startle after SMA rTMS ($F[2,19]=4.2$, $p=.03$). In all, data support that mPFC rTMS can reduce fear expressivity in aversive contexts but also suggest a more focal or sub-cortical target may be needed to achieve contextually precise effects.

FUNDING: This study was supported by the National Institute of Mental Health (NIMH; Grant # K23 MH123931-01A1).

HEARTBEAT EVOKED POTENTIAL AND TIME-FREQUENCY ANALYSES REVEAL ENHANCED NEURAL INTEROCEPTIVE PROCESSING WITH DEEP BRAIN STIMULATION FOR TREATMENT-RESISTANT DEPRESSION

Elisa Xu¹, Jacob Dahill-Fuchel², Samantha Pitts¹, Jacqueline Overton¹, Tanya Nauvel¹, Patricio Riva Posse³, Andrea Crowell³, Martijn Figee¹, Shannon O'Neill¹, Sankaraleengam Alagapan⁴, Christopher Rozell⁴, Kisueng Choi¹, Helen Mayberg¹, Allison Waters¹
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Descriptors: Interoception, Time Frequency Analysis, Deep Brain Stimulation

Change in interoceptive processing may be important to the mechanisms by which deep brain stimulation (DBS) to the subcallosal cingulate (SCC) affects treatment resistant depression (TRD). A measure of interoceptive processing is the heartbeat evoked potential (HEP), which is time-locked to the cardiac cycle. HEP is thought to reflect cortical processing of baroreceptor sensation and may be suppressed in depression. Given evidence that SCC DBS impacts autonomic regulation, the current study investigated HEP and evoked spectral changes in interoceptive processing over a course of SCC DBS for TRD. Nine consecutive patients with treatment resistant depression were studied as part of an ongoing experimental trial of SCC DBS for depression. HEPs and spectral features were extracted from resting EEG recordings acquired with DBS ON and OFF in a laboratory setting throughout a 6-month program of therapeutic SCC DBS. Compared to baseline, the HEP is enhanced over frontal midline channels in treatment responders between 350-510ms ($p=0.03$). Additionally, an acute effect of SCC DBS on HEP is observed at week 4 of treatment ($p<0.01$). Both chronic and acute SCC DBS yields a heartbeat evoked low beta (12-15hz) power increase in all patients at Fz between 400-450ms ($p<0.05$). We observed a positive correlation

of change in HEP amplitude and reduction in HDRS-17 scores ($r=0.47$, $p=0.23$) though below threshold for statistical significance. These findings suggest that SCC DBS modulates neural interoceptive processing, converging with recent insight into mechanisms of treatment efficacy. FUNDING: UH3NS103550.

THE LATE POSITIVE POTENTIAL PREDICTS CHANGES IN DRUG DEMAND OVER TREATMENT FOR COCAINE USE DISORDER

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Descriptors: Addiction, Late Positive Potential, Behavioral Economics

Current treatments for cocaine use disorder (CUD) often fail to reach desired clinical efficacy and are not equally effective across individuals. Identifying biomarkers that predict treatment outcomes that could foster treatment-individual fit. This study investigated the late positive potential (LPP) as a predictor of changes in cocaine demand over time in individuals with CUD receiving contingency management treatment (CM) and counseling. We hypothesized that higher baseline LPP responses to cocaine than to pleasant cues would be associated with greater cocaine demand over the course of treatment. We enrolled 59 treatment-seeking individuals with moderate-to-severe CUD who completed baseline behavioral economic and neural measures of motivational value, including a cocaine purchasing task and an EEG picture-viewing task, respectively. Participants received CM treatment and counseling for four weeks. Cocaine demand assessments were repeated after two and four weeks of treatment. We used Bayesian generalized linear mixed modeling to assess the predictive effects of LPP, Time, and their interaction on cocaine demand. Results revealed a positive association between LPP and demand, regardless of time. Individuals with higher LPP responses to cocaine than pleasant cues had higher likelihood of being a zero responder over time (i.e., reporting no demand for cocaine). These findings demonstrate a promising intersection between behavioral

science and neuroscience and hold important implications for the potential of using the LPP as a biomarker to improve personalized treatment.

FUNDING: This support was supported by the National Institute on Drug Abuse grants F32DA048542 (PI: Webber) and R01 DA039125 (PI: Schmitz).

HD-TDCS OVER LEFT SUPPLEMENTARY MOTOR AREA IMPROVES SPEECH REACTION TIME BY MODULATING PRE-MOVEMENT EEG ACTIVITY IN NEUROTYPICAL ADULTS

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Louisiana State University

Descriptors: High-Definition Transcranial Direct Current Stimulation, Supplementary Motor Area, EEG

The supplementary motor area (SMA) has been implicated in the planning phase of movement for both speech and limb functions. In neurological conditions such as Parkinson's disease, speech and limb motor deficits can concurrently occur wherein SMA and its connections with subcortical structures are often compromised. Therefore, it would be reasonable to assume that normalizing neural activity within SMA could improve speech and limb motor functions. We examined this hypothesis by applying non-invasive neurostimulation over left SMA in neurotypical subjects. In three counterbalanced sessions, anodal, cathodal, and sham high-definition transcranial direct current stimulation (HD-tDCS) were applied over left SMA, and subsequently subject's EEG and behavioral data were recorded as they performed speech and limb tasks. Anodal HD-tDCS accelerated speech reaction time compared to sham, whereas there were no effects of stimulation on limb reaction time. Global field power analysis confirmed a significant decrease in the pre-movement EEG activity for speech following anodal HD-tDCS. This effect was not observed for limb movements. These findings suggest that anodal stimulation over SMA facilitated motor planning for speech by attenuating pre-movement EEG activity, which subsequently improved reaction times. Surprisingly, we did not observe such an effect for limb movement. Future studies are warranted to expand upon our findings perhaps by applying different stimulation parameters for limb movement.

FUNDING: This work was supported by a grant from Louisiana Board of Regent Research Competitiveness Program (award number: AWD-004500).

NEUROPATHOLOGY

ADHD SYMPTOMS DIMINISH THE IMPACT OF SENSORY ENTRAINMENT ON ATTENTION PERFORMANCE

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Virginia Tech

Descriptors: Entrainment, Attention, Rhythm

Sensory entrainment is a phenomenon wherein neural oscillations adjust their frequency to synchronize with rhythmic stimuli. Research suggests that sensory entrainment may help explain the relationship between early and intensive music education and later cognitive performance benefits. The present study tested whether sensory entrainment caused short-term cognitive and rhythmic motor performance benefits in a young adult sample, and whether entrainment (amplitude and inter-trial phase coherence of steady-state evoked potentials) or Flanker task reaction time were impacted by stimulus rhythm or individual differences in Attention Deficit Hyperactivity Disorder (ADHD) symptoms or music training. Participants ($N=47$) were asked to report the extent and type (e.g. instrumental, vocal) of music experience and severity of ADHD symptoms, and then were exposed to repetitive 1.25-Hz or arrhythmic visual or auditory stimuli with interlaced Flanker test items, while EEG was recorded. Both entrainment and Flanker performance were better during periods that included rhythmic sensory stimulation (RSS) than during periods that included arrhythmic sensory stimulation, depending somewhat on which half of the experiment was analyzed. Neither music training nor ADHD symptoms impacted entrainment, but higher ADHD symptoms predicted more modest Flanker performance improvements during RSS. Results suggest that, while rhythmic stimulation may cause neural entrainment and improve short-term attentional performance in adults, people with ADHD may be more resistant to these performance benefits.

SOURCE-LOCALIZED CYCLIC ACTIVITY: EXAMINING THE DYNAMIC CHANGES OF NEURAL OSCILLATIONS ON THE SOURCE LEVEL IN ADOLESCENCE WITH ADHD

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Sarah Karalunas
Purdue University

Descriptors: Inhibition, attention-deficit/hyperactivity disorder, oscillations

Posterior alpha oscillations are often regarded as an idle or default cognitive state. They are positively correlated and functionally associated with activation of the default mode network (DMN). In contrast, centro-frontal theta oscillations are functionally related to the frontoparietal network (FPN). Differences in these EEG-measured frequency bands and their functionally associated networks may be involved in cognitive impairments observed in attention-deficit/hyperactivity disorder (ADHD) due to difficulty flexibly switching between default and control states in ADHD. However, data to test this theory using time-sensitive neural measures during active task performance remain limited. Here, we use a novel EEG source analysis approach to examine dynamic changes in source localized cyclic activity during a go/no-go task in adolescents with and without ADHD. In contrast to other approaches, the approach here retains temporal information for which EEG is best suited. Analysis of alpha power increased activation in key DMN areas in ADHD during the interval prior to stimulus onset, but also increased theta power localized to regions of the FPN during stimulus processing and response decision. Results demonstrate how functional networks commonly associated with fMRI can be represented in EEG dataspace by applying source analysis to individual time bins associated with cycles of an oscillation within a given frequency band. The results help clarify how dynamic differences in task positive and negative networks are related to cognitive task performance in ADHD.

FUNDING: Funding for this research was provided by K23 MH108656 (PI: Karalunas) and R37 MH059105 (PI: Nigg).

MONITORING THE PROGRESSION OF MILD COGNITIVE IMPAIRMENT WITH MOBILE EEG

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Descriptors: Mobile EEG, MCI Progression, Cognitive Function

As the population ages, the prevalence of mild cognitive impairments (MCI) leading to dementia increases. This highlights the need for accessible, affordable, and reliable diagnostic tools to facilitate the early detection of MCI and improve the treatment window. However, current assessment methods are time-consuming, subjective, and not easily accessible, making early detection and monitoring of MCI challenging. Mobile electroencephalography (EEG) has the potential to provide a non-invasive, portable, and efficient method of monitoring cognitive function. This study assessed the feasibility of using a low-cost



mobile EEG system to track MCI progression in 203 participants. EEG recordings were taken at baseline and during several cognitive tasks, with trained clinicians assessing Montreal Cognitive Assessment (MoCA) and Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) scores. EEG data analysis revealed significant differences in brain wave activity between MCI and control participants during baseline recordings. In addition, strong positive correlations were found between MoCA scores and theta range frequencies (4-7 Hz). These results demonstrate the feasibility of using mobile EEG to track MCI progression, making monitoring cognitive function more accessible and efficient. This technology could benefit healthcare providers, patients, and caregivers by leading to better management and outcomes for patients with cognitive impairments, reducing the risk of developing dementia.

FUNDING: NSERC Discovery Grant.

FUNCTIONAL CONNECTIVITY IN TOURETTE SYNDROME AND ATTENTION DEFICIT HYPERACTIVITY DISORDER

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Descriptors: Tourette syndrome, Attention deficit hyperactivity disorder, Functional connectivity

Tourette syndrome (TS) and attention deficit hyperactivity disorder (ADHD) frequently co-occur. Children with TS who also have a diagnosis of ADHD are more likely to have impairments in cognitive function and more psychosocial and behavioral difficulties. However, to what extent TS and ADHD have common or distinct neurobiological underpinnings remains unclear. In the current study, we assessed the functional networks that are associated with TS, ADHD, or their combination. Resting-state EEG was recorded from 137 children with either TS ($n = 51$), ADHD ($n = 24$), co-occurring TS and ADHD ($n = 29$), or who were typically developing controls ($n = 33$). Brain sources were reconstructed from sensor-level EEG data and functional connectivity was computed among 68 cortical regions according to the Desikan-Killiany atlas. Network-based statistics revealed that both TS and ADHD were associated with reduced connectivity in distinct networks across several frequency bands. No interaction between TS and ADHD was found. Network-based statistics did not reveal networks of increased connectivity in TS or ADHD.

These results suggest that both TS and ADHD are associated with decreased connectivity between several brain regions, though in different networks. In regard with resting-state functional networks, TS and ADHD appear to have additive effects.

FUNDING: This project was supported by NIMH grants K01MH079130 & R03MH094583 awarded to Dr. Denis Sukhodolsky. Dr. Simon Morand-Beaulieu was supported by a postdoctoral fellowship award from the Canadian Institutes of Health Research (MFE164627) and by the Clinical Research Training Scholarship in Tourette syndrome from the Tourette Association of America and the American Brain Foundation, in collaboration with the American Academy of Neurology.

NEGATIVE SYMPTOM AND MRI CORRELATES OF PRESERVED NATURAL LANGUAGE PROCESSING IN SCHIZOTYPAL PERSONALITY DISORDER COMPARED WITH SCHIZOPHRENIA

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Descriptors: MRI, schizophrenia, natural language processing

Thought disorder (TD) occurs across the schizophrenia (SZ) spectrum and is assessed through the analysis of language production. TD is present but attenuated in schizotypal personality disorder (SPD), making it a promising candidate for the identification of a protective factor in psychosis. Natural language processing (NLP) analytics have led to assessing semantic coherence and syntactic complexity. This is the *first* study to evaluate these metrics in SPD. We studied 41 Healthy Controls (HC), 26 SPD, and 26 SZ patients. All received 3T MRI and rigorous clinical assessment (SCID5/SIDP/PANSS). Open-ended spoken language was elicited using a qualitative research interview. Part-of-Speech tags and phrase length were calculated for analysis of syntactic complexity and sentences were converted to their respective BERT embeddings to measure semantic coherence (mean phrase-to-next-phrase) speech. Groups were compared on NLP using ANCOVA (covariates age/sex). Correlations were calculated to examine the association of NLP with negative symptom severity and superior temporal gyrus (STG) volume. SZ patients showed: 1) *greater* semantic coherence vs. HC ($p < 0.001$) and SPD ($p < 0.02$); 2) *reduced*

complexity vs. HC ($p < 0.08$) and SPD ($p < 0.03$). There were no HC-SPD group differences. Across the SPD+SZ groups, *increased* semantic coherence was associated with *greater* negative symptoms ($p < 0.02$); reduced complexity was associated with smaller STG thickness ($p < 0.05$). *NLP is a promising new area for psychophysiology*. Preserved language function in SPD may reflect a protective factor against SZ onset.

FUNDING: This research is supported by two grants from NIMH: R01 MH121411 and Supplement MH121411-02S1 to EAH (Contact PI) and PRS (MPI). Dr. Hazlett is supported by a VA CSR&D Senior Research Career Scientist Award (1 IK6 CX002700).

METHODOLOGICAL ASPECTS IN PSYCHOPHYSIOLOGY

WEARABLE BUT NOT ALWAYS RELIABLE: EVALUATING THE RELIABILITY AND VALIDITY OF PSYCHOPHYSIOLOGICAL SIGNALS FROM WEARABLE DEVICES IN LABORATORY AND AMBULATORY SETTINGS

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Descriptors: ambulatory psychophysiology, cardiovascular, electrodermal

Despite increasing popularity of ambulatory assessment, the validity of psychophysiological signals from wearable devices is unproven in daily life settings. We evaluated the reliability and validity of two wearable devices (Movisens EcgMove4 and Empatica E4) in the lab and daily life among adults aged 18-64 with Mindware as the laboratory gold standard. Results revealed higher valid data rates for ECGMove4's electrocardiogram (ECG) signals (from a chest strap) compared to E4's photoplethysmography (PPG) signals (from a wristband) in laboratory settings ($93.10 \pm 15.38\%$ vs. $26.14 \pm 11.95\%$) and ambulatory settings ($82.94 \pm 18.13\%$ vs. $8.79 \pm 6.50\%$). There was also higher agreement with heart rate (HR) and heart rate variability (HRV) gold standard (i.e., concurrent validity) for ECGMove4's ECG compared to E4's PPG (ICCs 0.95-1.00 for ECGMove4 vs. 0.75-0.98 for E4). Results also demonstrated decreased valid data rates in ambulatory settings vs. lab settings for both devices: 10% decrease for ECGMove4's ECG, 17% for E4's PPG, and 1.5% for E4's electrodermal activities (EDA). There was a negative correlation between E4's PPG signals' valid data rates in the lab and hand movements ($r = -.27$). We found higher

concurrent validity for HR vs. HRV (ICCs 0.98-1.00 vs. 0.75-0.97), and higher concurrent validity for the number of skin conductance responses vs skin conductance level (ICCs 0.38 vs. 0.09). Although validity of wearable devices is improving, our findings reveal gaps indicating caution when selecting devices that yield consistently robust and valid signals.

FUNDING: MH118218.

TASK DIFFICULTY INDUCED FLOW STATE: A SUMMARY OF FINDINGS FROM TWO DIFFERENT TASKS

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Descriptors: Hairong Lu

Research suggested that people tend to experience positive feelings, known as flow, when engaged in tasks that match their skill level. To investigate the psychological and neurological underpinnings of this phenomenon, two experimental studies were conducted in our lab using different tasks: a working memory-based n-back task and a visual discrimination task. In both experiments, we manipulated task difficulty from easy to hard and measured various indicators of flow, such as subjective reports, pupil dilation, and EEG P300. The results of the n-back task showed an inverted U-shaped curve for flow, pupil dilation, and EEG P300 over increasing perceived task difficulty. Similarly, the visual discrimination task also demonstrated an inverted U-shaped curve for flow over increasing objective task difficulty, however, not for perceived task difficulty. Additionally, we found a positive linear relationship between frontal theta activity and flow, suggesting higher executive control during flow states. This paper discusses the similarities and discrepancies in the findings from the two tasks and proposes intriguing questions for future research.

UNDERSTANDING THE NEURAL UNDERPINNINGS OF MOTOR IMPAIRMENT IN PERSONS WITH MULTIPLE SCLEROSIS USING THE LATERALIZED READINESS POTENTIAL

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Descriptors: Lateralized Readiness Potential, Multiple Sclerosis

Multiple sclerosis (MS) is a demyelinating neurodegenerative disease that often leads to cognitive and motor impairment. Previous research has focused on motor execution, but little research has examined how MS affects motor preparation and initiation. The lateralized readiness potential (LRP) is an ERP component that separates the neural signature related to pre-motor planning following a stimulus (i.e., LRP-S) from response preparation and activation (i.e., LRP-R). We compared the LRP-R and LRP-S between persons with MS (PwMS) and healthy control (HC) to gain novel insights into impairments in neural activity associated with response selection and activation. PwMS ($n=53$) and age-sex matched HC ($n=53$) aged 34-67 completed a Flanker task with concurrent EEG. We used a Repeated-measures ANOVA with congruency (congruent vs incongruent) and diagnosis (MS vs HC) as within- and between-subjects measure, respectively. There was no interaction effect for LRP-S outcomes. There was a diagnosis effect for LRP-S latency ($F_{1,104}=7.06$, $p<0.01$) wherein PwMS had later LRP-S compared to HC ($p<0.01$). There was an interaction effect for LRP-R mean amplitude ($F_{1,104}=7.98$, $p<0.01$) wherein PwMS had smaller LRP-R incongruent mean amplitudes compared to HC ($p<0.01$). These findings suggest that PwMS had delayed response selection, and poorer neural resources for response activation in conditions requiring greater cognitive demands, compared to their healthy peers. Therefore, motor impairment in MS is evident for both pre-motor and motor response initiation during a selective attention task.

FUNDING: This research was funded by the National Multiple Sclerosis Society and the NIH REACT Center.

SHAP VALUE BASED ERP ANALYSIS (SHERPA): INCREASING THE SENSITIVITY OF EEG SIGNALS WITH EXPLAINABLE AI METHODS

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Descriptors: EEG, Artificial Intelligence, Face Perception
Conventionally, ERP analysis relies on the researcher to identify sensors and time points where an effect is expected to occur. However, this approach is prone to bias and may limit the ability to detect unexpected effects or to investigate

the full range of the EEG signal. Data-driven approaches circumvent this limitation, however, the multiple comparison problem and the statistical correction thereof affect both the sensitivity and specificity of the analysis. In this study, we present SHERPA -- a novel approach based on XAI designed to provide the researcher with a straightforward and objective method to find relevant latency ranges and electrodes in the EEG data. SHERPA is comprised of a CNN for classifying the conditions of the experiment and SHapley Additive exPlanations (SHAP) as post hoc explainer to identify the important temporal and spatial features. A classical EEG face perception experiment is employed to validate the approach by comparing it to the established researcher- and data-driven approaches. Likewise, SHERPA identified an occipital cluster close to the temporal coordinates for the N170 effect expected. The electrodes with the highest SHAP values also provided stronger effect sizes than the other analysis. In contrast to other analyses, SHERPA suggests the presence of a negative selection process at the early stages of processing. Hence, our new method not only offers an analysis approach suitable in situations with limited prior knowledge of the effect, but also an increased sensitivity capable of distinguishing neural processes with high precision. FUNDING: This research was co-funded by the MWK Niedersachsen and the VolkswagenStiftung (grant number 11-76251-14-1/21).

THE MARKED POINT PROCESS AS A METHOD FOR QUANTIFYING TRANSIENT BRAIN OSCILLATIONS

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Descriptors: Unsupervised Learning, Time-Frequency Analysis, Emotion

Neuronal oscillations are used in cognitive electrophysiology to model the synchronized postsynaptic activity of neuronal assemblies, which has been shown to be isomorphic with psychological processes. Traditional wavelet- and Hilbert-based methods of time frequency analysis are constrained in their ability to maximize temporal and frequency resolution, per the Heisenberg uncertainty principle. Additionally, these methods are not sufficient to isolate the background 1/f aperiodic component, minimizing their sensitivity to transient variations in oscillatory activity. Finally, most existing methods use sine/cosine templates, which may be inappropriate

for quantifying non-sinusoidal waveforms. The present study tests and implements a data-driven machine learning approach to quantify oscillations as temporally sparse marked point processes (MPPs). MPPs are not subject to the constraints above and partial out aperiodic noise, while minimizing free parameters. The MPP approach was cross-validated using simulated data and then applied to EEG signals collected from 29 observers during rapid emotional scene processing. Results showed that (1) the MPP algorithm is sensitive to transient oscillations that may not be captured by other methods such as Hilbert envelopes or wavelet analysis; and (2) the MPP method detects rapid changes in oscillatory activity in human EEG data related to emotional scene processing. The implications of these results for measuring neurocognitive state transitions and further applications are discussed.

FUNDING: Sony Group Corporation.

PSYCHOPATHOLOGY AND TREATMENT STRATEGIES

TEMPORAL DYNAMICS OF EMOTION AND EMOTION REGULATION

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Stanford University

Descriptors: time course, electromyography, emotion regulation
Emotion regulation (ER) can be achieved by either changing the quantity or quality of emotion. This study aimed to investigate the impact of using qualitative versus quantitative ER goals on affect dynamics, specifically onset, rise time, and maximum amplitude, during reappraisal of negative emotional stimuli measured by electromyography (EMG) of facial expressions. The study included 156 participants (83 females, 72 males, 1 other) with a mean age of 20.82 years. The reappraisal task involved presenting negative photo stimuli, which participants first viewed for 8 sec and then reappraised for 8 sec. ER goal instructions directed participants to either continue viewing the picture (no ER goal) or to think about it in a way that it takes on a neutral (quantitative ER goal) or positive meaning (qualitative ER goal). Surface EMG over corrugator supercilii and zygomaticus major was recorded to measure negative and positive emotions, respectively. Qualitative ER goals generated earlier and more sustained reduction of negative emotion than quantitative ER goals. Qualitative ER goals also increased positive emotion compared to no

ER goal, while quantitative ER goals did not. These findings indicate that the qualitative ER goal offers the added benefits of positive emotion without extra cost in terms of affective dynamics. These findings provide a novel perspective on the ER process and suggest that qualitative ER goals may be more effective in regulating emotions compared to quantitative ER goals.

FUNDING: This research was supported by Swiss National Science Foundation Fellowship PA00P1-139593 awarded to Sylvia D. Kreibig and National Institutes of Health, National Institute of Dental and Craniofacial Research grant R01 DE026771 awarded to James J. Gross.

THE RELATIONSHIP BETWEEN HEART RATE VARIABILITY (HRV) AND NEGATIVE EMOTIONS DURING 5-WEEKS OF HRV BIOFEEDBACK INTERVENTION

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Descriptors: Heart rate variability, Emotion, Biofeedback
Heart Rate Variability (HRV) is a quantitative measure of the dynamic changes in heart rate, reflecting the intricate interplay between the sympathetic and parasympathetic branches of the autonomic nervous system, which modulate the heart's activity. HRV has been found to be associated with emotional regulation and can serve as an indicator of emotional states. However, most studies assessing the relationship between HRV and emotional states do so at one point in time and do not examine whether change in one is related to change in the other. We used data from a 7-week clinical trial of HRV biofeedback with younger and older adults to test whether changes in log RMSSD and emotion were associated over time. The negative emotion scores were measured through State Anxiety Inventory (SAI), Trait Anxiety Inventory (TAI), and Center for Epidemiological Studies Depression Scale (CES-D). The results showed that those whose HRV increased from pre- to post-intervention also showed decreased negative emotion at post intervention compared with pre intervention. Furthermore, these relationships were similar across HRV biofeedback conditions. Thus, changes in resting HRV over time are related to changes in emotion.

FUNDING: This study was supported by NIH R01AG057184 (PI Mather).



BEYOND BIOMARKERS: LEVERAGING TASK-BASED PSYCHOPHYSIOLOGY TO ILLUMINATE FUNCTIONAL IMPAIRMENTS IN PSYCHOPATHOLOGY AND IMPROVE TARGETED INTERVENTION

Jason Moser

Michigan State University

Descriptors: Functional impairments, Biomarkers, Intervention

We are in the age of “biomarker” discovery in mental health research. However, the discovery of so-called biomarkers has led to limited innovations in early detection, diagnosis, and treatment. Moreover, biomarker discovery work suffers from false positives, small effects, and a general lack of clarity regarding the ultimate practical implementation of biomarkers in the real-world. In this talk, I suggest it is time the pendulum swing towards a reinterpretation of our findings as indices of function in context. That is, when demonstrating an association between measures of psychopathology and psychophysiology we should interpret its meaning in the context of its functional significance in the task at hand. This approach has several advantages, including greater integration with basic science research, focusing the practical utility of any one association, and the generation of novel interventions at the level of functional impairments rather than at the level of a broader syndrome. I demonstrate the utility of this approach and its clinical application in the context of cognitive control and emotion regulation deficits in anxiety. Concluding remarks will center on how such an approach could help address replicability problems and lead to packages of interventions that help individuals with psychopathology solve the problems of living associated with their distress (e.g., school and occupational performance, relationship strengthening and building); and, that such information could ultimately be used to improve diagnosis, prevention, and intervention efforts.

INDIVIDUAL DIFFERENCES IN NEURAL ALCOHOL CUE-REACTIVITY ARE SHAPED BY HEAVY EPISODIC DRINKING

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Descriptors: P3 component of the ERP, alcohol reward, genetically informed study

The P3 component of the ERP elicited by alcohol cues (ACR-P3) has been theorized to reflect the acquisition of incentive sensitization for cues associated with alcohol reward. In theory, ACR-P3 is shaped by drinking experiences, but research to date has not demonstrated a role for individual drinking experiences in determining ACR-P3 amplitude. In this study, we decomposed the genetic and environmental sources of ACR-P3 amplitude in a longitudinal and genetically informed study. Participants (194 twins; 79 MZ & 94 DZ) were longitudinally followed from age 12 to 18; their alcohol intake was assessed annually with structured clinical interviews. They completed a picture-viewing task (pictures of alcohol, nonalcohol beverages, and neutral IAPS images) at age 18 or 20. Results indicate that variability in ACR-P3 amplitude can be attributed to non-additive genetic factors and non-shared environmental effects. Although ACR-P3 amplitude is highly heritable (69% CI [39-82]), it also is influenced by unique, non-shared environmental experiences (31% CI [18-61]). Additionally, controlling for genetic and shared environmental liability, consuming more alcohol within one's heaviest-drinking 24-hour period predicted increased ACR-P3 ($p=0.009$). Findings are consistent with evidence suggesting that, while strongly genetically determined, a portion of P3 reactivity to alcohol cues is an acquired marker of risk for AUD that likely reflects acquisition of incentive salience for alcohol-related cues due to heavy episodic drinking.

NEUROPSYCHOLOGICAL MECHANISMS OF THE LIFE-SPAN

RESTING EEG PERIODIC AND APERIODIC COMPONENTS PREDICT COGNITIVE DECLINE OVER 10 YEARS

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Descriptors: Aging, EEG, Aperiodic

Measures of intrinsic brain function at rest show promise as predictors of cognitive decline. Individual alpha peak frequency (IAPF), and the aperiodic exponent

are particularly important, and reflect the strongest frequency of alpha oscillations and the relative balance of excitatory:inhibitory neural activity, respectively. Both IAPF and the aperiodic exponent decrease with age and have been associated with worse executive function and working memory. However, few studies have jointly examined their associations with cognitive function, and none have examined their association with longitudinal cognitive decline – rather than impairment. In a preregistered secondary analysis of data from the longitudinal MIDUS project, we tested whether IAPF and the aperiodic exponent predict cognitive function ($N=234$; age at EEG recording $M=54.86$, $SD=10.76$) over 10 years. Using multi-level modelling, we found that IAPF and the aperiodic exponent interacted to predict cognitive decline on overall cognitive ability, even after controlling for age. Post-hoc tests showed that “mismatched” IAPF and aperiodic exponents (e.g., higher exponent with lower IAPF) predicted greater cognitive decline compared to “matching” IAPF and aperiodic exponents (e.g., higher exponent with higher IAPF; lower IAPF with lower aperiodic exponent). These effects were largely driven by measures of executive function and not episodic memory. Our findings provide the first evidence that IAPF and the aperiodic exponent are joint predictors of cognitive decline from midlife into old age.

FUNDING: European Community's Seventh Framework Programme, Grant/ Award Number: n°208572; Waisman Intellectual and Developmental Disabilities Research Center, Grant/ Award Number: U54-HD090256; Mind & Life Institute; University of Reading, Grant/ Award Number: 2020 Fellowship; Seventh Framework Programme; National Institute of Mental Health, Grant/ Award Number: F32-MH126537 and 2R01MH043454-28A1; National Institute of Child Health and Human Development; Intellectual and Developmental Disabilities Research Center; National Institute on Aging, Grant/ Award Number: P01-AG020166, U19- AG051426, and U01 AG077928.

UNIQUE EFFECTS OF AGE AND FITNESS ON WHITE MATTER MICROSTRUCTURAL INTEGRITY

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Descriptors: Aging, White Matter Microstructure, Cardiorespiratory fitness

It is well known that white matter microstructural integrity declines with increasing age, however evidence suggests that improved cardiorespiratory fitness (CRF) may mitigate this decline. Specifically, higher fit older adults tend to show preserved white matter microstructural integrity compared to their lower fit counterparts. However, it is an open question to what extent fitness and aging *independently* impact white matter integrity across the *entire* adult lifespan. Using diffusion weighted imaging, we assessed the impact of CRF (estimated via Jurca et al., 2005), age, and their interaction on fractional anisotropy (FA) in a large sample of adults aged 25-75. After orthogonalizing age and fitness, we found unique effects of age, fitness, and their interaction on FA across 27 bilateral white matter regions. As expected, age was negatively associated with FA, and fitness was positively associated with FA. To reduce the number of FA comparisons, we conducted a PCA on the white matter regions and selected the top 3 factors for further analysis. One factor, including tracts between frontoparietal regions, was uniquely negatively related to age. The second included inferior motor and arousal tracts and was uniquely positively related to fitness. The third included regions supporting interhemispheric connectivity and was related to both age and the age-by-fitness interaction. These analyses suggest that there may be brain regions in which fitness uniquely impacts white matter microstructural integrity and that these regions tend to include motor and arousal-related tracts.

FUNDING: NIA grant R01AG059878 (M. Fabiani & G. Gratton, PIs) NIA grant RF1AG062666 (G. Gratton & M. Fabiani, PIs).

BEHAVIORAL AND CARDIOVASCULAR MARKERS OF EMOTIONAL REACTIVITY IN MIDDLE CHILDHOOD

Madison Politte-Corn¹, Rebecca Brooker², H. Goldsmith³, Kristin Buss¹

¹The Pennsylvania State University, ²Texas A&M University, ³University of Wisconsin, Madison

Descriptors: autonomic profiles, stranger fear, high-intensity pleasure

Introduction: We examined whether cardiovascular reactivity either 1) differentially relates to displays of emotion or 2) reflects undifferentiated emotional arousal and engagement with the environment, using both singular measures of RSA and PEP and autonomic profiles (i.e., co-inhibition, reciprocal sympathetic activation, reciprocal parasympathetic activation, co-activation). Method: 328

children (164 pairs of twins) aged 6-10 provided data. RSA and PEP data were collected at baseline and during laboratory tasks designed to elicit high-intensity pleasure and stranger fear. Measures of RSA and PEP reactivity during the emotion tasks were computed as unstandardized residual scores, partialling out the variance associated with baseline. Autonomic profiles were assigned based on change in RSA/PEP to the emotion tasks compared to baseline. Cluster-robust standard errors were computed to account for nested data. Results: Both high-intensity pleasure and stranger fear were associated with decreased RSA, reflecting parasympathetic withdrawal. Children with the autonomic profile of co-inhibition displayed more high-intensity pleasure than children with the co-activation profile. Children with autonomic profiles characterized by increased RSA displayed lower stranger fear compared to autonomic profiles characterized by RSA withdrawal. Discussion: Results suggest that cardiovascular reactivity differentially relates to displays of emotion when considering combined effects of RSA and PEP (i.e., autonomic profiles), but not when measures of RSA and PEP are examined in isolation.

COGNITIVE CONTROL DEFICITS ASSOCIATED WITH EARLY CHILDHOOD TRAUMA

Katharina Paul¹, Sven Mueller^{2,3}

¹University Hamburg, ²Ghent University, ³Nencki Institute

Descriptors: cognitive control, early childhood trauma

Studies have reported impaired inhibitory control in individuals who have experienced early childhood trauma, which may contribute to the development of psychiatric disorders. In this study, we aimed to investigate the neural correlates of cognitive control deficits in individuals who have experienced early childhood trauma. Trauma was assessed using the Childhood Trauma Questionnaire (CTQ) in a healthy sample of young adults (18-30 years). To investigate cognitive control, performance markers, N2 and P3a and P3b components as well as frontomedial theta and delta during a Go-NoGo task will be examined. The study is pre-registered and carried out in a sample of 800 participants (20% of participants reported to have experienced moderate to extreme trauma levels). We predict alterations in the P3a and N2 components, such that individuals with early childhood trauma show increased

N2 and reduced P3a amplitudes as well as delayed latencies. Additional analyses will explore the role of specific trauma types.

AFFECTIVE MODULATION OF THE LPP AND SUBJECTIVE EMOTIONAL AROUSAL: A COMPARISON BETWEEN ADOLESCENTS AND YOUNG ADULTS

Nicola Sambuco^{1,2}, Elise Stevens³, Francesco Versace⁴

¹University of Florida, ²University of Bari "Aldo Moro",

³University of Massachusetts Chan Medical School, ⁴The University of Texas MD Anderson Cancer Center

Descriptors: LPP, pictures, adolescents

Images that elicit the largest late positive potential (LPP) in young adults (erotica and mutilations), are not suitable to assess neuroaffective responses in adolescents and children. To overcome this issue, researchers have used heterogeneous sets of pictures across various semantic contents based on normative ratings of subjective arousal collected in young adults, introducing potential biases. In this study, we compared LPP responses and self-reported arousal ratings of pictures with different semantic contents in adolescents (N=61, aged 14-17) and young adults (N=46, aged 18-21) using age-appropriate high-arousing contents. The results showed that both groups had similar LPP responses to low-arousal pleasant and unpleasant images, as well as highly arousing unpleasant images. However, pleasant content rated as highly emotionally arousing prompted very different LPP responses in the two groups. In young adults, erotic images elicited the largest LPP response, while in adolescents images of extreme sports elicited LPP responses comparable to those evoked by low arousing pleasant contents. LPP responses to food-related images were similar to those evoked by neutral images in both groups. This study highlights the challenges of selecting suitable materials to assess neuroaffective responses in adolescents: Images rated as highly emotionally arousing do not necessarily evoke large electrophysiological responses, potentially leading to inaccurate conclusions and challenges in comparing results across studies.

PSYCHOPATHOLOGY AND INDIVIDUAL DIFFERENCES

A NOVEL PARADIGM TO INVESTIGATE THE ROLE OF ERROR MONITORING IN SOCIAL ANXIETY

Kianoosh Hosseini Ghalebini, Jeremy Pettit, Fabian Soto, Aaron Mattfeld, George Buzzell
Florida International University and The Center for Children and Families

Descriptors: Error Monitoring, Memory, Social Anxiety

Stronger error monitoring is linked to social anxiety (SA). However, it is not understood why this is the case. One hypothesis is that stronger error monitoring could strengthen encoding of errors or their context (e.g., social cues in the environment). As encoding of errors or incidental social cues cannot be studied by traditional error monitoring tasks, we developed a novel paradigm to test these ideas. While EEG data was being collected, 54 participants completed a novel Face-Flanker task, involving presentation of task-unrelated, trial-unique faces behind target/flanker arrows on each trial. Following the task, a surprise memory test was used to evaluate incidental learning on error trials. During the flanker, individuals higher in SA showed greater error-related theta synchrony over MFC ($p = .03$), as well as between MFC and visual cortex ($p = .02$). During the subsequent surprise memory test, higher SA also predicted more accurate recognition memory for faces originally appearing on error (vs. correct) trials ($p = .009$). Crucially, greater error-related theta synchrony between MFC and visual cortex during the flanker predicted subsequent increases in recognition memory for faces from error trials ($p = .03$). Our findings not only suggest higher SA individuals exhibit better incidental encoding of social stimuli on error (vs. correct) trials, but this behavioral phenomenon may be driven by error-related dynamics within the theta band. Results demonstrate the potential of a novel paradigm to elucidate mechanisms underlying the link between error monitoring and SA.

FUNDING: R01MH131637 (Buzzell, Pettit).

WHERE EMPATHIC STATES AND PSYCHOPATHIC TRAITS INTERSECT

Hedwig Eisenbarth¹, Joana Vieira², Anna Dapprich³
¹Victoria University of Wellington, ²University of Exeter,
³Radboud University

Descriptors: Psychopathy, Empathy, ANS and EMG

Empathic behavior can be assessed in different ways, and given the diversity of measures, divergence in results for its relationship with psychopathic personality - a trait described by low empathy- is to be expected. Therefore, assessing behavioral, self-reported and physiological reactions to empathy provoking tasks could provide further clarity about the mechanisms of (non-) empathic behavior. Across two preregistered studies (lab study $n = 67$, online study $n = 162$) in undergraduate student samples using an empathic accuracy task, implicit (Distancing task) and explicit (Helping question) measures of empathic concern, as well as facial muscle reactions, galvanic Skin response (GSR) and heart rate (HR), we found that psychopathic traits were related to deficits in self-reported empathy, but not to behavioral or physiological reactions in the context of empathy provoking scenarios. In the lab-study, we further found no relationship between physiological and behavioral reactions to the empathy inducing videos. However, Bayesian mixed-effects models showed that participants with higher psychopathic traits showed more empathic accuracy with higher zygomaticus activity when the video target expressed anger. In contrast, participants with higher psychopathic traits showed less empathic accuracy with higher zygomaticus activity when the target expressed either happiness or sadness. These results show that differences between implicit and explicit assessment methods reflect the complex relationship between psychopathic personality and empathic reactivity.

HIGH-ANXIOUS PARTICIPANTS SHOW REDUCED VMPFC ACTIVITY DURING THREAT/ SAFETY REVERSAL LEARNING: MAGNETOENCEPHALOGRAPHIC CORRELATES

Florian Bublitzky¹, Alejandro Espino², Sebastian Schindler³, Jonas Reichelt², Tom Schwegmann², Markus Junghöfer²
¹Central Institute of Mental Health, ²University Hospital Münster, ³University of Münster

Descriptors: Facial expression recognition, instructed threat, MEG

Facial emotion recognition is crucial for social communication and depends on the context. Recognition biases in favor of threat detection can prevent harm but also contribute to the development and maintenance of anxiety disorders. We examined the effects of trait anxiety on threat perception and its modifiability through threat-safety reversal learning using magnetoencephalography (MEG). 40 low- and 40

high-anxious participants completed an emotion recognition task with subtle fearful and happy faces in varying contexts of threat or safety. Results show that contextual threat led to increased threat ratings and biased recognition of fearful and happy faces. MEG data revealed spatiotemporal clusters of neural activity associated with contextual threat, emotion recognition, and anxiety-group in prefrontal cortex regions. During threat/safety instantiation, the integration of affectively incongruent face-context compounds (e.g., happy faces in a threat context) was associated with enhanced vmPFC activity (250-330ms). This effect persisted later in time (310-400ms) but only in low- and not high-anxious participants. Similar regions were engaged in threat-safety reversal learning, showing differential threat-safety processing in a vmPFC cluster (150-240ms), but again only in low- but not high-anxious participants. Thus, the PFC integrated incongruent face-context information and threat-safety reversal learning. In both processes, high-anxious participants show less differential processing, possibly due to impaired memory updating and inhibition of (old) threat associations.

FUNDING: This work was supported by the German Research Foundation (BU 3255/1-2).

NEURAL CORRELATES OF PERSONALITY: DISENTANGLING CONTRIBUTIONS OF PERIODIC AND APERIODIC RESTING EEG SIGNALS

Luiza Bonfim Pacheco¹, Daniel Feuerriegel¹, Hayley Jach², Stefan Bode¹, Luke Smillie¹

¹University of Melbourne, ²University of Tübingen

Descriptors: EEG, Personality, aperiodic activity

This study provides the first account of how a new EEG metric that distinguishes periodic activity from the overlapped aperiodic activity (1/f) can be used to investigate robustness of effects in Personality Neuroscience. Using a large sample ($N = 300$), we explored the putative relationship between Extraversion and established resting markers of reward sensitivity frontal alpha asymmetry (FAS) and frontal-posterior theta (FPT) (Study 1) and investigated robustness of machine learning predictions of personality from resting EEG (Study 2). For both studies, frequencies were measured at total power, and the separate periodic and 1/f activities. Contrary

to expectations, total power FAS and FPT correlated negatively with Extraversion ($r \sim -0.14$). However, this effect disappeared for the periodic FAS and FPT. Effects for 1/f FAS approached significance ($p \sim .08$), which might suggest that 1/f is driving the effect shown for this measure at total power. For Study 2, all Big Five traits reached highest decoding performance at periodic power, suggesting that the unrelated 1/f activity prevented optimal decoding for these traits at total power. Decoding from 1/f indices performed well for Agreeableness, suggesting that both periodic and 1/f activities contain relevant information for this trait. Together, these results show that disentangling periodic activity from 1/f produces more consistent results for effects brought by oscillatory activity, than considering total power. Moreover, we also provide evidence that 1/f itself might be a relevant marker for future research in personality.

FUNDING: Internal funding at the University of Melbourne.

AMYGDALA STRUCTURE AND FUNCTION IN TRAUMA-RELATED PSYCHOPATHOLOGY

Nicola Sambuco, Margaret Bradley, Peter Lang
University of Florida

Descriptors: MRI, amygdala, trauma

The amygdala is a primary region implicated in emotional processing. Although both functional and structural differences in the amygdala have been reported when comparing healthy controls to patients diagnosed with stress-related disorders (e.g., post-traumatic stress disorder, PTSD), investigations have largely proceeded independently, despite evidence showing that structural and functional data are – at least in part – related. The current study tested the combined contribution of amygdala volume and functional brain activity (during affective scene viewing) in the amygdala as they predicted trauma severity in a sample ($N = 100$) of patients diagnosed with internalizing disorders. Results showed that 1) amygdala volume and emotional reactivity are not correlated, and 2) structural and functional data explain unique proportions of trauma-related psychopathology. Specifically, regularized elastic-net regression with leave-one-out cross-validation indicated that severity of post-traumatic symptomology uniquely predicted reduced amygdala volume, and severity of traumatic experience (e.g. whether self/other life was endangered) uniquely predicted blunted emotional

reactivity. Taken together, the data identify different stress-related mechanisms that may mediate neurobiological dysfunction in the internalizing disorders.

FUNDING: This research was supported by the National Institute of Mental Health [grants MH094386 and MH098078 to P.J.L.].

ABSTRACT

Discussion Panels

DISCUSSION PANEL

TRANSLATING MODELS OF APPETITIVE MOTIVATION: FROM RODENTS TO HUMANS (AND VICE-VERSA), A FRIENDLY CONTROVERSIAL THEMATIC SESSION

Session Chairs: Francesco Versace¹, Bruce Bartholow²

¹The University of Texas MD Anderson Cancer Center,

²University of Missouri

Descriptors: Translational Science, Addiction, Individual Differences

A comprehensive understanding of brain function and dysfunction requires scientific approaches representing many levels of analysis. For example, inferences concerning neurocognitive function in humans are built upon decades of research in preclinical (e.g., rodent) models. Likewise, questions addressed in preclinical neuroscience are informed by phenotypes observed in human behavior and their associations with brain imaging data. Yet, direct translation of preclinical findings to human models—and vice-versa—remains largely elusive, a critical barrier to progress in both basic and applied brain science. The purpose of this symposium is to bring together diverse perspectives on this problem in the domain of appetitive (i.e., approach) motivation. The goal of this session is to highlight areas of agreement and, importantly, areas of disagreement among leading scholars who represent both preclinical and clinical approaches and varying perspectives on the possibilities for translation. The tenor of this session is meant to be controversial yet collegial. The goal is not to achieve any consensus but rather to highlight aspects of this problem on which current disagreements might produce subsequent breakthroughs. Panelists will include Dr. Rita Goldstein (Icahn School of Medicine at Mount Sinai), Dr. Shelly Flagel (University of Michigan), Dr. Jared Young (University of California, San Diego), and Dr. Brett Froeliger (University of Missouri). In addition to questions from the organizers, challenging questions from the audience will be solicited.

CAPTURING AND INTERPRETING INDIVIDUAL DIFFERENCES IN CUE-REWARD LEARNING: FROM RODENTS TO HUMANS

Shelly Flagel

University of Michigan

Cues or stimuli in the environment can guide behavior in adaptive ways, bringing one in close proximity to valuable resources, such as food. For some individuals, however, such stimuli can acquire inordinate control over behavior and elicit maladaptive tendencies. Indeed, the way an individual responds to cues in the environment may be a key determinant of psychopathology. In rats, we can capture individual differences in response to reward-associated stimuli using a Pavlovian conditioned approach paradigm. When an illuminated lever (conditioned stimulus, CS) precedes the non-contingent delivery of a food reward (unconditioned stimulus, US), distinct conditioned responses emerge. On one extreme of the population are goal-trackers, those that treat the cue merely as a predictor and attend to the food cup upon cue presentation. On the other extreme are sign-trackers, those that approach and interact with the cue upon its presentation. Thus, for sign-trackers, the cue becomes an incentive stimulus, attractive and desirable in its own right. Rats that sign-track are also more impulsive, show attentional deficits, and are more likely to relapse to drug-seeking behavior relative to rats that goal-track. There have been a number of recent attempts at translating this animal model and capturing sign- and goal-tracking tendencies in humans. These attempts at translation and the similarities and differences we are seeing between animals and humans will be discussed on both a behavioral and neurobiological level.

THE ADVANTAGES OF REVERSE TRANSLATION FROM HUMAN ADDICTION AND LONGITUDINAL RECOVERY

Rita Goldstein, Nelly Alia-Klein
Icahn School of Medicine at Mount Sinai

Addiction is characterized by excessive salience attributed to the drug and its cues accompanied by compromised self-control and mediated by mesocorticolimbic brain networks. Although heterogeneous across individuals, the process of addiction and recovery develops over months and years. Therefore, the built-in cross-sectional nature of most rodent and human post-mortem interrogations eliminates the ability to study within-subject markers of progression (e.g., addiction severity, initial vs. long-term recovery). An advantage of human neuroimaging studies is their longitudinal designs, adapting a whole-brain approach and studying behavior in naturalistic settings. However, once reliable and valid markers are established (e.g., brain measures of drug-cue reactivity and craving), the ability to assign causality (e.g., to the direct drug effects) is limited, requiring reverse translation to preclinical models. Here I will argue for the primacy of the ever-changing human phenotype in selecting the discovery 'thread' and then following to a more nuanced and controlled preclinical model. For example, human studies point to the involvement of cocaine addiction and abstinence in the dynamic modifications of immune markers in plasma, as associated with brain function. These findings may spur preclinical research to test pharmaceutical targets. Another important thread to follow is language-based, where machine learning is enabling language models to predict behavior. Can preclinical studies explore the constructs underlying drug addiction and recovery using animal communication?

CROSS-SPECIES TRANSLATION OF EFFORTFUL MOTIVATION – IMPORTANCE OF CLINICAL SENSITIVITY

Jared Young
University of California, San Diego

There is a long history in examining effortful motivation in rodents, particularly in substance use research. Reinforcement schedules, such as the progressive ratio breakpoint task (PRBT), have enabled researchers to determine how much effortful motivation an individual

will put forth for the same reward as the effort required is progressively increased. Increasing recognition that amotivated states drive functional outcomes in people with depression and schizophrenia led to reverse translation of the PRBT for patient populations and for disease-relevant manipulations. We provided cross-species pharmacological predictive validation, in that amphetamine increased breakpoint (i.e., effort) in both humans and mice. Furthermore, we demonstrated that both humans and mice exhibit an elevated parietal alpha as participants reach their breakpoint (a cross-species biomarker). We and others demonstrated that people with schizophrenia and depression have reduced breakpoints (clinical sensitivity). Interestingly, people with bipolar disorder exhibit increased breakpoints relative to healthy participants. More importantly, and consistent with hypotheses, breakpoint predicted 24% of the variance in cognitive performance in people with schizophrenia. Disease-relevant manipulations that reduce breakpoints (e.g., chronic corticosterone, reduced Sp4 gene expression, spring-time photobirth) may be relevant to clinical outcomes. These findings support the PRBT as a model of effortful motivation across species that provides opportunities for developing novel therapeutic targets.

TRANSLATING VS TRANSFERRING MODELS OF APPROACH MOTIVATION BETWEEN RODENTS AND HUMANS?

Brett Froeliger
University of Missouri

Preclinical models of drug addiction have provided invaluable insight into the pathophysiology of substance use disorders. Forward translating rodent models has guided clinical neuroscience research to further examine neural mechanisms that mediate the trajectory of substance use disorders and mechanisms that mediate response to treatments. Despite converging evidence from rodent and human studies on common neural mechanisms of approach motivation in drug addiction, there remains a relative dearth of translational research that has produced clinically efficacious treatments that promote and or sustain long-term abstinence among individuals with a substance use disorder. Here I will discuss some of the strengths and limitations of bi-directional research and pose questions around when we are transferring knowledge vs harmonizing and translating models of approach motivation.

DISCUSSION PANEL

LANGUAGE: NEW APPROACHES AND NEW IDEAS

Session Chairs: Kara D. Federmeier¹, Chia-lin Lee²

¹University of Illinois, Urbana-Champaign, ²National Taiwan University

Panelists: Ryan J. Hubbard¹, Yali Pan²,
Brennan R. Payne³, Julie M. Schneider⁴

¹University of Illinois, ²University of Birmingham,

³University of Utah, ⁴Louisiana State University

As an impressive example of human cognitive complexity, language allows for exchanges of thoughts and feelings across space and time through a swift orchestration among vast psychophysiological resources. Language is learned and modified over the lifespan and, in turn, shapes our apprehension of the world. The study of language, therefore, ideally encompasses speakers and comprehenders of all ages and with different backgrounds, queries the

bidirectional relationship between language and other cognitive processes, and brings together multiple, complementary techniques. This symposium aims to showcase these features of current research. We begin with a series of short talks emphasizing the novel inferences about language and its interface with cognitive and emotional processing that have been gained through innovative combinations of different psychophysiological measurement techniques (e.g., EEG, MEG, eyetracking, pupillometry, Transcranial Magnetic Stimulation) and analysis approaches (e.g., ERPs, oscillations, Representational Similarity Analysis). Drawing on their experience with diverse populations across the lifespan and socio-economic spectrum, the speakers will also share their insights into how considering development and broadening the participant base in our studies enhances our understanding of language. With the foundation laid by these talks, this symposium aims to spark a lively discussion among the audience and the panelists on the challenges and opportunities of working with different populations and using these novel approaches to understand language.

ABSTRACT**Posters****Poster Session I**
**POSTER SESSION I-001 | APATHY
IS ASSOCIATED WITH INCREASED
CONNECTIVITY OF THE RIGHT NUCLEUS
ACCUMBENS WITH INSULAR, FRONTAL, AND
TEMPORAL CIRCUITRY IN OLDER ADULTS AT
RISK FOR ALZHEIMER'S DISEASE**

Joshua Gertler¹, Lauren Kenney¹, Adrianna Ratajska¹,
Francesca Lopez¹, Katie Rodriguez¹, Rachel Schade¹,
Alyssa Ray¹, Jared Tanner¹, Gene Alexander²,
Adam Woods¹, Dawn Bowers¹

¹University of Florida, ²University of Arizona

Descriptors: Apathy, rsfMRI connectivity, Premorbid Alzheimer's

Apathy is a common neuropsychiatric symptom in neurodegenerative disorders such as Alzheimer's disease (AD). It is distinct from depression, characterized by loss of motivation, and linked to alterations in reward circuitry. In this study, we tested whether apathy in cognitively normal older adults at risk for AD would be associated with decreased connectivity of basal ganglia regions which are reliably involved in reward processing. Participants included 123 older adults from the University of Florida and University of Arizona (Mean age=71, SD=4.7) with cognitive complaints and first-degree family member with AD. All were cognitively normal with no clinical depression and all completed Starkstein's Apathy Scale. T1 and fMRI images (Siemens 3-T) were acquired using ADNI-3 protocols. Data were preprocessed and analyzed with the CONN toolbox using standard preprocessing and quality control methods. Functional connectivity was assessed with seed-based connectivity maps. Analyses included laterally seeding the caudate, putamen, pallidum, and nucleus accumbens (NA) and controlling for age, site, and sex. A voxel-wise threshold of $p < 0.001$ and cluster threshold of FDR $p < 0.05$ was used. Increased apathy was associated with increased, rather than decreased, connectivity between the right NA and right insular, temporal, and frontal regions, as well as the contralateral left middle insula. These findings are consistent with reports of right

lateralized reward circuitry underlying apathy and previous reports of atrophy in these cortical and insular regions relating to apathy in AD.

FUNDING: NIH grant R01-AG 64587.

**POSTER SESSION I-002 | APERIODIC EEG AND
7T MRSI EVIDENCE FOR MATURATION OF E/I
BALANCE SUPPORTING THE DEVELOPMENT
OF WORKING MEMORY THROUGH
ADOLESCENCE**

Shane McKeon, Maria Perica, Ashley Parr,
Finnegan Calabro, Will Foran, Beatriz Luna
University of Pittsburgh

Descriptors: E/I Balance, FOOOF, Spectroscopy

Animal & human models indicate changes in excitatory (E, via glutamate; Glu) and inhibitory (I, via GABA) neurotransmitters (NTs) through adolescence suggestive of critical period plasticity supporting cognitive development. EEG work has shown background aperiodic activity, derived from the FOOOF protocol, is associated with the E/I balance and neuronal population spiking, represented by the slope (i.e., the exponent) and the offset, respectively. EEG and MRSI data were collected on 164 participants (10-32yo, 87 F), with 3 visits/person at 18mo intervals, for a total of 286 sessions. MRS collection and analysis was done in accordance with our previous work (Perica et al., 2022). The FOOOF python toolbox was used to characterize the PSD, fit as a function across the entire spectrum (1-50Hz). Results showed that the aperiodic exponent ($p < 0.0001$) and offset ($p < 0.0001$) decrease across adolescence. The Glu-GABA imbalance measure, derived from regressions of the two metabolites, was found to decrease with age ($p = 0.001$). The Glu-GABA imbalance increased with exponent ($p = 0.04$) but not offset ($p = 0.58$). The Glu-GABA imbalance was a mediator of age-related changes in exponent ($p = 0.032$). Reductions in offset may reflect maturational decreases in overall spike rate of cortical neurons, while our results showing decreases in exponent suggest maturational dominance of excitatory over inhibitory. These findings provide backing to the FOOOF protocol using empirical longitudinal data and novel *in vivo* evidence reflective of critical period plasticity in DLPFC through the adolescent period.

FUNDING: This work was supported by Grant Number 5R01MH067924-17 from the National Institute of Mental Health, T32 Training Grant Number 2T32MH019986-26 from the National Institute of Mental Health, the Staunton Farm Foundation, and support from the Department of Bioengineering, University of Pittsburgh.

POSTER SESSION I-003 | CEREBROVASCULAR MECHANISMS OF COGNITIVE AGING: ROLES OF ARTERIAL STIFFENING AND WHITE MATTER LESIONS

Daniel Bowie^{1,2}, Kathy Low^{1,2}, Benjamin Zimmerman^{1,2}, Samantha Rubenstein^{1,2}, Samia Islam^{1,2}, Brad Sutton^{1,2}, Gabriele Gratton^{1,2}, Monica Fabiani^{1,2}

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

Descriptors: Aging, Cerebrovascular Health, Diffuse Optical Imaging

The health of the brain's vasculature deteriorates during normal aging in a process known as arteriosclerosis. During this process, the brain's arteries slowly stiffen and lose their elasticity, leading to decreases in the perfusion of oxygenated blood throughout the brain, which contributes to declines in brain structure, function, and ultimately, cognition. Here, employing two-mediator sequential mediation analyses on a relatively large sample ($N > 150$) of individuals aged 18-85 years, we show that the deleterious effect of aging on fluid cognitive ability is partially mediated by the indirect effect of cerebral arterial elasticity (diffuse optical imaging measures of the cerebral arterial pulse; Pulse-DOT) and white matter lesions (T1-weighted white matter hypointensities). Our data also suggest that arterial stiffening precedes the loss of white matter integrity, and that cardiorespiratory fitness confers neuroprotective benefits by moderating the relationship between age and cerebral arterial health, thereby providing a target for nonpharmaceutical interventions. These results are consistent with a hierarchical model of neurocognitive aging in which age-related declines in neurovascular health may accelerate declines in the brain's white matter integrity, which may detrimentally impact brain function and cognition.

FUNDING: This work was supported by NIA grants R01AG059878 and RF1AG062666 to M. Fabiani and G. Gratton.

POSTER SESSION I-004 | ASSOCIATION BETWEEN CEREBRAL ARTERIAL ELASTICITY, CARDIOVASCULAR RISK AND COGNITION IN HEALTHY OLDER ADULTS

Frini Karayanidis^{1,2}, Jenna Johnson^{1,2}, Nicholas Ware^{1,2}, Sarah Johnson^{1,2}, Kathy Low^{3,4}, Shania Soman^{1,2}, Felicity Simpson^{1,2}, Nathan Beu^{1,2}, Maddison Mellow⁵, Ashleigh Smith⁵, Gabriele Gratton^{3,4}, Monica Fabiani^{3,4}

¹University of Newcastle, Australia, ²Hunter Medical Research Institute, ³Beckman Institute, ⁴University of Illinois, Urbana-Champaign, ⁵University of South Australia

Descriptors: Healthy Aging, Cerebral Arterial Elasticity, Cardiovascular Health

Cognitive control processes and frontal brain areas are sensitive to aging, especially in the presence of cardiovascular risk factors (CVRF) whose prevalence increases with age. Many CVRFs are linked to subtle, progressive changes in cerebral arterial elasticity and reactivity that impact global and regional brain perfusion. The Pulse Relaxation Function (PReFx) is an index of regional cerebral arterial elasticity that is derived from diffuse optical tomography measures of the cerebral arterial pulse wave (pulse-DOT). PReFx is associated with age, cardiorespiratory fitness (CRF), cortical white and grey matter volumes and performance on executive function tasks. In this study, we examine the association between arterial elasticity over frontal cortex, CVRF and cognitive control ability in an age-restricted sample to minimise age effects. We use cross-sectional data from the Newcastle cohort of the ACTIVate Study that includes 200 adults aged 60-70yrs with no dementia or cerebrovascular condition (10.1136/bmjopen-2020-047888). Average PReFx was measured from left, midline and right frontal cortex. Composite CANTAB scores targeted memory, executive function, and processing speed. Framingham Risk Score (FRS) measured 10yr cardiovascular risk. Early analyses show expected relationships between PReFx over frontal cortex, CRF and FRS. CANTAB executive function and processing speed composites correlated with age and CRF, but not FRS or PReFx scores, suggesting the need for more sensitive measures targeting specific cognitive processes and regional PReFx.

FUNDING: Funded by Australian National Health and Medical Research Council (NHMRC APP 1171313).

POSTER SESSION I-005 | LONELINESS TO MEANINGLESS: EVENT-RELATED POTENTIALS REVEAL LONELINESS MODULATES NEURAL RESPONSES OF SEMANTIC PROCESSING IN HEALTHY OLDER ADULTS

Bing Li¹, Chih-Mao Huang², Qiduo Lin¹,
Ovid J. L. Tzeng^{1,2,3}, Hsu-Wen Huang¹

¹City University of Hong Kong, ²National Yang Ming Chiao Tung University, ³National Taiwan Normal University

Descriptors: loneliness, semantic processing, Event-related potential

Loneliness (LS) is an aversive emotional response to the subjective-evaluated inadequacy in individuals' social relationships and interactions, with its prevalence only to be exacerbated by the Covid-19 pandemic. Previous studies have associated loneliness in late adulthood with clinical affective disorders and cognitive functional declines. Yet few studies focused on the impact of loneliness on language comprehension, despite the obvious social nature of language abilities and its importance in maintaining one's social network. We aim to fill this gap and investigate whether and how loneliness affects semantic retrieval in healthy older adults. Event-related potentials were recorded while participants were making category membership decisions on three types of targets: high typicality (HT), low typicality (LT), and violation (VIO). The N400 effect between LT and VIO was negatively correlated with LS. The high loneliness group showed marginal HT-VIO differences on N400 with delayed onsets, in more restricted time windows from the successive 50ms analysis compared to the low loneliness group. These results suggest loneliness erodes and alters individuals' semantic processing among healthy older adults. Loneliness modulates the efficacy of using category contexts in activating semantic associations. Overall, loneliness may further hinder language comprehension, which undermines one's ability to communicate and reconnect with others, and then in return, feed into loneliness reciprocally.

FUNDING: This work was supported by Academia Sinica Thematic Research Program (AS-103-TP-C04) and by the Hong Kong Institute for Advanced Study, City University of Hong Kong (9360157).

POSTER SESSION I-006 | CONTENT SPECIFICITY OF THE INNER SPEECH EFFERENCE COPY

Emily Martinez¹, Joseph Toscano²

¹University of California, Los Angeles, ²Villanova University

Descriptors: inner speech, efferece copy, corollary discharge

Inner speech, or coherent linguistic thought that exists fully within one's own mind, is theorized to operate using similar production processes as overt speech, aside from the final step in which the speech motor commands are executed. One production process that supports speech monitoring is the corollary discharge, which uses "content-specific" efferece copy signaling to aid the system in identifying self-produced motor commands and monitor for errors. The inner speech analog of this system has been proposed to be involved in various forms of atypical inner speech (e.g., hallucinations, stuttering), yet the direct study of inner speech efferece copy signaling has been limited, with many researchers instead examining N100 changes using overt speech efferece copy signaling as a proxy. Further, researchers who have examined N100 changes related to inner speech efferece copy signaling have largely focused on gross phonemic errors (i.e., between-category errors) despite the underlying process being thought to be able to account for smaller-scale errors in speech. We extended this literature by examining inner speech efferece copy signaling in response to both between- and within-category differences. EEG data were collected from 30 healthy individuals as they engaged in a directed inner speech task. We found evidence of N100 changes to both between-category and within-category differences. This provides support for the functional similarity between inner and overt speech production models and the level of content specificity in internal speech representations.

POSTER SESSION I-007 | NEURAL CORRELATES OF ATTENTION TO ALCOHOL IMAGES AND PROBLEMATIC DRINKING

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Descriptors: Alcohol Use, Distress Tolerance, Late Positive Potential (LPP)

Alcohol use is prevalent among college students, with 33% of students endorsing binge drinking within the last month (SAMHSA, 2019). Health-related problems, injury, risk for assault victimization and perpetrating crimes have

been linked to alcohol use. Research to understand alcohol use and related problems has relied on the Alcohol Use Disorder Identification Test (AUDIT). One possibility is that alcohol problems occur in those who are drawn to alcohol due to low distress tolerance. Additionally, little is known about the neurocognitive correlates of both drinking and its related problems as assessed by the AUDIT. The current study evaluated the relation of the AUDIT and its subscales with the motivational salience of alcohol images as indexed by the late positive potential (LPP), an ERP that reflects attention to salient stimuli. Participants ($N=77$) passively viewed images of alcoholic beverages and images with neutral valence. To isolate the LPP response to alcohol images, we examined the residuals of a regression in which the neutral image LPP predicted the alcohol image LPP. Results indicated that scores of alcohol problem items in the AUDIT predicted the LPP, $F(3,73)=3.666$, $R^2=.143$, $B=2.280$ [.798, 3.763], $\beta=.201$, and this association was moderated by distress tolerance such that there was a stronger association between the LPP and the AUDIT in those with lower distress tolerance, $B=-.039$ [-0.067, -.011], $\beta=-.320$. These data suggest those who score higher on the problem items of the AUDIT and have lower distress tolerance have greater attentional capture by alcohol cues.

POSTER SESSION I-008 | ANTERIOR INSULA AFFECTS THE RIGHT HEMISPHERE PREPONDERANCE OF STIMULUS-PRECEDING NEGATIVITY: CORRELATION ANALYSIS

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Descriptors: Anticipation, Anterior insula, Hemisphere difference

Anticipatory attention is reflected by the stimulus-preceding negativity (SPN), an event-related potential (ERP) with multiple sources, including the anterior insula (aINS) (Kotani et al., 2017). One common feature of SPN and aINS is their right-hemisphere dominance (RHD). This study investigated whether the RHD of the aINS correlates with that of the SPN, using both fMRI and ERP. 23 healthy adults participated in separate ERP and fMRI experiments, both using a time estimation task. SPN was measured using 58 electrodes, and mean amplitudes were calculated for the left and right hemispheres. The aINS

activity was measured using a 1.5T MRI scanner, and beta values were extracted from the left and right aINS. RHD indices (the right hemisphere value divided by the left hemisphere value) were calculated for SPN and aINS. Outlier detection was performed on the RHD index of SPN, and 10 participants were rejected from the analysis. Pearson's correlation analysis was performed on the data from the remaining 13 participants, revealing a significant correlation between the RHD indices of SPN and aINS ($r = .58$, $p = .04$). Our observation suggests that the RHD of the SPN may stem from that of the aINS.

FUNDING: This research was supported by JSPS KAKENHI Grant-in-Aid for Scientific Research(C) 20500536.

POSTER SESSION I-009 | MONITORING FOR EXCEPTIONS FROM "OPPOSITE DAY" — ELECTROPHYSIOLOGICAL EVIDENCE FOR ENHANCED ATTENTION TO RARE CONGRUENT STIMULI

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Descriptors: Visual Attention, Simon Task

We report event-related potentials indicating enhanced attention to stimuli possibly signalling the need to temporarily override a non-instructed but adaptive strategy, from an EEG-study originally designed for a different question. In 1200 trials each, 53 participants were asked to indicate the orientation of a horizontal or vertical white bar presented to the left or right of fixation on a black background, without contralateral stimulation, by pressing a button to the left or right of fixation before an adaptive response deadline. For 26 participants, the side of the correct button was congruent (i.e., it matched the side of the stimulus) in 75% of the trials. For 27 participants, it was only congruent in 25% of the trials. EEG was recorded from 60 electrodes with a sampling rate of 1000 Hz. The N2pc, aggregated across all posterior and occipital electrodes, in response to rare congruent stimuli was larger than the N2pc in response to all other stimuli, resulting in a significant interaction between congruency and group. As the N2pc reflects spatial attention, this indicates enhanced attention to rare congruent stimuli. We suggest that participants optimised behaviour by adopting the non-instructed strategy of preparing the response contralateral to the stimulus, irrespective of its orientation, when congruent stimuli were rare. If so, they would have had to quickly override this "opposite strategy" in the case of an unexpected congruent stimulus, requiring an

ipsilateral response. This may explain the apparently enhanced attentional response to rare congruent stimuli.

FUNDING: This research was funded by the German Sport University Cologne, grant number 2017, Call No. 1, internal research funds awarded to Thomas Jean Hosang.

POSTER SESSION I-011 | ATTENTIONAL BIASES TO SOCIAL THREAT IN LONELINESS: EVIDENCE FROM COMPUTATIONAL AND NEUROPHYSIOLOGICAL APPROACHES

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Polish Academy of Sciences

Descriptors: Loneliness, Computational Modeling, Attention

Recent studies have questioned the reliability of tasks used to measure attentional biases to threat. To address this limitation, two different approaches have been proposed: computational modeling and neurophysiological indicators. In order to evaluate these options, two experiments were conducted. The first experiment involved 288 individuals from across the range of scores on the revised UCLA Loneliness Scale who completed a Dot Probe Task. Results from the Drift Diffusion Model indicated that lonely individuals responded faster to social stimuli than non-lonely peers, which was not reflected in the traditional behavioral measures used in the Dot Probe paradigm. The second study included 26 lonely and 26 non-lonely participants who completed a Dot Probe Task while electroencephalographic recording was conducted. Results revealed reduced efficiency in perceptual decision-making among lonely individuals, but no evidence of hypervigilance in neurophysiological indicators of orienting to social threats. In conclusion, computational approaches may provide a better understanding of cognitive processes, as they have been shown to be sensitive to divergence in perceptual discrimination between groups, even in the absence of overt differences in standard behavioral measures.

FUNDING: This work was supported by the National Science Centre, Poland (Grant No: 2019/35/B/HS6/00517).

POSTER SESSION I-012 | EFFICACY OF MINDFULNESS ON SUBJECTIVE FEELINGS, AUTONOMIC ACTIVITY, AND ENDOCRINE LEVELS AFTER ACUTE MENTAL STRESS

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Descriptors: mindfulness, autonomic activity, cortisol

Recently, mindfulness has become a major psychotherapy intervention for improving anxiety and mood symptoms and preventing the recurrence of depression. Mindfulness interventions contain different instructions, including focusing on the breath and focusing on sounds. However, the influence of different instructions on the therapeutic mechanisms of mindfulness remains unknown. Therefore, this study investigated the effect of different manipulations on subjective feelings, autonomic activity, and the endocrine system after acute mental stress. Participants were divided into three conditions: focusing on the breath, focusing on sounds, and a control group. Then, the participants conducted a difficult arithmetic task for five minutes and completed one of the three conditions for 15 minutes. Results indicated that the participants focusing on the breath showed more positive emotions, less negative emotions, more relaxation, and less fatigue than those focusing on sounds or in the control condition. Moreover, the level of cortisol, a stress hormone, decreased in participants focusing on the breath than those focusing on sounds or the control conditions. This empirical study indicates that focusing on the breath is an effective manipulation to decrease stress hormones after acute mental stress.

FUNDING: JSPS KAKENHI Grant Number 23K02939.

POSTER SESSION I-013 | NEW METRICS TO CHARACTERIZE PHYSIOLOGICAL CHANGES INDUCED BY VOLITIONAL PACED SIGHING

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Descriptors: breathwork, heart rate variability, arterial elasticity

Structured breath practices produce acute and chronic improvements in psychological and physiological well-being. In addition, paced sighing, specifically at 0.066 Hz, elicits a sympathetic response that is identifiable in the RRI spectrum and may be used clinically to estimate arterial elasticity (Patent: US 11076762B2). The current study examined RRI spectral changes produced by 0.066Hz sighing in 20 women enrolled in a 2-year prospective study investigating the effects of alcohol use on cardiovascular health. ECG was recorded during 5-min baseline and paced volitional sighing (once every 15s (0.066Hz)) tasks. Frequency of past 30d alcohol use was assessed using an online Timeline FollowBack and categorized as frequent (≥ 9 d) or infrequent (≤ 3 d). During the sighing task, power of RRI spectra at 0.066Hz (RRI-066) and its first harmonic, 0.13Hz (RRI-13), was estimated for each participant, log transformed, and averaged by group. Paced sighing increased RRI-066 and RRI-13 compared to

baseline ($p < 0.001$). The alcohol groups did not differ statistically ($p > 0.05$) during sighing despite smaller peaks in the frequent versus infrequent drinkers (RRI-066: 9.5 ± 0.9 vs. 9.9 ± 1.0 ; RRI-13: 9.7 ± 1.1 vs. 10.1 ± 1.1 , respectively). Results suggest that paced sighing elicits a sympathetic response that is evident in the RRI spectrum. Unexpectedly, RRI-13 was larger than RRI-006 and frequent past-30d drinking did not significantly dampen power at either peak. A larger sample and more nuanced drinking distinctions may be needed to detect vascular alterations caused by alcohol consumption.

FUNDING: R01 AA027017, F31 AA030178.

POSTER SESSION I-014 | ERP DATA QUALITY IN EARLY CHILDHOOD: A LONGITUDINAL AND SYSTEMATIC INVESTIGATION

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Descriptors: ERP Data Quality, N2 and P3b, Longitudinal
Given the unique challenges of event-related potential (ERP) data acquisition in young children, assessing ERP data quality is especially important. Yet, it remains to be investigated how ERP data quality changes over time in early childhood. Here, we examined developmental changes in the data quality of ERP components N2 and P3b elicited during a visual Go/No-Go task across preschool to first grade ($N = 152$). We used the bootstrapped standardized measurement error (bSME) to quantify the precision of mean amplitude scores extracted from observed waveforms (Go and No-Go) and the difference wave (No-Go minus Go, or delta). A 3×2 ANOVA with time (preschool, kindergarten, first grade) and component (N2, P3b) as within-subjects factors was conducted separately for Go, No-Go, and delta bSME. For all bSME measures, a) compared to N2, P3b data quality was significantly worse across all time points; b) N2 and P3b data quality improved from preschool to kindergarten and preschool to first grade but did not change from kindergarten to first grade; and c) improvements in data quality from preschool to kindergarten were greater for P3b than for N2. Our results reveal component-specific differences in ERP data quality in early childhood and suggest that the transition to formal schooling may contribute to improvements in factors that relate to ERP data quality. This study highlights the importance of considering noise proneness of specific ERP components in efforts to improve data quality, and examining how school experiences contribute to changes in ERP data quality in young children.

FUNDING: This work was supported by the Eunice Kennedy Shriver National Institute of Child Health and Human Development (Grant 5R01HD071957). The contents are the sole responsibility of the authors and do not necessarily reflect the views of the Eunice Kennedy Shriver National Institute of Child Health and Human Development.

POSTER SESSION I-015 | DIFFERENCES IN N2 CORRELATIONS WITH INTERNALIZING AND EXTERNALIZING SYMPTOMS ACROSS STROOP AND FLANKER TASKS

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Descriptors: conflict monitoring, n2, internalizing-externalizing symptoms

Psychopathology is often marked by cognitive dysfunction with specific abnormalities in conflict monitoring. While studies suggest that the nature of conflict monitoring differences depends on whether symptoms are inner-directed (internalizing) or outer-directed (externalizing), findings vary—perhaps related to differences in tasks. The present study examined the relationship between conflict monitoring, as measured by N2, and symptoms during flanker and Stroop tasks. Internalizing and externalizing composite scores from the Adult Self Report were compared to N2 recorded using high-density EEG data from 128 university students. A three-way interaction between task, internalizing, and externalizing scores was found. At low levels of internalizing scores, larger N2 during the Stroop task was related to higher externalizing scores but larger N2 during the flanker was related to lower externalizing scores. However, at high levels of internalizing scores, larger N2 during the flanker task was related to higher externalizing scores. Larger N2 for Stroop at high levels of internalizing was related to lower externalizing scores. These findings suggest that the size of N2 is influenced by an interaction between task demands and individual differences in both internalizing and externalizing behavior, and that specific facets of conflict monitoring may vary across cognitive tasks, as captured by N2, that differ across psychopathological dimensions. Findings suggest that failing to consider task differences might obscure relationships between N2 and psychopathology.

POSTER SESSION I-016 | MONEY OR A MOUTH-WATERING REWARD? A NEUROPHYSIOLOGICAL COMPARISON OF MONETARY AND FOOD-RELATED REWARD SALIENCE

Tracy Bertka¹, Alina Espinoza¹, Kaylie Carbine¹, James LeCheminant², Michael Larson²

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Descriptors: RewP, Food Reward, Monetary Reward

Research suggests that the reward value of food influences diet, but it is unclear how receiving or losing a food reward is more or less salient than other rewards. We tested if neural indices of food-related reward (measured by the reward positivity; RewP) differed than other salient rewards- money and positive feedback. 64 participants ($M_{age}=20.41$; 45% female) completed three doors tasks and received a reward (i.e., favorite candy, money, positive feedback) if the correct door was chosen and lost part of that reward if the incorrect door was chosen. Feedback was randomly assigned to 50% reward and 50% loss trials. Paired tests of equivalence (TOST) with paired-samples t-tests (NHST) assessed for differences in RewP reward amplitude and difference amplitude (reward minus loss) between candy and money, money and positive feedback, and candy and positive feedback. There were no differences between candy and money reward amplitudes (TOST $p<.001$, NHST $p=.91$) and money elicited a larger reward amplitude than positive feedback, though the effect was smaller than anticipated (TOST $p<.001$, NHST $p=.04$). The study was not powered enough to detect differences between candy and positive feedback for reward amplitudes or any of the difference wave comparisons (TOST $ps>.05$, NHST $ps>.05$). Money and candy may elicit a similar neural reward response, which has implications for understanding the high reward salience of food and interventions that may use monetary rewards to improve diet. However, a higher-powered study is needed to confirm results.

FUNDING: Internal funding from Brigham Young University Graduate Studies.

POSTER SESSION I-017 | CHILDHOOD FAMILY SOCIOECONOMIC STATUS AND NEURAL INDICES OF COGNITIVE CONTROL IN ADULTHOOD

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Descriptors: Childhood family socioeconomic status, Cognitive control, N2pc

Childhood family socioeconomic status (SES) is linked to differences in brain structures and functions supporting cognitive control in childhood. However, it is unclear whether the links between childhood family SES and brain functions supporting cognitive control are evident in adulthood. To address this question, we collected event-related potentials (ERP) data from adults (Mean age: 21.86, SD : 2.62) using the ERP CORE Visual Oddball task ($N=41$) to measure P3b, and the Visual Search task ($N=43$) to measure N2pc as neural indices of cognitive control. Given that subjective and objective SES measures capture different mechanisms through which SES may relate to neurodevelopment, we asked participants to complete the MacArthur Subjective Social Status Scale, an index of subjective childhood family social status, and report the highest level of education their parents had completed when the participants were 10 years old. Two hierarchical regression analyses indicated parent education related to larger (more positive) P3b in the Visual Oddball task but smaller (less negative) N2pc amplitude in the Visual Search task (Beta=.43, $p=.01$; Beta=.32, $p=.04$, respectively). The addition of subjective childhood social status to the models did not significantly contribute to P3b or N2pc amplitudes (R-squared change=.01, $F(1, 38)=.44$, $p=.51$; R-squared change=.01, $F(1, 40)=.32$, $p=.57$, respectively). Broadly, these results provide preliminary evidence that childhood family SES may continue to contribute to neural functioning in young adulthood.

POSTER SESSION I-018 | USING CAUSALLY INFORMED FUNCTIONAL CONNECTIVITY METHODS TO IDENTIFY PREFRONTAL-CINGULATE TMS TARGET FOR REWARD POSITIVITY MODULATION

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Rutgers University

Descriptors: TMS, EEG, Targets

Anterior midcingulate cortex (MCC) dysfunction has been implicated in several psychiatric disorders, including addiction and depression. However, MCC's deep location from the skull makes it infeasible to develop treatments using transcranial magnetic stimulation (TMS). Recent attempts to indirectly modulate cingulate activity with TMS have targeted regions in the prefrontal cortex (PFC) with high functional connectivity (FC) with the MCC. However, functional connectivity (FC) targets estimated with Pearson correlations pose theoretical limitations.



We propose that FC methods grounded in stronger causal principles allow for more effective control over spurious connections than standard correlation approaches and produce FC targets that better represent the direct functional connections between two regions. To test this idea, we used EEG-fMRI data from 18 healthy participants and created PFC-MCC targets using the field-standard Pearson correlation and combined-FC. Next, in our proof of target engagement study, we will present the TMS efficacy results of the standard correlation approach (PFC-MCC) in modulating the reward function of the MCC, as evaluated using the Reward Positivity. Combining TMS with resting-state FC methods and EEG provides a great opportunity for systematic investigations of the potential role of TMS in modulating deeper cortical activity, thereby opening an exciting new era of investigative possibilities in basic and clinical research in the domain of MCC function and beyond.

FUNDING: Behavioral & Neural Sciences Program National Institute of Drug Addition (NIDA).

POSTER SESSION I-019 | ADHD SYMPTOMS DO NOT MODERATE THE RELATIONSHIP BETWEEN ANXIETY AND BEHAVIORAL AND NEURAL INDICES OF COGNITIVE CONTROL

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¹Michigan State University, ²Columbia University

Descriptors: Error-Related Negativity, Anxiety, Children
Anxiety disorders (AD) and ADHD have been associated with cognitive control (CC) dysfunction, the ability to adapt to task demands. Previous research has found that AD and ADHD are associated with blunted error-related negativity (ERN), a neurophysiological index of CC. One study found that ADHD moderated the relationship between AD and the ERN, such that youth that exhibited high AD and ADHD symptoms had lower ERN amplitude than anxious children with low ADHD symptoms. Although no study has tested this in pre-school aged children. We sought to address this by examining whether ADHD symptoms moderated the relationship between AD and CC in youth ages 4 – 6. We hypothesized that the presence of high ADHD symptoms would reduce CC in a sample of clinically anxious youth, such that performance and the ERN would be reduced. The sample consisted of clinically anxious children (N=53, M=5.09, SD=0.64),

who completed a go/no-go task while electroencephalogram (EEG) was recorded and a flanker task via the NIH Toolbox. Results revealed no moderation effect of ADHD on the association between AD and CC Flanker ($p=0.66$) and Go/No-Go performance ($p=0.21$) or the ERN ($p=0.71$). However, we found that greater ADHD symptoms were associated with poorer flanker accuracy ($p=0.006$). These findings suggest that ADHD symptoms contribute to reduced CC performance in children with AD.

FUNDING: This work was supported by the National Institute of Mental Health R33MH121641 awarded to Katherine Rosenblum, Kate D. Fitzgerald & Jason S. Moser.

POSTER SESSION I-020 | PARENTS' ERROR SENSITIVITY TO THEIR CHILD'S MISTAKES

Sally Cole, Enrique Cibrian, Alexandria Meyer
Florida State University

Descriptors: frontal midline theta power, parent error sensitivity, go/no-go task

Error-related neural activity (e.g., the error-related negativity) is elicited from both performed mistakes and observed mistakes of a stranger, however, few studies have investigated error sensitivity whereby the individual observes the errors of their own child. We examined the relationship between parents' error sensitivity to their child's errors on a Go/No-go task. We expected that parents would exhibit increased frontal midline theta power (4 – 8 Hz) to their child's errors as compared to their correct responses. Parents' EEG was recorded while they observed their child playing a Go/No-go task, in which children were instructed to click a mouse button whenever they saw an alien, and to not click anything when they saw an astronaut. Parents were instructed to pay close attention to the computer screen and their child's responses (mouse clicks) to keep track of their performance on the task. We found that parents displayed greater theta power when observing their child's errors ($M=8.19$, $SD=23.6$) compared to correct responses ($M=-2.81$, $SD=13.65$), $t(71)=3.36$, $p=.001$, indicating that parents' error related neural activity is elicited by observing their child's mistakes. These results may have implications for predicting how parents react to their child's mistakes in their daily interactions as well as how children learn to interpret and react to their own mistakes.

POSTER SESSION I-021 | PSYCHOPHYSIOLOGICAL CORRELATES OF PROTEIN VS. CARBOHYDRATE INTAKE AND INHIBITORY CONTROL IN OVERWEIGHT PRETEENS

Graciela Alatorre-Cruz^{1,2}, Yuyuan Gu¹, Heather Downs¹, Darcy Hagood¹, David Williams^{1,2}, Linda Larson-Prior^{1,2}

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Descriptors: Inhibitory Control, Macronutrients, Obesity

Preteens with overweight show problems in inhibitory control observed in behavioral and electrophysiological responses. Diet affects brain activation, and it depends on the type of macronutrients consumed. We hypothesized that consuming certain macronutrients may improve the inhibitory control process in overweight preteens. To test this hypothesis, fifty-one preteens were provided with one of two equal-calorie shakes (high-carbohydrates (hC) or high-protein (hP)) 90 minutes before collecting event-related potentials during a stop-signal task. Twenty-four preteens drank hC shake (mean BMI = 23.2 ± 4.9; 10.2 years old), and 27 drank hP shake (mean BMI = 23.5 ± 4.7; 10.1 years old). Although no significant differences were observed in behavioral responses between groups, the hC and hP groups differed in the amplitude of N200 and P300a components regardless of experimental condition. The hP displayed greater negativity than the hC groups in frontal regions, reflecting differences in conflict-monitoring. The hC group showed a greater positivity of P300a than the other group, suggesting differences in attention-inhibition process. The amplitude of N200 and P300a positively correlated with better behavioral performance in the inhibition condition. We conclude that carbohydrates and protein macronutrients have a specific effect on inhibitory control in preteens with overweight. Although both improve participants' behavioral performance, we suggest that hP shake increases their ability to detect the inhibition condition, while the hC shake supports participants' inhibition processing.

FUNDING: Funding: this research was supported by USDA/Agricultural Research Service Project 6026-51000-012-06S.

POSTER SESSION I-022 | TEMPORAL-SPATIAL PCA REVEALS COMPENSATORY P300 AMPLITUDES NOT DETECTED WITH TRADITIONAL ERP METRICS IN HEALTHY ELDERLY WITH GENETIC ALZHEIMER'S RISK

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Descriptors: Temporal-spatial PCA, Alzheimer's risk, Inhibitory control

Alzheimer's disease (AD) is associated with smaller amplitudes and delayed latencies in cognitive event-related potentials (ERPs). As AD-related pathology begins decades before cognitive symptoms, ERPs in healthy, cognitively intact groups with AD risk might uniquely detect these early changes. The limited research in healthy elders with genetic AD risk (APOE ε4) most consistently reveals delayed P300 latencies, but few studies report differences in P300 amplitudes. Notably, P300 has a relatively large time window, likely encompassing multiple underlying processes. Temporal-spatial PCA (tsPCA) is better suited to isolate processes that overlap in time, which might better detect group differences. Thus, we used both traditional ERPs and tsPCA to investigate P300 amplitudes in cognitively intact elders (25 ε4-, 21 ε4+) during accurate stop-signal inhibition trials. Traditional ERP amplitudes did not significantly differ by ε4. In contrast, tsPCA revealed two P300 factors in each ε4 group. P300-Posterior (parietal maximum; ε4- Pz; ε4+ P1) corresponded with the traditional P300 and did not significantly differ by ε4. However, P300-Anterior (ε4- FC1; ε4+ Cz), reflecting age- and executive demand-related activity, revealed greater activation in ε4+ than ε4-. Coupled with good task performance, greater ε4+ activity likely reflects compensation for AD risk-related neural deficits during this pre-symptomatic stage. Importantly, these patterns were uniquely detected using tsPCA, demonstrating the advantage of parsing temporally overlapping ERP processes.

FUNDING: Private contribution from Thomas J. Salentine (KN) and NSF grant #1854158 (KN).

POSTER SESSION I-023 | NEURONAL AND PSYCHOPHYSIOLOGICAL RESPONSES REFLECT THE STRENGTH OF AFFIRMATIVE BELIEFS ON FOOD PRODUCTS

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Descriptors: concealment information test, fNIRS, implicit evaluation

We examined the relationship between physiological responses and the strength of affirmative beliefs on the palatability of foods using a concealment information test (CIT). The CIT is a criminal investigation technique in which a suspect is required to deny the facts of a case, which potentially entails denying their own beliefs, leading

to an increased psychological load and strong physiological response. Nine subjects participated in the study. In the task, four sweets were used. The subjects were required to answer falsely (i.e., deny their belief) to questions, such as “Did [the chocolate] taste good?” Autonomic responses were monitored using, for example, an electrocardiogram to measure changes in low and high frequency (LF/HF) cardiac activity, and cortical hemodynamic responses were measured using fNIRS. After the task, subjects answered the same questions honestly. We performed paired t-tests to assess differences in physiological responses to questions about the highest- and lowest-rated sweets. The results show that LF/HF ($d=1.05$) changes and hemodynamic responses in the bilateral dorsolateral prefrontal cortex (DLPFC) ($d>0.8$) during questions about the highest-rated sweets were greater than those during questions about the lowest-rated sweets. This suggests an increased psychological load when denying one's own beliefs, showing that a task-derived psychological load is greater when there are stronger affirmative beliefs about the questions. These results suggest the possibility of objectively assessing the strength of consumers' beliefs about food products.

POSTER SESSION I-024 | DIFFERENTIAL MODULATION OF THETA BAND ACTIVITY FOR SPEECH VS. LIMB MOVEMENT INHIBITION THROUGH NON-INVASIVE PREFRONTAL CORTEX STIMULATION

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Descriptors: Theta activity

Converging evidence suggests that common neural mechanisms support speech and limb movement planning and execution. However, less is known about whether they are subserved by a common inhibitory network. Prefrontal theta has been suggested to be the oscillatory marker of motor response inhibition. Nevertheless, it is unclear whether there are differences in the contribution of prefrontal theta for speech vs. limb inhibition. To address these gaps, we stimulated right dorsolateral prefrontal (rDLPFC) cortex using high-definition transcranial direct current stimulation (HD-tDCS) in 23 subjects, and subsequently recorded EEG while they performed speech and limb Go/No-Go tasks. Data were collected in two counter-balanced sessions (cathodal or sham). Results showed cathodal HD-tDCS lowered the accuracy for speech vs. limb

No-Go. In addition, cathodal, but not sham, HD-tDCS significantly increased the power of theta activity for speech vs. limb No-Go over right prefrontal electrodes. Source contrast of EEG data further confirmed a significant difference between speech and limb No-Go over the prefrontal cortex following cathodal, but not sham, HD-tDCS. Increasing in the power of theta activity within prefrontal cortex may reflect the recruitment of additional neural resources to offset stimulation-induced decline in inhibitory processes (lower accuracy for speech) for a complex motor task, such as speech compared to limb. These findings provide translational implications for neurological disorders such as Parkinson's disease wherein both speech and limb are concurrently impaired.

FUNDING: This work was supported by a grant from Louisiana Board of Regent Research Competitiveness Program (award number: AWD-004500).

POSTER SESSION I-025 | EEG SIGNALS SENSITIVE TO COGNITIVE CONTROL AND UNCERTAINTY DIFFER DEPENDING ON THE EXPLORATION STRATEGY USED

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Descriptors: EEG, Explore-Exploit Dilemma, Cognitive Control

An important dichotomy in the study of human exploration strategies is the existence of directed exploration and random exploration. Directed exploration strategies occur when exploration is used to reduce uncertainty about specific options. Random exploration strategies occur when all options are equally likely to be explored. Here, we sought to investigate whether changes to task structure can shift the exploration strategies participants used and to examine the neural signals involved in these two exploration strategies. We developed a novel learning task – inspired by work in artificial intelligence – which required consistent exploration to learn the task. Within the task, half of the blocks contained the possibility that choices could lose points (Risky blocks), while the other half contained choices that could not lose points (Safe blocks). In Experiment 1 ($n=55$), during Risky blocks we found that participants adopted a directed exploration strategy whereas during Safe blocks they adopted a random exploration strategy. In Experiment 2 ($n=49$), we replicated Experiment 1 while collecting EEG data. We found that an EEG signal tied to cognitive control (theta oscillations)

was larger during Risky blocks when compared to Safe blocks. In addition, we found that an EEG signal sensitive to uncertainty (P300) was larger during exploration on Risky blocks when compared to Safe blocks. Taken together, our results highlight differences in the cognitive processes and neural signals involved in directed versus random exploration.

FUNDING: Dr. Roland and Muriel Haryett Neuroscience Fellowship Natural Sciences and Engineering Research Council of Canada - Post Doctoral Fellowship Canadian Institute for Advanced Research - AI Chair Program.

POSTER SESSION I-026 | AGE-RELATED DYNAMICS OF COGNITIVE CONTROL IN A CUED FLANKER TASK

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Descriptors: Cognitive Control, Aging, ERPs

Different stages of stimulus evaluation ("early" feature-level vs. "late" conjunction-level) can be used to respond in a conflict task, with different speed and accuracy outcomes. During a cued flanker task, where cues indicate the probability of a congruent array (75%, 50%, or 25%), participants may use the cue to adjust their processing strategy to rely more on the early or late stages. Relying on early stages results in faster responses but larger behavioral differences between congruent and incongruent trials (congruency effect, CE) than when relying on the later stages. Here we investigated if flexible strategic adjustments change with age and if cue-related ERPs reflect variations in strategy selection. Behaviorally, both younger (YA) and older adults (OA) showed a greater CE following the 75% cues compared to the 50% and 25% cues, suggesting that when participants expect congruent arrays they base their response on early stages of stimulus evaluation, making them more sensitive to distractors. Across all cues, however, OA showed a larger CE compared to YA, suggesting that OA have difficulty inhibiting distractors. During the cue interval, parietal P2 and P3 varied as a function of the cue but did not index strategic variations. Instead, P2 and P3 were larger for informative (75% and 25%) compared to uninformative (50%) cues. In sum, OA can flexibly adjust their processing strategy, but have greater difficulty with inhibition. ERPs during the cue interval reflect the information value of the cues rather than the specific strategy that is being selected.

FUNDING: Funded by NIA grant RF1AG062666.

POSTER SESSION I-027 | THE RELATIONSHIP BETWEEN ERPS AND EROS DATA IN A TASK-SWITCHING PARADIGM

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Descriptors: Cognitive control, multimodal neuroimaging, networks

Cognitive control is associated with separable brain networks, specifically the cingulo-opercular and frontoparietal networks. These networks can be hypothesized to align with the updating and shifting components of the cognitive control model by Miyake and Friedman (2012). However, the exact relationship between these networks and this model of cognitive control remains unclear. The majority of evidence has been gathered using fMRI, which has limited temporal resolution and may not be the most suitable method for studying the fast dynamics of cognitive control. To address this issue, we used a combination of event-related potentials (ERPs) and event-related optical signals (EROS) to achieve optimal spatiotemporal resolution. Using a task-switching paradigm, we separately identified the effect of mixing cost (repeating a task in single- vs mixed-task blocks) and of switch cost (switching tasks across trials in the same block) which can be related to updating and shifting in Miyake and Friedman's framework, respectively. Our results revealed positive cross-correlations between ERPs and EROS effects in the cingulo-opercular network for mixing cost (indexing updating) and in the frontoparietal network for switch cost (indexing shifting). These findings support a network-based model of cognitive control, with the frontoparietal network implicated in shifting and the cingulo-opercular network in updating.

FUNDING: Funded by NIA: RF1AG062666.

POSTER SESSION I-028 | NOVEL RESTING STATE EEG METRICS OF MILD TRAUMATIC BRAIN INJURY AND THEIR ASSOCIATION WITH LONGITUDINAL COGNITIVE FUNCTION.

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Descriptors: Cognition, Concussion, EEG

The existing literature on EEG spectral power contains conflicting reports regarding changes in canonical frequency bands following mild traumatic brain injury (mTBI). The aperiodic signal however is an arrhythmic component of neural activity that reflects “scale-free” broadband frequency and has recently been associated with deficits of cognitive and behavioral health. We aimed to test if this metric of EEG showed differences in student athletes with a recent mTBI and if the aperiodic signal was associated with longitudinal cognition. Post injury measures of cognitive function and rs-EEG were collected from 56 participants (29.60 ± 10.92 yrs.) who were diagnosed with mTBI within 14 days of injury. Participants without a mTBI served as a control group. Age and sex were controlled using logistic and linear regression models. At baseline, those with mTBI scored significantly lower in verbal fluency ($b = 1.4$; $p = 0.003$) and executive function ($b = 1.2$; $p = 0.002$) compared to those without. The alpha center peak frequency, within frontoparietal electrodes ($b = 0.4$; $p = 0.04$) was significantly decreased in those with mTBI compared to those without. In the mTBI group only, lower immediate post-injury alpha center peak frequency in frontoparietal electrodes was strongly associated with increased executive function over time ($b = 0.15$; $p = 0.001$). These exploratory findings provide preliminary evidence of a novel scale-free metric of changes in power following mTBI and its potential as a prognostic marker of cognitive recovery.

POSTER SESSION I-029 | RELATION OF CONTEXT-SPECIFIC SEDENTARY BEHAVIOR TO INHIBITORY CONTROL AND CONFLICT MONITORING (ERN)

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Descriptors: ERN, sedentary behavior, event-related potentials

Findings are inconsistent regarding the relation of sedentary behavior to brain function and cognition possibly due to differences in context which sedentary behavior occurs. This study examined the relation of context-specific sedentary behavior to error-related negativity (ERN) and inhibitory control (flanker task) in young adults. All participants ($n = 41$; mean age 21) completed demographics and past-day recall of sedentary time. Participants were fitted with an EEG cap (64 Ag/AgCl electrodes) and data were recorded during the flanker task. Separate hierarchical regression models were performed with ERN

amplitude and flanker performance as dependent variables while controlling for demographic measures in Step 1. Step 2 of each model included sedentary time for online leisure (shopping, social media, video chatting), online entertainment (movies, TV, videos), electronic gaming, travel, reading, and schoolwork. Results for ERN mean amplitude revealed smaller amplitude with more time spent in online leisure ($B = 0.77$, $p = .01$). Flanker performance revealed longer RT for incongruent trials with more time spent reading ($B = 29.34$, $p = .04$). These data suggest that sedentary time for online leisure may diminish underlying error monitoring processes related to error salience. Conversely, more time spent reading was associated with slower RT for more difficult trial types. Such findings highlight the importance of considering the specific context of sedentary behavior when investigating its impact on brain function processes and cognitive performance that underly behavior.

POSTER SESSION I-030 | THE ROLE OF PUPIL-LINKED AROUSAL IN PATCH-LEAVING DECISIONS

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Descriptors: Patch-leaving decisions, Pupillometry, Noradrenaline

Deciding when to abandon a depleting resource in favour of potentially richer alternatives is fundamental to adaptive behaviour. Such patch-leaving decisions require balancing the expected advantage of leaving against both the cost of moving and the reward foregone in the current environment. Based on previous research, we hypothesised that bursts of noradrenergic (NE) activity from locus coeruleus (LC) underpin patch-leaving. Here, we investigated pupil dilation as an index of brainstem neuromodulatory systems in healthy participants ($N = 51$) performing a task probing patch leaving. In the task, participants harvested from patches in two environments with different variability of the patches' initial reward rate. Participants adjusted their decisions based on the instantaneous reward rate, but also displayed a bias to overharvest (stay longer in a patch compared to the statistical optimum). This overharvesting was more pronounced in the high variability environment. Importantly, phasic pupil dilation in response to reward outcomes was larger when participants decided to leave their patch, compared to stay trials. This differential response was most pronounced in low-value patches. The phasic pupil dilation ramped towards the leave decisions, both within and across trials. We discuss these findings in light of theories of LC-NE function.

FUNDING: This work was supported by the Deutsche Forschungsgemeinschaft (DFG) grant JO-787/6-1 and by the Research Foundation Flanders (FWO) postdoctoral fellowship (12V5620N).

POSTER SESSION I-031 | TO DO IT OR NOT TO DO IT? THE CAUSAL ROLE OF PREFRONTAL AREAS IN MORAL DECISIONS: A TRANSCRANIAL DIRECT CURRENT STIMULATION STUDY

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Descriptors: emotion, moral decision-making, tDCS

For the dual process theory of moral judgment, automatic emotional responses and cognitive control compete in driving moral decisions. If the emotional response prevails, the judgment tends to reject the utilitarian option. At neural levels, these two processes are implemented by emotional vs. cognitive brain areas, such as the ventromedial (vmPFC) and the right dorsolateral prefrontal cortex (r-dlPFC). In this tDCS study, we aimed to dissociate the vmPFC and r-dlPFC contributions to moral judgment. We assessed changes in subjective experience (valence, arousal, moral acceptability) and performance (choice, response time-RT) on a moral dilemma task (N=48) after anodal, cathodal, or sham transcranial direct current stimulation (tDCS, between-subjects) targeting vmPFC and r-dlPFC in two sessions (within-subjects). Half dilemmas were Trolley-type (i.e., killing one is an unintended consequence of saving others), and half were Footbridge-type (i.e., killing one is an intended means to save others). Trolley-type dilemmas elicited more utilitarian choices, slower RT, and higher unpleasantness, arousal and acceptability ratings. RTs were slower after anodic tDCS of vmPFC, and acceptability ratings to Trolley-type dilemmas were higher in cathodal tDCS. Increasing vmPFC excitability increases the emotional-cognitive conflict, cascading in RT slowing. Decreasing overall cortical excitability reduces the emotional-cognitive conflict, resulting in greater acceptability.

POSTER SESSION I-032 | THE EFFECTS OF INFECTION CUES ON CARDIAC DECELERATION AND SOCIAL RISK AVERSION

Derek Spangler, Nina Lauharatanahirun
Penn State University

Descriptors: cardiac deceleration, threats of infection, social risk aversion

Reducing social contact when faced with threat of potential infection (e.g., person coughing) is critical to protect ourselves from communicable illnesses. This effect may rely on cue-evoked cardiac deceleration, a correlate of defensive preparation. The processing of such infection cues via cardiac responses and its relationship to social decision making remains poorly understood despite important implications for health behaviors. The current study examined the effects of infection images on cue-evoked cardiac deceleration and subsequent effects on social risk decision making. Eighty healthy college students completed a novel paradigm that combined brief image presentations (Image Type: infection, harm, neutral) and a lottery choice task (Outcome source: social, non-social) while electrocardiography was collected. Cardiac deceleration is measured as heart rate change from the pre- to circa-image period. Social risk aversion will be quantified as the proportion of safe choices in the social relative to non-social condition of the decision-making task. The within-person effects of image type and cardiac deceleration on social risk decisions will be tested with multilevel regression. We also tested the extent to which cardiac deceleration may serve as a mediator of the effect of image type on social risk decisions. These results can speak to whether the autonomic nervous system mediates the adaptive effects of infection cues on social risk aversion. Findings will be discussed in the light of biobehavioral theories of disgust, defensive responding, and risk assessment.

POSTER SESSION I-033 | SOCIAL DEFENSE CASCADE: PRELIMINARY EVIDENCE FOR DYNAMICS OF AUTONOMIC DEFENSIVE RESPONSES TO APPROACHING SOCIAL THREAT

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Descriptors: threat, defense cascade, social

In constantly changing environments, a dynamic organization of defensive responding is a prerequisite for survival. Indeed, autonomic defensive responses have been found to adapt to the imminence of a threat and availability of escape options. Formalized as the defense cascade model, it was shown that approaching inevitable threat (e.g., electric shock) elicits a state of parasympathetically-dominated attentive immobility, marked by increasing cardiac deceleration and skin conductance. However, if the threat can be actively avoided, the organism is under

growing sympathetic control, indicated by cardiac acceleration and even more increased skin conductance. In the current pilot study, we tested whether such dynamic organization of autonomic defensive responding also applies to the social domain. Twenty-one healthy participants underwent a novel social defense cascade paradigm, in which increasing social threat imminence was operationalized by pictures of neutral faces, that gradually changed to full-blown angry expressions accompanied by auditory negative devaluations. In line with prior research, we found that cardiac deceleration and moderate increases in skin conductance defined the defensive response pattern when participants were exposed to approaching inevitable social threat. If social threat was avoidable, cardiac deceleration switched to acceleration when threat was most imminent, accompanied by a profound increase in skin conductance. These preliminary results suggest dynamic defensive responding to approaching social threat, extending the defense cascade model.

FUNDING: Deutsche Forschungsgemeinschaft (DFG; WE 4801/6-1).

POSTER SESSION I-034 | BEYOND BUTTON PRESSING: THE EFFECT OF MEANINGFULNESS ON AROUSAL RESPONSE TO DECISION MAKING IN INTERACTIVE VIDEO

Yuxian Lin, Robert Potter
Indiana University

Descriptors: Interactive video, Decision-making, Arousal

This study investigated the influence of decision meaningfulness on the audience's arousal response during a 30-minute interactive video exposure. In a between-subject design, subjects ($N=47$) were randomly assigned to a condition where they made a sequence of seven, multiple-option decisions that were either meaningful (i.e., impacted the video's plot) or non-meaningful. Physiological data (EDA and ECG) were collected and time-locked to the video presentation. Arousal data from the decision-making and post-decision phases were analyzed using MLM. Decision-making phase results were contrary to prediction; the interaction between decision type and time was significant with SCL increases greater overall when making non-meaningful decisions compared to meaningful ones. This result should be interpreted considering the significant three-way interaction between decision type, decision repetition, and time. Viewers making non-meaningful decisions had a diminishing arousal response increase with each subsequent decision made. Conversely, those making meaningful

decisions experienced greater arousal responses increase as the video progressed.

Poster Session I-035 | WORRRY INDUCTION AND THE ERROR-RELATED NEGATIVITY

Rachel Ferry, Rachel Witt, Alex Grieshaber,
Brady Nelson
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Descriptors: Error-related Negativity, Worry, Event-related potentials

Generalized anxiety disorder and chronic worry have been associated with an enhanced error-related negativity (ERN). Conceptual models have proposed that state worry enhances the ERN. However, worry has also been implicated in cognitive avoidance that reduces negative emotional states, and it is unclear whether state worry enhances or attenuates the ERN. In 242 young adults ($M_{age} = 21.78$), the present study examined the impact of a state worry induction on the ERN. Participants completed a flanker task while EEG was recorded during three different within-subject conditions: pre-worry, worry, and post-worry. Participants also completed self-report measures of state anxiety and worry after each condition, and the Inventory of Depression and Anxiety Symptoms-II. Self-report anxiety and worry were enhanced following the worry induction, supporting the effectiveness of the worry induction. The ERN was attenuated during the worry induction relative to pre-worry, but did not differ from post-worry. Across all three conditions, greater obsessive-compulsive checking symptoms were associated with a larger ERN, but only in the context of low depression symptoms. The present study indicates that state worry attenuates the ERN, supporting theories that worry may act as a form of cognitive avoidance that leads to decreased cognitive resources to process errors. Individual differences in obsessive-compulsive symptoms were associated with a larger ERN, suggesting that other clinical characteristics likely enhance error-related brain activity.

POSTER SESSION I-036 | ATTENTION BIAS AND WORRY: THE INFLUENCE OF CONTRAST AVOIDANCE AND EMOTION REGULATION

Hannah Hamrick, Morgan Middlebrooks, Arooj Abid,
Wesley Vaught, Matt Judah
University of Arkansas

Descriptors: late positive potential, attention bias, worry

The contrast avoidance theory of worry (Newman & Llera, 2011) proposes that people worry to maintain a state of chronic distress, thereby avoiding sudden shifts from positive to negative mood states. This may also reflect difficulties with adaptive emotion regulation. Relatedly, selective attention to negative information, which has been evaluated by the late positive potential (LPP) response, is believed to maintain worry. In the current study, contrast avoidance and difficulties with emotion regulation were examined as mediators of the relationship between the LPP response to negative images and self-reported worry. Participants were recruited via the departmental research participation pool. The final sample consisted of 106 undergraduate students, the majority of whom identified as cisgender women ($n=78$, 73.6%) and White ($n=75$, 70.8%). Electroencephalogram data were collected while participants viewed blocks of negative and neutral IAPS images. The neural response to negative images was isolated by subtracting the LPP response to neutral images, LPPnegative-neutral. A parallel mediation analysis was conducted using the PROCESS macro. There was an indirect of the LPPnegative-neutral on worry through both contrast avoidance ($a1b1 = .12$, [.0333, .2115]) and difficulty with emotion regulation ($a2b2 = .06$, [.0084, .1308]), suggesting that each uniquely explains the relation of attention to negative stimuli with worry. Future research should test how interventions for dysregulated emotion and contrast avoidance may impact attention to negative information and worry.

POSTER SESSION I-037 | MAGNETENCEPHALOGRAPHIC AND BEHAVIORAL CORRELATES OF EMOTIONS ELICITED BY MUSIC

Alejandro Espino-Payá¹, Nieves Fuentes-Sánchez², Sabine Prantner², Andreas Wollbrink¹, M. Carmen Pastor², Markus Junghöfer¹

¹University of Münster, ²University Jaume I

Descriptors: Music, Magnetoencephalography, Oscillations
Research demonstrated that listening to music involves the activation of cortical and subcortical regions. Nevertheless, methodological variables, such as the duration of the music or the specific type of emotion induced, were often not taken into account. Our study, therefore, investigated the magnetoencephalographic and behavioral correlates of emotions elicited by music. A total of 30 volunteers listened to 60 musical excerpts (30 unpleasant, 30 pleasant) for 8s. After the music listening task, subjective ratings (affective valence, arousal, happiness, fear, preference, and familiarity) were collected. Results revealed that pleasant music was rated as more pleasant,

exciting, and happy compared to unpleasant music, which was rated higher in arousal and fear. Regarding the neural correlates, we investigated frequency-specific whole brain synchronization during pleasant in contrast to unpleasant music listening. We found differences of synchronization between the two conditions in the theta and beta frequency bands. For Theta (4 to 8 Hz), stronger neural synchronization occurred for pleasant music predominantly in frontal, temporal and occipital areas of the right hemisphere. For Beta (12 to 30 Hz) we found a convergent positivity bias in parietal and occipital areas of both hemispheres. These findings contribute to a better understanding of music-induced emotions and could provide a foundation for clinical treatment of patients suffering from affective disorders.

FUNDING: This work was supported by the Universitat Jaume I [grant number UJI-B2019-34], AEI [grant number PID2020-114633GB-I00], and the University of Münster [postdoc grant for NF-S].

POSTER SESSION I-038 | ELECTROCORTICAL TIME COURSE FOR THE PROCESSING OF AFFECTIVE IMAGES OF CLIMATE CHANGE

Morgan Oja, John Foley, Makayla Mattson, Josh Yang, Mikkena Weiler, Lin Fang, Josh Carlson
Northern Michigan University

Descriptors: Climate change, emotion, ERP

Climate change is an urgent issue that humanity is facing on a global scale. Understanding the psychological mechanisms involved in the processing of climate change information may help facilitate and motivate behavioral engagement to promote change. Research suggests that climate change relevant information captures attention at the behavioral level. Yet, the neural time course that underlies the capture of attention by climate change information is still unknown. Event-related potentials (ERPs) offer excellent temporal resolution and both earlier (e.g., P1 & N1) as well as later (e.g., LPP) latency ERPs are modulated by attention. Therefore, the ERP methodology is well suited to determine the time course in which attention is allocated to climate change information: spanning an initial orienting phase to a later sustained attention phase. This study aimed to assess the electrocortical time course of attentional capture by climate change relevant images. Thirty university students (female = 20, $M = 21.1$, $SD = 2.41$) participated in our study. Participants completed an imaging viewing task including emotionally positive (windmills and other mitigation strategies) and negative (industrial pollution and natural disasters) climate change relevant images as well as climate irrelevant



images. The results showed an early ERP differentiation for negative images of climate change and a later differentiation for positive images of climate change. In sum, different types of climate change information appear to capture attention at earlier and later stages of information processing.

POSTER SESSION I-039 | EMOTION REGULATION FLEXIBILITY: NEUROPHYSIOLOGICAL AND OSCILLATORY MECHANISMS OF SWITCHING BETWEEN REAPPRAISAL AND DISTRACTION STRATEGIES

Agnieszka Adamczyk^{1,2}, Jacobien van Peer¹, Saskia Koch¹, Mirosław Wyczesany², Karin Roelofs¹
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Descriptors: ERPs, emotion regulation, cognitive reappraisal
 Emotion regulation (ER) flexibility—an ability to switch between ER strategies to adjust them to changing situational demands—predicts better mental health. Here, we tested predictors and neural consequences of switching between reappraisal and distraction strategies using a novel task and the Late Positive Potential (LPP) as an index of ER efficacy. Participants ($n = 64$) passively watched and implemented an *instructed* strategy (initial implementation phase) in response to negative pictures of high or low affordance level (i.e., that were easy or difficult to reinterpret). Then, they decided to *switch from* or *maintain* the instructed strategy and implemented the *chosen* strategy (post-choice implementation phase). Bayesian and frequentist mixed-effects models showed that *low* picture affordance and *high* picture intensity predicted more switch from (versus maintain) reappraisal decisions (and vice versa). Neuronally, maintaining both reappraisal and distraction *reduced* the post-choice, relative to initial implementation, LPP amplitudes (0.7 and 0.6 μV). However, whereas switching from reappraisal to distraction *decreased* (3.2 μV), switching from distraction to reappraisal *increased* (-1.4 μV) the post-choice LPPs, regardless of the picture affordance level. These results show that ER flexibility increases situation-strategy fit, yet the neural consequences of switching are dependent on the strategy chosen, not the stimulus-affordance characteristics.

FUNDING: This research was supported from a grant from the National Science Centre in PL (2018/31/N/HS6/03962).

POSTER SESSION I-040 | A PRELIMINARY INVESTIGATION OF RESTING HEART RATE VARIABILITY AND THE NEED FOR AFFECT AMONG ASIAN AMERICANS AND EUROPEAN AMERICANS

Darcianne Watanabe, DeWayne Williams
 University of California, Irvine

Descriptors: heart rate variability

Recent work suggest the relationship between resting heart rate variability (HRV), a psychophysiological index of emotion regulation abilities, and self-reported difficulties in emotion regulation to be stronger among Asian Americans (AA) relative to European Americans (EA). Prior work also showed that the need for affect (NA), defined as the motivation to approach and not avoid emotion inducing situations, is associated with resting HRV. Yet, the association between HRV and NA has not yet been explored differentially between AA and EA. The current preliminary study evaluates this in a sample 21 AA and 86 EA college-aged students. Participants first completed a 5-minute baseline-resting period to assess resting high-frequency HRV, followed by the 26-item NA questionnaire; including NA-approach (13 items) and NA-avoid (13 items) subscales. Controlling for important covariate such as age and sex, results showed that ethnicity significantly moderated the association between HRV and NA-approach only ($B = -2.42$ (1.26), $p = .05$), such that the association was positive among AA, but negative among EA. Although each slope was not statistically significant, the effects are meaningful. In sum, these findings support prior studies suggesting emotion regulation differences between AA and EA. Novel findings suggest that these differences might influence the relationship between resting HRV and the motivation to approach emotions, as higher HRV is associated with less approaching for AA, but more approaching for EA. Future directions and implications for ER will be discussed.

POSTER SESSION I-041 | "I CAN SEE YOU, BUT CAN YOU SEE ME?" THE MODULATION OF EMOTIONAL MIMICRY THROUGH VISUAL CONTACT DURING ONLINE MEETINGS

Michał Olszanowski, Aleksandra Fortunska, Natalia Frankowska
 SWPS University

Descriptors: emotional mimicry, facial emotion expression, social interactions

Previous studies have shown that exposure to vocal emotional expressions, similar to facial expressions, elicits convergent facial displays (so-called emotional mimicry). However, other studies suggest that attentional and visual engagement in the interaction (i.e., the experience of being watched) also modulates mimicry. This suggests that mimicry may be contextually regulated by factors such as whether the recipient sees the sender's face and is aware that the sender is watching his or her response. In the course of the experiment, participants were told that the goal was to collect psychological data on the user experience of alternative forms of video calling. They were presented with expressions of non-affiliative (i.e., anger and disgust) and affiliative (i.e., sadness and happiness) emotions in two possible forms: (1) either combined facial and vocal expressions or (2) limited to vocal expressions only (the sender's camera was turned off). In addition, participants were informed that either: (1) their camera was on and the video signal was transmitted back to the sender, or (2) the camera was off and the sender could not see the observer. Facial activity (fEMG) as an indicator of facial mimicry was measured during the presentation of the expressions, while participants rated the intensity of the expressions after each presentation. Results showed that the ability to see facial expressions and the experience of being watched jointly influence mimicry, but importantly, mimicry also depends on whether the emotions have affiliative or non-affiliative meaning.

FUNDING: National Science Foundation (Poland), grant no. 2020/37/B/HS6/03538.

POSTER SESSION I-042 | FEAR CONDITIONING INTERFERES WITH THE VISUAL PROCESSING OF CONTEXTUAL CUES

Alejandro Santos-Mayo, Stephan Moratti
Complutense University of Madrid

Descriptors: Fear Conditioning, Context, MEG

Fear conditioning is a process whereby organisms identify cues that predict potential harmful events in a context where the surrounding signals can also be associated. Here, we adapted a cued fear conditioning paradigm where a fear-relevant conditioned stimulus (CS+, Gabor patch) and a fear-irrelevant one (CS-, Gabor patch orthogonal to the CS+) were presented along with a permanent contextual cue (wave-square background surrounding the

CS) to 35 subjects in three phases: habituation, acquisition and extinction. Only during the acquisition phase, the CS+ was paired with a 95 dB aversive acoustic noise (US). The steady-state visual evoked field (ssVEF) response of two different frequencies belonging to the background and CS was recorded using a MEG system. Hilbert transform analysis showed the CS+ up and CS- down modulations widely reported in the fear conditioning literature. Interestingly, the ssVEF responses to the background during CS+ trials were reduced and potentiated during CS- trials. Our results are opposite to our Rescorla-Wagner model-based hypothesis where the background should acquire excitatory properties (higher ssVEF power). Instead, they are compatible with competition models of attention, whereby the fear-related CS+ competes with background processing. In CS- trials reduced ssVEF power likely reflects less processing resources being deployed for the CS resulting in increased background response. Therefore, fear conditioning seems to interfere with the visual perception of the context by prioritizing the allocation of visual resources for the fear cue.

FUNDING: Funding was provided by Ministerio de Ciencia e Innovación (Grant Nos. PGC2018-097940-B-I00).

POSTER SESSION I-043 | NEURAL OSCILLATORY ACTIVITY DURING ANGER RUMINATION IS PREDICTIVE OF RETALIATORY AGGRESSION IN A SAMPLE OF UNDERGRADUATE STUDENTS

Mairin Cotter, Kate Loposser, Zachary Wilde,
Fayth Walbridge, Tiffany Harris, Rachel Kaplan,
Stephanie Smith
University of Southern Mississippi

Descriptors: Rumination, Aggression, Electroencephalography
Rumination, the tendency to focus on negative emotions and thoughts, is a maladaptive coping strategy associated with symptoms of depression and aggression. Identifying neural correlates of anger rumination may serve as an objective indicator of treatment change. Using EEG oscillations to measure rhythmic patterns of coordinated brain activity, we examined if frontal midline theta and alpha oscillations recorded while ruminating on an anger-evoking event would predict subsequent aggression. 75 undergraduate students (M age = 20; 52% female; 70% White; 23% Black; 3% Asian; 4% other) completed an online ball-toss game (Cyberball). Participants were randomly assigned to a Rumination (n=38) or Distraction (n=37) condition.

Participants were socially excluded by virtual players and asked to think about how they were treated during the game (rumination) or their morning routine (distraction). Participants could then retaliate by aggressively throwing the ball at other players. For each condition, two regression analyses were run with retaliatory aggressive throws or unprompted aggressive throws as the dependent variable, and theta or alpha oscillations as the independent variable. Alpha was found to be a significant predictor of retaliatory throws for the rumination group ($\beta = .38$, $t(36) = 2.49$, $p = .017$) and not the distraction group ($\beta = .31$, $t(35) = 1.91$, $p = .064$). Theta was not a predictor of aggressive responses. These results suggest that alpha activity while ruminating may be a helpful tool in determining if brain activity changes in response to rumination-focused CBT treatments.

POSTER SESSION I-044 | HEART RATE ACCELERATION DURING EMOTIONAL PICTURE VIEWING BOOSTS EMOTIONAL MEMORY & AVOIDANCE RESPONSES

Stephan Moratti, Alejandro Santos Mayo, Inés Abalo Rodríguez, Silvia Molina Blanco, Sara Pampín Del Río, Miriam Díaz Sánchez, Gabriel Sánchez del Corral, Sergio Calvo García
Complutense University

Descriptors: hear rate changes, emotional memory, avoidance behavior

In previous work, we found that not all participants show fear bradycardia when they observe unpleasant high arousing emotional pictures (de Echegaray & Moratti, 2021, Psychophysiology). A significant proportion of participants was characterized by sympathetically driven heart rate (HR) acceleration. Whereas HR deceleration has been associated with an orienting response, HR acceleration indexes the activation of the defense system. In the current study we first replicate that healthy volunteers show these two principal response patterns of HR deceleration and acceleration to unpleasant complex visual scenes. After the passive picture viewing paradigm, the volunteers executed a surprise recognition task of the emotional pictures. Here, we test, how an increased orienting response as indexed by HR deceleration or sympathetically driven arousal as indexed by HR acceleration affects emotional memory. Our data supports the notion that sympathetically driven arousal boosts emotional memory as HR accelerators showed boosted emotional memory. This is in

line with the observation of increased emotional memory due to noradrenergic activity as reported by the literature. Further, we observed that HR accelerators showed faster avoidance responses than HR decelerators as reflected by shorter response times when switching off unpleasant pictures after approach onset simulated by increasing picture size.

FUNDING: This work was funded by the Spanish Ministry of Science (Ministerio de Ciencia e Innovación: PDI2021-126074NB-I00).

POSTER SESSION I-045 | THE EMOTIONAL IMPACT OF SCENES AND VIDEO: EFFECT SIZES OF ERP, SSVEP, AND SELF REPORT MEASURES

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Descriptors: emotion, video, ssVEP

Real-world videos can evoke strong emotional states. Recent work assembled a set of 10 s multimodal film clips to evoke emotion in the lab to explore the extent to which dynamic, audiovisual stimuli may differentially prompt brain reactivity as compared to scene stimuli. To track video engagement, steady-state visual evoked potentials (ssVEP) were elicited with a flickering border surrounding each video, which yielded reduced ssVEP amplitude during emotional as compared to neutral video perception. Here we extend this work with a within-group comparison of emotional reactivity evoked by a new set of 90 video clips as well as 90 content-matched scenes, indexed by emotion-modulated ERPs. Ratings of arousal were significantly enhanced by pleasant and unpleasant videos relative to emotional scenes, while arousal ratings of neutral videos and scenes did not differ. EEG analyses ($n = 44$) confirm significant modulation of the late positive potential (LPP) by pleasant and unpleasant, compared to neutral scenes, and replicate the significant reduction of ssVEP amplitude during pleasant and unpleasant, compared to neutral videos. Continuing analyses will standardize the EEG measures and compare the impact of emotional modulation between these 2 stimulus types. If videos engage stronger emotional states than scenes, as ratings suggest, we may find larger emotional modulation by videos than by scenes. However, the unpredictable nature of narrative video stimuli may reduce the difference between emotional and neutral video perception, resulting in stronger differences for scenes.

POSTER SESSION I-046 | LINKING BRAIN-HEART INTERACTIONS TO EMOTIONAL AROUSAL IN IMMERSIVE VIRTUAL REALITY

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Descriptors: Brain-heart interaction, Emotional arousal, Virtual reality

The subjective experience of emotions is rooted in the contextualized perception of changes in bodily (e.g., heart) activity. Increased emotion intensity (emotional arousal, EA) has been related to lower high-frequency heart rate variability (HF-HRV), lower EEG parieto-occipital alpha power and higher heartbeat-evoked potential (HEP) amplitudes. We studied EA-related brain-heart interactions (BHI) using immersive virtual reality (VR) for naturalistic yet controlled emotion induction. 29 healthy adults (13 women, age: 26±3) completed a VR experience (that included rollercoasters) while continuous EA ratings, EEG and ECG were collected. We analyzed HF-HRV as well as BHIs using HEPs and “synthetic data generative” modeling (i.e., directional functional BHI). Higher EA was associated with lower HEP amplitudes in a left fronto-central electrode cluster. While HF-HRV and parieto-occipital alpha power, separately, were reduced during higher EA, there was no evidence for the hypothesized EA-related changes in bidirectional information flow between them. Whole-brain exploratory analyses in additional neuronal (delta, theta, alpha, beta and gamma) and HRV (low-frequency, LF, and HF) frequency bands indicated a temporo-occipital cluster, in which higher EA was linked to decreased brain-to-heart (i.e., gamma→HF-HRV) and increased heart-to-brain (i.e., LF-HRV→gamma) information flow. Our results confirm previous findings from less naturalistic experiments and suggest the presence of EA-related BHI changes not in the parieto-occipital alpha but in the temporo-occipital gamma band.

POSTER SESSION I-047 | GENETIC ASSOCIATION OF THE NICOTINIC ACETYLCHOLINE RECEPTOR ALFA-4 SUBUNIT GENE (CHRNA4) RS1044396 WITH INTERNET GAMING DISORDER IN SIBERIAN ADOLESCENTS: A REPLICATION CASE-CONTROL STUDY

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Descriptors: Internet Gaming Disorder, Genetic Association, Adolescents

Two case-control studies have shown that CHRNA4 rs1044396 variants are associated with generalized Internet addiction and Internet Gaming Disorder (Montag et al., 2012 and Jeong et al., 2017, respectively). No such association was found in another study (Park et al., 2018). We aimed to perform a replication study of Internet Gaming Disorder (IGD) and rs1044396 variants association in adolescents. Methods: 472 urban Siberian (Krasnoyarsk) adolescents (age 14.52 ± 1.52; boys/girl ratio 46.4 % / 53.6 %) were tested with “Game Addiction Scale for Adolescents” (GASA, (Lemmens J.S. et al., 2009). DNA samples were collected by “Saliva DNA Collection and Preservation Devices” (Norgen Biotek). Genotyping was carried out using the polymerase chain reaction approach. Quantitative data are shown as median (25-75% quartiles). Kruskal-Wallis test was used. Results: We revealed that rs1044396 CC genotype carriers exhibited the highest GASA score (10.00 (7.50-14.00), CT – 10.00 (7.00-14.00), and CC – 12.00 (8.00-16.00), p(Kruskal-Wallis) = 0.023). Conclusions: Thus, the CC variant of CHRNA4 rs1044396 was associated with IGD in Siberian adolescents. Our result corresponds to similar findings in adult populations. We suppose that the nicotinic acetylcholine receptor alfa-4 subunit may play a role in the formation of IGD by modulating the dopaminergic pathway. Future studies need to investigate the relationship between the dopaminergic and cholinergic systems in more detail to better understand the biological basis of Internet addiction.

POSTER SESSION I-049 | DEMOGRAPHIC DERBY: PARTICIPANTS CHARACTERISTICS TO CONSIDER IN ERP STUDIES OF LEARNING AND WORKING MEMORY

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Descriptors: Electroencephalography, Learning, Demographics

There is considerable inter-subject variability in electroencephalography (EEG) data. While this may be largely due to differences in the brain structure, such as cortical folding patterns, various other features may influence EEG. In some cases, such as that of aging, these characteristics are known to have some impact on components of interest. However, individual differences in EEG data, especially in event-related potential (ERP) studies, are largely ignored in studies of homogenous groups of healthy adults. Are there certain characteristics that we shouldn't disregard? Here, we analyzed a large-sample dataset of participants who completed a short battery of experiments testing learning, decision-making, and working memory while EEG data were recorded. We compared the observed neural responses to several participant characteristics, including age, gender, personality traits, stress, and sleep behaviour. Importantly, we sought to determine whether any of these traits had a ubiquitous effect on ERP components, rather than only impacting certain neural functions. Our results showed that certain biological characteristics, such as age and gender, had a different effect on ERP components than psychological characteristics, such as chronic stress. While it is difficult to make blanket recommendations on how to consider individual characteristics in ERP experiments, we have highlighted some that are worth exploring when interpreting your data.

POSTER SESSION I-050 | LONG-TERM STABILITY OF FEEDBACK-EVOKED BRAIN-HEART COUPLING (N300H) AND FRONTOMEDIAL THETA OSCILLATIONS (FMΘ)

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Unterschemmann, Erik Mueller
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Descriptors: frontomedial theta, brain-heart communication, long-term stability

Neurophysiological correlates of feedback processing like frontomedial theta (FMΘ) or the previously observed

within-subject EEG-heart rate correlation phenomenon termed N300H have been shown to be associated with trait and pathological anxiety and hence reflect promising candidates as biomarker for anxiety. However, while the temporal stability of trait and pathological anxiety has been established with psychometrically well-validated instruments, the long-term stability of many neurobiological individual differences measures, including FMΘ and N300H, is currently unknown. Given that the long-term stability is an essential property of feasible biomarkers, we aimed at elucidating the re-test reliability of FMΘ and N300H. To this end, we examined $n=55$ participants at two separate time-points (6 months apart) who twice performed a gambling task to elicit feedback evoked N300H and FMΘ responses while EEG and ECG were recorded. Preliminary analyses revealed that the retest-reliability for the N300H was ranging from $r_{t1-t2}=0.45-0.6$ and between $r_{t1-t2}=0.6-0.75$ for baseline corrected FMΘ power. Thus, both neural correlates of feedback processing are characterized by a satisfying long-term stability. Moreover, it is important to highlight that the N300H reflects within-subject correlations of two different physiological measures (EEG and ECG), thus, the observed re-test reliability coefficients are substantial and indicate a considerable long-term stability of individual differences in presumably functional brain-heart covariation as assessed with N300H.

POSTER SESSION I-051 | WEAK SITUATIONS: THE USE OF UNCERTAINTY TO REVEAL INDIVIDUAL DIFFERENCES IN LEARNING RELATED TO PTSD

Todd Allen
University of Northern Colorado

Descriptors: Uncertainty, Partial Reinforcement, PTSD

Most individuals who experience a trauma do not develop post-traumatic stress disorder (PTSD). Therefore, the identification of individual differences that may signal increased risk for PTSD is important. Recent work has focused on avoidant personality factors like behavioral inhibition (BI) which is a risk factor for PTSD. Enhanced learning has been found for BI humans eyeblink conditioned with a tone CS and corneal air puff US and behaviorally inhibited rodents (Wistar Kyoto rats) which learned an avoidance response (i.e., lever pressing) with a tone warning signal followed by a footshock. In addition, Lissek et al. (2006) proposed a weak situation involving less salient cues with some degree of uncertainty

would better identify individual differences as compared to a strong situation with highly salient cues with little uncertainty which produces consistently strong results. Therefore, the effects of schedules of partial reinforcement as compared to continuous reinforcement were tested with BI organisms. Both the enhanced eyeblink conditioning and avoidance learning expressed by BI organisms was more evident with schedules of reinforcement in which the stimuli were only paired on half of the training trials as compared to continuous reinforcement with 100% paired trials. Overall, the use of weak situations with uncertain relationships may be more ecologically valid than learning tasks in which the aversive event may occur on every trial and may provide more sensitivity for identifying individual differences in learning for those at risk for, or expressing, PTSD symptoms.

POSTER SESSION I-052 | IS FRONTAL ALPHA ASYMMETRY A MARKER OF APPROACH MOTIVATION? INSIGHTS FROM A COLLABORATIVE FORKING PATH ANALYSIS

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Descriptors: Frontal Alpha Asymmetry, Approach Motivation

Resting frontal alpha asymmetry (FAA) has been proposed as a marker of both state and trait approach motivation, yet recent meta-analyses indicate small or non-existent associations with self-reported traits. Aiming to explain this lack of replicability, it was suggested that individual differences due to traits (i.e. FAA) should be pronounced in situations where individuals show differences in their predisposition to approach (state-trait interaction). To explore this issue, we drew on the CoScience project ($n = 720$) and preregistered two approaches. First, we compared FAA during a resting period, a picture viewing task, and a gambling task, hypothesizing that the later would trigger different levels of approach motivation due to the positive nature of the pictures and the offered monetary incentives, respectively. Second, we considered experimenter influences on the motivational state, hypothesizing that more attractive experimenters would trigger approach motivation. Individuals may be affected differently by these situational variables, and this may be related to their self-reported levels of trait approach motivation. Analyses showed that FAA was only sensitive to some

task manipulations but did not correlate with self-reported trait approach motivation in any condition or approach. To confirm these results, we supplemented all analyses with Bayesian statistics and a Cooperative-Forking-Path analysis exploring analyst's degrees of freedom. Together, our extensive analysis of a large dataset suggests that FAA is not a reliable marker of trait approach motivation.

POSTER SESSION I-053 | HEART RATE VARIABILITY PREDICTS TOTAL PERIPHERAL RESISTANCE OVER SIX YEARS IN BLACK MEN BUT NOT BLACK WOMEN

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Descriptors: heart rate variability, total peripheral resistance

We recently showed that in White Americans (WA) higher heart rate variability (HRV) predicted lower blood pressure (BP) and total peripheral resistance (TPR), but no association was present among Black Americans (BA). It is proposed that unfair treatment, such as discrimination, likely contribute to these findings. From a social-psychological perspective, the unique intersection of being a BA woman might leave BA women particularly susceptible to these maladaptive physiological patterns. We therefore reexamined how the association between HRV and TPR might vary at the intersection of both race and gender in 385 BA and WA normotensive young adults (54% BAs; mean age 23.16 ± 2.9 yr). HRV was indexed at Time 1; all other variables were indexed at both time points. Controlling for body surface area and Time 1 TPR, moderation tests showed that higher HRV at Time 1 significantly predicted lower TPR at Time 2 in BA men ($F(1, 202) = -2.12, p = .028$), but not in BA women ($F(1, 202) = .023, p = .767$). No notable results were found in WA or using cardiac output and mean arterial pressure. In sum, BA women may show TPR-mediated elevations in BP irrespective of resting HRV, which can be particularly detrimental for cardiovascular health. Exploratory analyses showed increases in adiposity over time might contribute to this lack of association among BA women, which is in line with recent work linking adiposity gain with discrimination. Additional implications and future directions will be discussed.

POSTER SESSION I-054 | NEIGHBORHOOD DISADVANTAGE AND RACIAL/ETHNIC DIFFERENCES IN NEURAL REACTIVITY TO EMOTIONAL STIMULI IN CHILDREN

Celeste Beauvillair, Brandon Gibb
Binghamton University, SUNY

Descriptors: late positive potential (LPP), neighborhood disadvantage, emotional stimuli

Research has shown that neighborhood disadvantage and contextual threat increase risk for the development of psychopathology in youth. The goal of the current research was to examine a potential neural mechanism of this risk. Specifically, we examined links between census-derived indices of neighborhood crime and neural reactivity to emotional stimuli indexed with the late positive potential (LPP) ERP component, which reflects sustained attention to emotional information, in a sample of 101 participants between the ages 7-11 years old. We also examined how these responses may differ across racial/ethnic groups. We found that neighborhood crime was associated with LPP response to fearful, but not happy or sad, faces, and that this was moderated by children's race/ethnicity. Specifically, among children from racial-ethnic minority groups, higher levels of neighborhood crime were associated with larger LPP responses to threat-relevant stimuli (fearful faces). In contrast, among non-Hispanic White children, there was no significant relation between neighborhood crime and LPP responses. This suggests that levels of crime within one's neighborhood may be a more salient stressor for children from minority racial-ethnic groups than for non-Hispanic White children.

POSTER SESSION I-055 | SUICIDAL IDEATION AND NEURAL REACTIVITY TO EMOTIONAL STIMULI IN CHILDREN

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Descriptors: suicide, ERP, children

Suicide is a public health concern and a leading cause of death for children in the United States. As such, there is a growing need to identify correlates of suicidal ideation (SI) in youth, including potential biomarkers. Prior research has suggested that the late positive potential (LPP), an ERP component indexing sustained attention to emotional stimuli, is blunted in adults with a history of suicidality e.g., Weinberg et al., 2016). The findings have been interpreted in the context of the emotion context

insensitivity (ECI) hypothesis, which focuses on reduced reactivity to both positive and negative stimuli. This study aimed to determine whether similar findings are observed in children with a history of SI and whether these relations may be at least partially independent of current depressive symptoms. The present study evaluated LPP responses in 7-11 year old children ($N=99$; 50.5% girls) with ($n=12$) and without ($n=87$) a history of SI. LPP magnitudes were obtained from a Morphed Faces task, in which stimuli displaying a variety of emotional expressions (happy, sad, afraid, neutral) were morphed to display low, medium, and high levels of each emotion. Children with a history of SI had reduced LPP responses during the task, regardless of emotion or morph level, $t(97) = -2.13$, $p = .03$, and findings were maintained even after statistically controlling for current depressive symptoms ($p = .05$). These findings are consistent with the ECI model and suggest that blunted LPP response to emotional stimuli may be a useful biomarker of suicide risk in children.

FUNDING: National Institute of Mental Health grant MH098060 awarded to Brandon E. Gibb.

POSTER SESSION I-056 | OCCIPITAL ERROR-RELATED ALPHA POWER AND ITS ASSOCIATION WITH ANXIETY SYMPTOMS IN PRESCHOOLERS

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Descriptors: Alpha, Anxiety, Errors

Pediatric anxiety disorders may derive from atypical maturation of neural substrates for error-processing, thus associated biomarkers are critical for developing novel treatments and preventing these disorders. Occipital error-related alpha suppression is a recently proposed EEG index of cognitive arousal and attentional engagement with potential as an early marker of anxiety. Accordingly, we sought to study the association between occipital error-related alpha power and anxiety symptoms in preschoolers as well as the moderating effect of age in this relationship. We performed spectral analysis of EEG data collected during a Go/NoGo task (Zoo Task) completed by 104 children (ages 4-7; 60 girls) sampled across a wide range of anxiety severity. Symptoms were measured using the DSM anxiety subscale of the Child Behavior Checklist (CBCL-anxiety). Alpha power suppression occurred in the occipital cortex for NoGo-errors compared to Go-correct trials. We also found a correlation between error-related alpha power and CBCL-anxiety and confirmed this association with a general linear

model. Similarly, we found a significant moderation of CBCL-anxiety by the occipital error related alpha power x age interaction. In agreement with previous research on adults, we confirmed that preschoolers exhibit occipital error-related alpha suppression. Furthermore, we discovered a link between occipital error-related alpha power and anxiety symptoms and a moderating effect of age in this relationship. Our findings suggest a new potential marker for treating and preventing pediatric anxiety.

FUNDING: - R33-MH121641 (PI Fitzgerald) - DSI Fellowship, Columbia University.

POSTER SESSION I-057 | TEMPORAL CASCADE OF MULTIMODAL INFANT SUSTAINED ATTENTION MEASURES: LOOKING PRECEDES EEG POWER METRICS THAT PRECEDE HEART RATE RESPONSE

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Purdue University

Descriptors: Multimodal psychophysiology, Sustained attention, Cross-correlation analyses

Sustained attention involves a set of highly integrated biobehavioral responses that implicate multiple physiological systems. Prior infant studies have measured sustained attention using looking behaviors, theta power, alpha power, and heart rate (HR). Yet, the temporal relationships among these behavioral, neural, and cardiac measures have not been characterized, limiting our understanding of the temporal coupling of multimodal psychophysiological processes. Here, we used cross-correlation analyses (i.e., assessing associations between separate time series across a range of time lags) to examine when peak cross-correlations between pairs of measures occurred, allowing us to determine the temporal unfolding of sustained attention. One-year-old infants ($N=36$; 53% male) completed a free-viewing task that contained face and toy images while EEG and HR data were collected. Four time series (i.e., looking, HR, theta power, and alpha power) were computed in one-second epochs. As predicted, looking behaviors preceded EEG and HR measures, with peak cross-correlations occurring at a lag of two seconds. Partial support was found for temporal relationships among EEG and HR measures, with theta power preceding HR by one second whereas alpha power and HR were synchronous. Our results suggest a temporal cascade of infant sustained attention, such that looking behaviors precede neural responses that in turn precede HR changes. Broadly, quantifying these temporal relationships offers biologically plausible values for future integrative neuroscience studies on infant sustained attention.

FUNDING: Internal funding was provided by Purdue University.

POSTER SESSION I-058 | PARENTING STYLES AND LEVELS OF RESPIRATORY SINUS ARRHYTHMIA DURING PARENT-CHILD INTERACTIONS

Nia Cole, Brandon Gibb
Binghamton University

Descriptors: Respiratory sinus arrhythmia, Parenting
Respiratory sinus arrhythmia (RSA), indexed by high frequency heart rate variability (HF-HRV), and reflecting variation in the beat-to-beat interval, has been proposed as a physiological marker of emotion regulation capacity. Variations in RSA have been linked to various forms of psychopathology in youth, but less is known about factors that may contribute to children's RSA. Although there is some evidence for the role of different parenting styles, the evidence is mixed, which may be due to variation across different forms of parenting as well as differences in relations with resting RSA versus RSA reactivity. To address these questions, the current study examined links between different parenting styles (warmth, over protection, and authoritarianism) and children's RSA during a structured interaction paradigm that included a resting period, a positive discussion, and a negative discussion. This sample included 488 children between the ages of 7-11 years old and their mothers. Results showed that boys, but not girls, exposed to higher levels of authoritative parenting exhibited lower RSA levels across the entire interaction paradigm. These results add to literature suggesting different physiological correlates of parenting styles for boys versus girls.

POSTER SESSION I-059 | A LONGITUDINAL EXAMINATION OF AGE- AND LEARNING-DEPENDENT VISUOCORTICAL PROCESSING DURING INFANCY

Maeve Boylan, Jessica Sanches Braga Figueira, Bailey Garner, Ryan Barry-Anwar, Zoe Pestana, Andreas Keil, Lisa Scott
University of Florida

Descriptors: Visuocortical Processing, Brain Development, ssVEP

The first year of life is a time of functional organization of both brain and behavior that result in developmental cascades that affect later attentional, perceptual, and cognitive

processing. However, surprisingly little is known about how to best support learning during this period of rapid developmental change. To examine the trajectory of age- and learning-dependent neural changes, the present study utilized a steady-state visual evoked potential (ssVEP) paradigm, a label training session, and a longitudinal sample of infants ($n=20$). At 6, 9, and 12 months, infant ssVEPs were acquired before and after a label learning task in which two species of computer-generated novel objects paired were individual- or category-level labels. During the ssVEP task, infants viewed concurrent presentations of novel objects superimposed on female faces, each sinusoidally modulated against a Brownian noise background at a rate of 5 Hz or 6 Hz. Ongoing analyses reveal ssVEP amplitude changes across the training session and across longitudinal visits. At 6 months, neural activation is centered around mid-occipital electrodes and demonstrates an increase from pre- to post-training for the individual-level stimuli only. At 9 months, topographic distribution of ssVEP amplitude begins to lateralize, particularly for the individual-level stimuli, and by 12 months, post-training responses to the individual- and category-level have lateralized to right occipito-temporal regions. These results demonstrate experience-dependent specialization across both label-learning conditions and age.

FUNDING: Funding for this research was provided to L. Scott and A. Keil from a National Science Foundation (BCS:1728133).

POSTER SESSION I-060 | PHASE-SPECIFIC MODULATION OF TRANSCRANIAL ALTERNATING CURRENT STIMULATION IN HUMANS

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University of Minnesota

Descriptors: Transcranial alternating current stimulation, Neural oscillations, Oscillation phase

Animal studies show that transcranial alternating current stimulation (tACS) can bias spike timing towards a particular phase of an ongoing oscillation. However, to date direct evidence for this in humans is lacking. In this real-time tACS-transcranial magnetic stimulation (TMS) study we investigated corticospinal excitability at different tACS phases. Twenty healthy volunteers received 2 mA tACS targeting the motor cortex at their individual alpha or beta frequency. During four tACS blocks (~6.5 min each), 600 single TMS pulses were applied to the hotspot of the first dorsal interosseus muscle at 120% of the motor threshold. Using a real-time prediction algorithm, TMS

was applied at the peak, trough, rising, and falling phase of the tACS oscillation. Results showed that cortical excitability (CE) was affected by phase ($F=8.62$, $p<0.001$), which was similar across tACS frequencies (interaction $p=0.765$). Specifically, CE was larger at the trough/falling phase, compared to peak/rising phase. Using a sliding window we found that the phase corresponding to maximal CE changed throughout a block. For alpha tACS, phase maximal CE started at the falling phase and drifted to the trough at the end of block. Similarly, for beta tACS, the preferred phase transitioned from falling/trough to trough/rising. These results are in line with single-unit data in non-human primates and provide evidence that tACS can bias preferred phase of neural output. As such, tACS may be a valuable clinical tool for disorders associated with abnormal neural oscillation patterns.

FUNDING: The project was supported by the Minnesota's Discovery, Research, and Innovation Economy initiative and the Brain and Behavior Research Foundation, Young investigator grant.

POSTER SESSION I-061 | CULTIVATING COMPASSION IN EDUCATION: SELF-REPORT AND SALIVARY ALPHA-AMYLASE AS INDICATORS OF BURNOUT

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Weber State University

Descriptors: Burnout, Alpha-Amylase, Compassion

While empathy is a psychological phenomenon which is vital for successful social cognition and interactions, it can lead to emotional overload in the form of empathic distress when not properly regulated (Klimecki et al., 2013; Silva et al., 2018). Researchers have identified that a person could limit the emotional exposure involved in empathic responses using strategies such as mindfulness or compassion meditation to reframe the distinction between one's own experiences and the experiences of another (Li et al., 2014; Cheng et al., 2007). This study investigated the effects of a 9-week intervention using either breath-based mindfulness (LTB) or compassion mindfulness (CCT) compared to a control group on reducing burnout indicators in educators. Self-reported burnout, as well as salivary alpha-amylase were collected. Significant improvement occurred in posttest burnout scores ($p<.05$) of participants in the CCT group ($n=8$, $d=1.695$) and LTB group ($n=11$, $d=.82$), with no change in the control group ($n=15$) despite all participants showing consistent increases in salivary alpha-amylase over the duration of the study, $p<.05$. Results indicate that participating in

any mindfulness intervention reduces educator burnout, even in contexts where situational stress is consistently increasing; however, for the largest effects, practicing a compassion-based mindfulness is best.

FUNDING: This project was supported by the Weber State University Neuroscience Program and Spectrum Academy.

POSTER SESSION I-062 | HAPTIC STIMULATION PROMOTE MOTOR LEARNING

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Descriptors: haptic stimulation, event-related desynchronization, event-related synchronization

The effectiveness of learning defines by the optimal level of brain activation. Haptic stimulation (HS) promotes learning by changing the level of activation. The aim of the study was to analyze the effects of HS on motor learning. The study was conducted on 20 male volunteers, aged 22 to 41 years. Haptic stimulation (TeslaSuit) reinforced the correct and incorrect actions during training in VR simulator. Task-related HS increased the average reaction rate and the number of successful actions, and reduced the number of unsuccessful actions. Subthreshold stimulation is marked by significant beta- and gamma-ERD (500-1000 ms) in the sensorimotor cortex associated with the attention processes, processing input information, and correcting behavior. Threshold HS elicited significant beta-ERS (500 ms), which reflect deactivation of the motor cortex after the cessation of movement. In the frontal cortex, theta-ERS (200 ms) after subthreshold HS indicates an increase in the level of vigilance, gamma-ERD (500 ms) denotes strengthening the processing of input information. After threshold stimulation, beta-ERD (500 ms) indicates comparison of information about one's own actions and the haptic signal. In the parietal cortex after subthreshold HS theta-ERS (200 ms) indicate activation of the ascending attentional system. After the threshold HS alpha ERD (immediately) and alpha ERS (1000 ms) reflect the integration of voluntary movements. The obtained results indicate a steady increase in the activation level under the haptic stimulation, which affected the effectiveness of learning.

POSTER SESSION I-063 | CHARACTERIZING VISUOCORTICAL CHANGES DURING AVERSIVE GENERALIZATION LEARNING: COMPUTATIONAL MODELING AND TEMPORAL DYNAMICS

Laura Ahumada, Christian Panitz, Caitlin Traiser, Jourdan Pouliot, Payton Chiasson, Faith Gilbert, Andreas Keil
University of Florida

Descriptors: Aversive Conditioning, ssVEP, Computational Modeling

Aversive conditioning of basic visual features such as orientation or location alters the tuning of visuocortical neurons. In retinotopic visual areas, this re-tuning may take the form of a sharpening or generalization pattern. However, prior studies instructed participants regarding the contingency between the conditioned (CS+) and unconditioned stimuli (US). Furthermore, these studies modeled the changes in visuocortical tuning at the group level, preventing analyses of individual differences. In the present study, we used a paradigm with four oriented gray-scale gratings. The experiment consisted of three phases: habituation, acquisition, and extinction. Participants (n=31) viewed the gratings in a flickering fashion to evoke steady-state visual evoked potentials (ssVEPs). Only during acquisition, one of the gratings (CS+) was paired—and co-terminated—with a loud white noise (US). The other gratings (GSs) were never paired. Participants were not instructed about this contingency. Data were reduced using Gaussian (generalization) and Difference-of-Gaussian (sharpening) models. Ratings of expectancy, valence, and arousal fit a Gaussian model. ssVEPs likewise showed initial generalization during acquisition, characterized by heightened ssVEP amplitude to the CS+ and gradually diminishing responses to the GSs. As learning progressed, and specifically during extinction, a sharpening pattern emerged, defined by relatively suppressed ssVEPs to GS1 and GS2. Ongoing analyses examine the internal consistency of models that fit individual participant data.

POSTER SESSION I-065 | HEMISPHERIC ASSYMETRY IN THE PROCESSING OF AN EMOTIONAL WORKING MEMORY TASK

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Descriptors: Working Memory, Emotion, EEG

Emotion and working memory are key components in daily life experiences. Previous research has already established a connection between these processes but the neural substrates of this relationship remain an open discussion. The present study aimed to investigate the effects of the use of pictures with emotional valence on the performance of a working memory task as well as the neuronal response during the task. For this purpose, 32 participants performed a 2-back task with negative, positive, and neutral images selected from the International Affective Pictures System (IAPS). No significant difference was found in the performance or in the response time related to the valence of the images. Repeated-measures ANOVA with hemisphere and valence as factors revealed an increase of the activity in the right hemisphere for the amplitude of the ERP P3 component and for the time-locked theta power for all the images. The P3 component in the right hemisphere additionally showed greater mean amplitude for the negative images as compared to the neutral and positive ones. Together, these results suggest a predominant role of the right hemisphere for the processing of both working memory and emotional information, as well as a higher neuronal resource allocation to the processing of negative valence images which enabled a proper performance of the working memory task for the negative images.

FUNDING: This research was financed by a grant from the División de Investigaciones de la Sede Bogotá Universidad Nacional de Colombia. Project 48292.

POSTER SESSION I-066 | TRACKING ENCODING DYNAMICS VIA MULTI-STATE MODELING OF EYE MOVEMENTS

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Descriptors: Eye Movements, Memory

Visuospatial memories can include information about items details, inter-item relations, and relations that involve the bounds of the display space. Item and relational encoding rely on distinct neurocognitive processes and information-gathering behaviors (e.g., eye movements), but little is known about how learners balance these encoding goals in the moment. We used hidden Markov models to examine whether eye movements made during intentional study can be parsed into discrete "encoding states" that emphasize different types of information. Participants ($n=60$) studied 40 six-item visual displays for 16 seconds each in preparation for either a spatial reconstruction task or an item recognition task. Each gaze transition ("visit") made to one of the display items

during study was an observation in the model, and three variables—number of fixations made during the visit, mean fixation duration, and recency of prior visit to the same item—served as emissions. Based on measures of model fit, we identified four states, two of which were consistent with item-level and two with relational encoding. Task type (spatial versus item) interacted with state transition probabilities, with the item task favoring the item relative to the relational states. Across-trial variability in state transition probabilities predicted memory accuracy on both tasks. Multistate modeling of eye movements is promising avenue for memory research that can be easily extended in to map gaze-defined encoding states onto concurrently obtained neural data.

FUNDING: The Louisiana Board of Regents.

POSTER SESSION I-067 | FOOD CUE REWARD SALIENCE DOES NOT EXPLAIN HYPERPHAGIA IN ADOLESCENTS WITH PRADER-WILLI SYNDROME

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Descriptors: Prader-willli Syndrome, Late positive potential, food

A characteristic feature of Prader-Willi Syndrome (PWS) is hyperphagia, an extreme hunger that emerges in early childhood and remains a lifelong concern. Hyperphagia is difficult to evaluate objectively. This study used event-related potentials (ERPs) to investigate the extent of food and non-food image processing in satiated adolescents with PWS ($n=20$). The Late Positive Potential (LPP), a replicable and reliable index of motivational salience, was recorded during passive viewing of low- and high-calorie foods, animals, and household objects. The LPP responses to food images did not differ from non-food images in an *a priori* selected 400-700 ms interval or in the 484-900 ms window identified using data-driven analysis methods. Instead, significantly larger (more positive) ERP amplitudes were observed in response to high-calorie foods relative to animal images ($p=.001$) during an earlier time window (188-508 ms). Furthermore, those responses were associated with greater severity of hyperphagia measured by caregiver reports (Hyperphagia Questionnaire-Clinical Trials; $p=.01$). In conclusion, food stimuli may not be an atypically salient stimulus for adolescents with PWS, at least as measured by the LPP. Hyperphagia associated with PWS is likely due to altered satiety regulation rather than increased motivational salience of food and food-related cues.

FUNDING: This work was supported in part by funding from Eunice Kennedy Shriver NICHD P50HD103537 (Vanderbilt Kennedy Center). This work was also supported by Levo Therapeutics; the funder had no part in study design or data interpretation. The authors have no conflict of interest to declare.

POSTER SESSION I-069 | THE FORCE OF CRAVING: APPROACH MOVEMENTS RELATE TO LATERALIZED P3 AMPLITUDES AND SENSATION SEEKING

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Descriptors: approach-avoidance task, event-related potential, frontal asymmetry

Human behavior is shaped by motivational tendencies to approach and avoid. A substantial body of research has linked approach motivation and impulsive traits with greater relative left frontal asymmetry. The current study investigated sensation seeking and lateralized P3 amplitudes over left and right frontal sites during a novel tablet-based approach-avoidance task. Participants pulled pictures of desserts on a tablet towards them and pushed neutral objects away from them in one block. In another block, they made the opposite movements. Measures of reaction time and force were recorded. Participants were faster to pull dessert pictures towards them. P3 amplitudes to pulling dessert pictures were larger over left frontal sites than pulling object pictures or pushing dessert or object pictures. Greater relative left frontal P3 amplitudes related to faster reaction times to pull dessert pictures. Higher trait sensation seeking related to greater relative left frontal P3 amplitudes and faster reaction times to pull dessert pictures. These findings are the first to link neural correlates with a tablet-based approach-avoidance task, suggesting that neural correlates and personality traits are associated with behavioral measures of approach motivation in the task.

POSTER SESSION I-070 | ROBUSTNESS OF BALANCE-RELATED DIGITAL BIOMARKERS IN DIFFERENTIATING PEOPLE WITH MULTIPLE SCLEROSIS (MS) FROM PEOPLE WITHOUT MS

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Descriptors: Multiple Sclerosis, Digital Biomarkers, Balance

We investigated the potential of digital biomarkers during postural sway in differentiating groups of people presenting with MS, and young and older adults without MS. Our aim was to test the robustness of these digital biomarkers and their potential to be used as a diagnostic tool. Participants performed a balance test alternating between segments of eyes open and closed. Analyses were performed on physiological acceleration vibration (phybrata) power during postural sway. We also investigated the relationship between phybrata data and metrics of white matter microstructure, as measured by diffusion tensor imaging (DTI) in MS people. Participants included 50 individuals without MS and 22 participants with MS. Results revealed a main effect of Population ($F(1,552)=30.31$, $p < 0.001$), a main effect of Condition ($F(1,552)=12.11$, $p < 0.001$) and a significant interaction between Population and Condition ($F(1,552)=9.84$, $p=0.001$). Findings also revealed a significant negative relationship between FA and phybrata signal frequency in the fornix (MNI coordinates: 45, 60, 44) and right optic radiation (MNI coordinates: 38, 29, 42). Phybrata power was also higher for the older MS adults compared to the younger adults, but not for the non-MS population. Non-MS group did not have underlying balance issues, so it was expected not to see any difference in the non-MS phybrata power between young and old groups. These preliminary results suggest that the digital biomarkers can differentiate clusters of pwMS, people without MS, and accelerated aging (older pwMS).

FUNDING: Mitacs Postdoctoral Fellowship.

POSTER SESSION I-071 | NEUROPHYSIOLOGICAL UNDERPINNINGS OF INFORMATION PROCESSING SPEED DEFICITS IN PEOPLE WITH MULTIPLE SCLEROSIS

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University at Buffalo

Descriptors: Information Processing Speed, Multiple Sclerosis, Neural Dysfunction

Multiple sclerosis (MS) is a neurodegenerative disorder that negatively impacts cognitive functioning. The Symbol Digit Modalities Test (SDMT) is a gold-standard, clinically relevant, and widely used measure of information processing speed and broader cognition in MS. However, despite the importance of the SDMT in clinical evaluation, the neural underpinnings of performance on the SDMT are not well understood. In the present study we developed a novel computerized SDMT-event-related potential (ERP) paradigm in order to identify neural processes that underlie SDMT deficits in people with MS.



In the standard clinical administration of the SDMT, individuals refer to a symbol-digit key to verbally report a digit that corresponds with unique symbols that are displayed on a piece of paper. We translated these test items to a trial-by-trial design to implement the task as an SDMT-ERP paradigm. People with MS had significantly poorer response speed in comparison to controls on the SDMT-ERP task, and task performance exhibited good test validity in relation to the standard SDMT. Compared to control participants, people with MS had significant amplitude attenuation for the P1 (approx. 100 msec post-stimulus) and P3 (approx. 300-500 msec post-stimulus) ERP components, and delayed P3 latency. These findings suggest that SDMT performance deficits in MS reflect disturbances in early selective attention (P1 effects) and stimulus categorization (P3 effects). This approach provides relevant clinical insight that is not currently appreciated by conventional administration of the SDMT. FUNDING: This research was funded by a pilot grant from the National Multiple Sclerosis Society.

POSTER SESSION I-073 | IMPLICIT MONITORING OF MULTIPLE-OTHERS' FACIAL EXPRESSIONS AND ITS RELATION WITH TRAIT EMPATHY

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Descriptors: Empathy, N170, empathic concern

Empathy may entail costs when people interact with multiple others, since it requires more processing resources to infer other's emotional states. However, it is unclear how the emotional states of multiple others are perceived. The current study aimed to identify neural correlates of the implicit processing of multiple-others' facial expressions by examining event-related potentials (ERPs), which should increase with the number of task-irrelevant emotional faces. The effects of ERPs may vary with trait empathy. Participants ($N=28$) were required to respond to infrequent targets (photos of chairs) while three faces were shown as standards (0 ~ 3 out of which were smiles). They also answered the Interpersonal Reactivity Index questionnaire after the task. In results, the N170 amplitude was larger in the right hemisphere relative to the left as more smiles were included. In contrast, interestingly, the N170 for more smiles was smaller in participants with higher empathic concern. This result shows that the face-specific early neural responses involve the implicit processing of multiple-others' facial expressions. Furthermore, it is indicated that individuals with higher concern for others paid attention to facial expressions with

relatively negative valence (i.e., neutral faces). Motivation to help others may modulate the early neural processing for multiple others with potential needs.

POSTER SESSION I-074 | GARBAGE IN GARBAGE OUT: TEST-RETEST RELIABILITY OF SPECTRAL PARAMETERIZATION BY FOOOF

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Descriptors: Aperiodic, EEG, Oscillations

Spectral parameterisation techniques (i.e., FOOOF) allow for the separation of aperiodic and periodic activity in the electro- and magnetoencephalogram. Such techniques allow the non-invasive measurement of excitatory:inhibitory activity, and "pure" measurements of periodic activity. While relevant to individual differences in cognitive functions, little is known about the psychometric properties of these techniques. We used intraclass correlation coefficients (ICCs) to examine the test-retest reliability of parameterised activity at rest (eyes-open, eyes-closed) and during three eyes-closed tasks (arithmetic, music recall, and episodic memory recall; $n=49$) across three sessions (Session 1 and 2 90 minutes apart, Session 3 30 days later). ICCs were good for the aperiodic exponent and offset (ICCs $> .70$) and periodic activity (ICCs $> .66$ for alpha and beta [power, central frequency, and bandwidth]) in participants with clear oscillations across conditions. Across all three sessions, FOOOF performed poorly in resting eyes-open recordings (40% of participants had poor fits and minimal oscillations over noncentral sites) and test-retest reliability was poorer for parameterised periodic activity. Thus, under the right circumstances FOOOF provides reliable metrics of individual differences in resting-state and task-based parameterised neural activity. However, more work is needed to expand the circumstances under which FOOOF produces reliable results.

POSTER SESSION I-075 | ANTI-BLACK RACISM IN EEG, AND HOW WE CAN ADDRESS IT

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Descriptors: EEG, Diversity, Neurophysiology

Anti-black racism is prevalent within EEG research. The process of recording EEG can be challenging with Black participants because of differences in hair texture, density, and follicle shape, as well as the cultural and historical significance of Black hair. The potential impact of these barriers is profound: lack of representation of Black people within neurophysiological research, and findings in clinical neuroscience that may not generalize to Black individuals. In the current study, we aimed to begin to move the field forward by assessing common practices in EEG laboratories, with a focus on recruitment and data collection procedures for Black participants. Using a case study approach, we surveyed 9 principal investigators who use EEG as the primary research method. They spanned the country geographically representing each region, R1, and R2 universities with a range of 8 to 38 years of experience. Three laboratories reported Black participants were under-represented in comparison to the local population. Four laboratories did not have tailored outreach or recruitment for Black participants. Six laboratories reported modified EEG acquisition protocols for Black hair. They all reported more frequent challenges with data collection with Black compared to non-Black participants. A common procedure was to exclude Black participant EEG data. This highlights a need for targeted recruitment procedures as well as optimized laboratory protocols to improve data quality. Representation of Black participants in EEG research will improve the generalizability of scientific findings.

POSTER SESSION I-076 | CHILDHOOD FAMILY SOCIOECONOMIC STATUS AND PSYCHOACOUSTICS IN ADULTS: AN ERP STUDY

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University of California, Merced

Descriptors: Childhood Family Socioeconomic Status, Mismatch Negativity, Psychoacoustics

Although previous research demonstrated socioeconomic status (SES) disparities in neurodevelopment of auditory attention in early childhood, it remains unclear whether such differences persist into adulthood, especially in the absence of attentional demands. To address this question, we administered a passive auditory oddball paradigm with tones to examine the mismatch negativity (MMN) ERP component as a neural index of psychoacoustics in 45 adults from diverse childhood family SES backgrounds (Mean age = 21.42, SD = 2.47). As subjective ratings of childhood social status may reflect experiences not fully captured by parent education, we asked participants about both their subjective family social status and highest level of parent education when they were

10 years old. Hierarchical regression analyses revealed that objective childhood SES did not relate to MMN amplitude (Beta = -.061, $p = .191$) or latency (Beta = -.337, $p = .593$). Controlling for parent education, subjective childhood social status did not relate to MMN amplitude (R-square change = .001, Beta = -.017, $p = .863$) but related to MMN latency (R-square change = .114, Beta = -2.882, $p = .027$). Specifically, we found prolonged automatic processing of tone differences in those who perceive their childhood social status as lower. Our results suggest that the links between childhood family SES and auditory functions may persist into early adulthood, even in the absence of attentional demands, and highlights the importance of studying the contributions of contextual factors in neurodevelopment.

FUNDING: This work was supported by the National Science Foundation Graduate Research Fellowship.

POSTER SESSION I-077 | PHYSIOLOGICAL REACTIVITY AND HABITUATION TO ACUTE PSYCHOLOGICAL STRESS: THE INFLUENCE OF TRAIT EXTRAVERSION

Adam O'Riordan, Annie Ginty, Danielle Young
Baylor University

Descriptors: Personality, Cardiovascular reactivity, Stress
Background: Adaptive physiological responses to stress have been suggested as one potential mechanism facilitating the association between extraversion and positive health outcomes. The present study examined the influence of extraversion on physiological reactivity and habituation to acute stress. **Methods:** The present study utilized data from the Pittsburgh Cold Study 3. Participants in the study ($N = 213$) completed a standardized stress testing protocol twice, at two separate laboratory visits. The stress protocol consisted of a speech preparation period, a public speaking task, and a mental arithmetic task with observation. Extraversion was assessed using 10-items from the international personality item pool (IPIP). Systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), heart rate (HR) and salivary cortisol (SC) were assessed throughout a baseline phase and the stress task phase. **Results:** Extraversion was statistically significantly associated with larger DBP and HR reactivity in response to the initial stress exposure, as well as greater habituation of DBP, MAP and HR on repeated stress exposure. No significant associations emerged between extraversion and SBP responses, SC responses or self-reported state affective responses. **Conclusion:** Extraversion is associated with greater cardiovascular reactivity, as well as

pronounced cardiovascular habituation to acute social stress. These findings may indicate an adaptive response pattern amongst highly extraverted individuals and a potential mechanism leading to positive health outcomes. FUNDING: This work was supported by the Baylor University Postdoctoral Fellowship Program.

POSTER SESSION I-078 | RELATIONSHIP BETWEEN ANXIOUS APPREHENSION, ANHEDONIA, AND ERROR POSITIVITY ACROSS FLANKER, STROOP, AND GO/NO-GO TASKS

Amanda Holbrook¹, Zoey Halperin¹, Bethany Hartwell², Rylee Hopkins², Emily Laliberte¹, Berkeley Runia², Scott Baldwin², Michael Larson², Peter Clayson¹

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Descriptors: Error Positivity, Anxiety, Anhedonia

The ability to detect and adapt to errors is essential for goal-directed behavior. The error positivity (Pe) component of the event-related brain potential (ERP) seems to reflect the awareness and emotional appraisal of an error. A smaller Pe has been observed among individuals with depression than healthy controls; however, findings are inconsistent. Study-specific factors (e.g., task) or participant-related factors (e.g., co-occurring anxiety symptoms) might explain discrepant findings across studies. Therefore, we measured the Pe during three widely used tasks (flanker, Stroop, go/no-go) in a sample of 128 undergraduates and collected self-reported measures of anxious apprehension and anhedonia. When anxious apprehension was low, a larger Pe in the flanker task was associated with greater anhedonia symptoms. Conversely, when anxious apprehension was high, a smaller Pe in the flanker task was associated with greater anhedonia symptoms. Additionally, a larger Pe in the go/no-go task was associated with greater anhedonia symptoms, but only when anxious apprehension was low. Pe in the go/no-go task did not relate to anhedonia symptoms at high levels of anxious apprehension. Our findings suggest that both task and anxiety symptoms may account for the heterogeneity found in depression and error-monitoring literature. It appears the relationship between reduced awareness of errors and depression may only exist in the presence of co-occurring anxiety symptoms, whereas depression symptoms alone may be associated with increased awareness of errors.

POSTER SESSION I-079 | PATHOLOGICAL PERSONALITY DIMENSIONS AND PUNISHMENT-ENHANCED ERROR RELATED NEGATIVITY

Clare Beatty, Marcela Gallardo, Jacob Feldman, Adina Levy, Alex Grieshaber, Sarah Barkley, Brady Nelson
Stony Brook University

Descriptors: event-related potential, individual differences, psychopathology

Errors are a type of endogenous threat that elicit defensive motivation. The error-related negativity (ERN) is an event-related potential that is observed after the commission of an error and is enhanced when the error is punished. The predictability of threat is an important characteristic that has been shown to increase defensive motivation; however, it is unclear whether the predictability of punishment further enhances the ERN. In addition, it is unclear whether punishment enhancement of the ERN is associated with individual differences in psychopathology. In a sample of 170 18 to 35-year-old adults, the present study examined predictable and unpredictable punishment enhanced ERN and pathological personality dimensions. Results indicated that the ERN was enhanced when errors were punished compared to not punished, but there were no differences between predictable and unpredictable punishment. Greater negative emotionality was associated with a greater predictable punishment enhanced ERN and while greater disinhibition was associated with smaller predictable punishment enhanced ERN. These findings suggest that errors elicit defensive motivation through the enhancement of the ERN when punished, regardless of the predictability of the punishment. Additionally, individual differences in trait-like negative emotionality and disinhibition may influence predictable punishment-enhanced ERN.

FUNDING: Stony Brook University College of Arts and Sciences.

POSTER SESSION I-080 | MATERNAL DEPRESSION HISTORY MODERATES THE ASSOCIATION BETWEEN NEURAL REACTIVITY TO REWARD OUTCOME FEEDBACK AND DEPRESSIVE SYMPTOMS IN YOUTH

Elana Israel, Brandon Gibb
Binghamton University

Descriptors: Depression, Reward Processing, Event-Related Potentials

Offspring of mothers with a history of major depressive disorder (MDD) are at significantly heightened risk of developing the disorder themselves. However, not all offspring will go on to develop MDD, highlighting the need to identify moderators of this risk so that interventions can be developed for those at highest risk. The current study focused on the role of neural response to reward outcome feedback (monetary gains versus losses). Participants were 117 offspring (Mage: 13.04 years; 50.4% girls; 84.3% non-Hispanic White) of mothers with (n=62) or without (n=59) a history of MDD during the child's lifetime. Participants completed a monetary reward task, during which EEG was recorded, and the Children's Depression Inventory. To assess initial responsiveness to reward feedback, we examined the reward positivity (RewP). We found that RewP for monetary losses, $F(1, 115) = 7.83$, $p = .006$, $\eta^2 = .07$, but not gains, $F(1, 115) = 2.31$, $p = .13$, $\eta^2 = .02$, moderated the link between maternal MDD history and offspring depressive symptoms. Specifically, greater neural reactivity to losses was associated with higher depressive symptom levels among offspring of mothers with MDD, $r = .41$, $p = .001$, but not among offspring of never depressed mothers, $r = -.03$, $p = .81$. These results indicate that neural reactivity to negative outcome feedback may be a useful biomarker for identifying which offspring with a family history of MDD are at highest risk of developing depression themselves.

FUNDING: This project was supported by the National Institute of Child Health and Human Development grant HD057066 awarded to Brandon Gibb.

POSTER SESSION I-081 | FUNCTIONAL DISSOCIATION BETWEEN ERPS ELICITED BY PERFORMANCE VERSUS REWARD FEEDBACK IN MAJOR DEPRESSIVE DISORDER

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Descriptors: Depression, Electroencephalography, Feedback Type

Morphologically similar feedback-related event-related potentials (FR-ERPs) are elicited by performance-based (correct vs. incorrect) and reward-based (gain vs. loss) feedback. However, feedback type is seldom modeled, leaving it unclear how this drives individual differences in FR-ERPs. This is particularly relevant to depression,

given evidence of reduced reward sensitivity and heterogeneity across studies. To begin to address this gap, we examined FR-ERPs in women with depression (DEP) and healthy controls (HC) across two commonly used tasks: reward feedback was delivered using a simple guessing task, and performance feedback using a time estimation task. Participants (HC=44, Mage=23.59, DEP=36, Mage=25.64) completed both tasks while the EEG was recorded. Analyses focused on frontocentral ERPs occurring 250-350ms following feedback delivery (i.e., Reward Positivity, Feedback Negativity). On both tasks and in both groups, FR-ERPs were modulated by feedback valence. However, the correlation between FR-ERPs across tasks was non-significant ($r = .14$, $p = .229$). ANOVAs testing group differences in FR-ERP amplitudes revealed that the depressed group exhibited blunted reward sensitivity to guessing task ($F(1,76) = 5.45$, $p = .022$), but not to performance feedback ($F(1,74) = .004$, $p = .951$). Results suggest that FR-ERPs on these tasks were driven by task-specific variance, despite similar FR-ERP morphology. Future research should consider a broader range of feedback types to clarify relevant clinical phenotypes that dictate abnormal processing of feedback within and across tasks.

FUNDING: This research was funded in part by Dr. Foti's grant (NIMH, F31-MH090658).

POSTER SESSION I-082 | MONITORING OF SELF-COMMITTED VERSUS OBSERVED ERRORS IN OBSESSIVE-COMPULSIVE DISORDER AND SOCIAL ANXIETY DISORDER: AN ERP STUDY

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Descriptors: error monitoring, action observation, error-related negativity

Obsessive-compulsive disorder (OCD) has frequently been associated with hyperactive error-related brain activity. However, this does not seem to be specific for OCD, as hyperactive error processing has also been found in depression and anxiety. Previous clinical studies on error monitoring focused on brain responses to self-committed but not to observed errors. The present study investigated whether error monitoring is generally enhanced in OCD, affecting both self-committed and observed errors, or whether hyperactive error monitoring in OCD is



restricted to the processing of own actions. Event-related potentials were used to assess brain activity while participants actively performed a flanker task and observed the task performance of a previous participant. Patients with OCD were compared with healthy controls (HCs) and patients with social anxiety disorder (SAD). Amplitudes of the error-related negativity (ERN) were enhanced in OCD but not SAD compared to HCs for both own and observed errors. Patients with SAD showed an increased correct-related negativity (CRN) relative to HCs. The error positivity (Pe) reflecting error awareness was reduced in SAD compared to OCD for active task performance. Overall, these findings suggest a general hyperactivity in the error monitoring system in OCD. In contrast, SAD appears to be associated with reduced error-correct differentiation during active task performance. These results provide new insights into the neural processes that help to differentiate OCD from other disorders associated with enhanced processing of own errors.

FUNDING: German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) - Project number 438203225.

POSTER SESSION I-083 | BLUNTED REWARD POSITIVITY PROSPECTIVELY PREDICTS RELAPSE IN WOMEN WITH CANNABIS USE DISORDER

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Descriptors: Cannabis, Abstinence, Reward Sensitivity

People with Cannabis Use Disorder (CUD) exhibit differential reward sensitivity that ultimately maintains distressing and harmful cannabis use. Models of addiction suggest that greater CUD severity is related to decreased sensitivity to natural rewards, such as social or financial opportunities, which are often avoided in favor of drug use. Thus, markers of natural reward sensitivity may be helpful for risk identification and as treatment targets. One such marker is the Reward Positivity (RewP), an event-related potential (ERP) that occurs ~250ms after reward presentation. Previous studies have [RM1] found a blunted RewP to money in substance using individuals, however no study to date has examined the RewP's utility in predicting relapse. [RM2] The current preliminary study examined whether RewP amplitude to monetary reward (measured at baseline, day 7, day 14, and day 21) predicted relapse during a 21-day abstinence period

(maintained via contingency management) in a sample of women with severe CUD ($n=9$ successfully abstained, $n=6$ relapsed). Results revealed a significant Group (abstain vs. relapse)*FeedbackType (gain vs. loss) interaction ($F[1,78]=7.31$, $p=.008$). Follow-up analysis showed that those who successfully abstained had significantly greater RewP amplitude to monetary gains relative to losses ($t=4.64$, $df=78$, $p<.001$), whereas those who relapsed did not ($t=-1.04$, $df=78$, $p=.30$ [RM3]). Current results suggest the RewP to monetary rewards may have utility as a predictor of contingency management treatment response and as a possible treatment target in CUD populations.

POSTER SESSION I-084 | INFLUENCE OF BRIEF MINDFULNESS EXERCISE ON REGULATING EMOTION/MOTIVATIONAL PROCESSING IN AUTISTIC YOUTH

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Descriptors: Autism, Mindfulness, Emotional/Motivational Processing

Aims: The aim of this work is to see how a brief mindfulness (MF) exercise influences LPP amplitude and motor beta suppression in autistic youth. **Methods:** 21 autistic youth ages 12 to 21 participated in the study. First, participants viewed neutral or high interest pictures followed by a Navon letters task assessing global or local attentional scope while measuring EEG. Then, participants listened to a 2-minute MF audio clip before completing the same picture viewing and Navon letter task again. Faster button presses to Navon letters indicated a global (broadened) or local (narrow) attentional scope. Beta activity across central sites before button presses assessed motivated motor preparation. LPP amplitudes at site Oz to picture onset assessed motivated attentional capture. **Results:** Motor preparatory Beta activity decreased from pre to post MF, suggesting MF training enhanced motor preparation. LPP amplitudes increased from pre to post MF for interest and neutral pictures, indicating greater motivated attentional processing to pictures after MF. RTs to global targets following neutral pictures were faster post MF than pre MF, revealing MF training enhanced global processing. **Conclusion:** Following the MF exercise, RTs, LPP

amplitudes, and beta activity shifted from atypical patterns towards what is observed in a typically developing population. The effects of a brief MF training on autistic youth appeared to regulate emotional and motivational processing.

FUNDING: W81XWH-18-1-0284, U.S. Department of the Army, Mazefsky, PI, A Randomized Controlled Trial of the Emotion Awareness and Skills Enhancement (EASE) Program for ASD.

POSTER SESSION I-085 | DELTA BETA COUPLING AND ERP MEASURES OF ATTENTION BIAS AS PREDICTORS OF ADOLESCENT BEHAVIORAL INHIBITIONS AND SOCIAL ANXIETY SYMPTOMS

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The Pennsylvania State University

Descriptors: Social Anxiety, Behavioral Inhibition, Delta Beta Coupling

Behavioral inhibition (BI) is a robust predictor of social anxiety, and both are characterized by neurophysiological dysregulation. Yet, less than half of BI youth develop social anxiety disorder, suggesting that these constructs may have different neurophysiological correlates. We examined whether neural markers of implicit and explicit emotion regulation, indexed by event-related potential (ERP) measures of attention bias and delta beta coupling, differentially predict BI and social anxiety. Participants were 78 youth aged 12-14 (52.6% female). Delta beta coupling was quantified as the absolute value of the residual score of resting state delta (1-4Hz) and beta (13-25Hz) band power, averaged across frontal, central, and parietal sites. This score was reversed such that greater values indicated greater DBC. ERP-based attention bias was calculated as differences in P1 (100-130ms at occipital sites), N170 (140-180 at occipital-parietal sites), and N2 (320-420ms at frontal-central sites) amplitudes between angry and neutral faces during the dot probe task. BI was assessed via parent report, and adolescents self-reported social anxiety symptoms. Delta beta coupling and N170 amplitudes to threatening faces positively predicted adolescent social anxiety, but not BI. This effect was specific to the social avoidance and distress to novelty scales. Results suggest that delta beta coupling and N170 amplitudes, reflecting exaggerated top-down control of emotional systems and heightened attention selection and discrimination of threat, differentiate BI and social anxiety.

FUNDING: This study was funded by a grant from the NIH (RO1MH075750) to Dr. Kristin A. Buss.

POSTER SESSION I-087 | USE OF THE BETHESDA EYE & ATTENTION MEASURE AS A NEUROPSYCHOLOGICAL SCREENER FOR VETERANS WITH MENTAL HEALTH CONDITIONS AT RISK FOR HOMELESSNESS

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Descriptors: Veterans, Eye-movements, Cognition

Psychopathology can often obscure interpretation of neuropsychological test performance, especially in the context of subtle deficits. The Bethesda Eye & Attention Measure (BEAM) uses saccadic and manual responses to visual attention stimuli to identify subtle cognitive impairments from injuries such as mild traumatic brain injury (mTBI). To examine potential deficits we administered the BEAM to a transdiagnostic sample of Veterans who were at-risk for homelessness and receiving residential psychiatric treatment. Veteran participants (n=21) completed the BEAM, additional neuropsychological assessments, symptom measures, and a measure of autonomic nervous system function (heart rate variability [HRV]). Correlations were computed to identify associations. Participants were all male, 76% white, had a mean age of 35, mean education of 13 years, and 86% had experienced mTBI. Demographic and symptom measures, including pain, depression, and anxiety did not correlate with BEAM scores. Higher variability of BEAM saccadic reaction time correlated with worse neuropsychological performance on visual & verbal learning and delayed memory, inhibition, and set shifting (all $r \geq 0.43$, all $p < 0.05$). More BEAM no-go errors were also associated with worse processing speed and working memory ($r = 0.46$, $p < 0.04$) and lower/worse HRV ($r = -0.56$, $p = 0.03$). The BEAM may be effective in identifying subtle neuropsychological and perhaps physiological impairment while reducing the influence of psychiatric or demographic factors. The BEAM may be an especially useful tool in complex psychiatric populations.

FUNDING: NIH T32 in Geriatric Mental Health T32MH019934 Cognitive Rehabilitation for Homeless OEF/OIF/OND Veterans RX001972.

POSTER SESSION I-088 | BEYOND THE DIFFERENCE WAVE: LEVERAGING COMPUTATIONAL MODELING TO PREDICT DEPRESSION-RELATED REDUCTIONS IN THE REWARD POSITIVITY

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Descriptors: Reward Positivity, Computational Modeling, Sub-clinical depressive symptoms

The reward positivity (RewP) is a feedback-related ERP component that has been suggested as a potential biomarker for Major Depressive Disorder and is commonly computed by contrasting reward and punishment signals. However, this quantification may be problematic as each contributing signal may be separately affected by depression and anxiety symptoms. Here, we created a novel computational model that leveraged algorithmic fits of discrete basis functions to create artificial delta bursts. We then tested whether model parameters could be leveraged to describe more unique variance associated with depression-related blunting of the RewP. Participants were assigned to a healthy control group (N=68) or a sub-clinically depressed group (N=38) based on sub-clinical depressive symptomology measured via Beck's Depression Inventory BDI and completed a standard doors task with visual wins and losses. Sub-clinical depressive symptoms were significantly related to both the empirical RewP difference wave and our model parameters, which likely described similar variance in BDI scores. Although the model parameters described more unique variance, this difference was not significant. These findings support the efficacy of using our computational modeling technique to evolve beyond the use of a difference wave in quantifying the RewP.

FUNDING: Funding received from National Institute of Mental Health, grant number: 1R01MH119382-01.

POSTER SESSION I-090 | TESTING EFFECTS OF SENSORIMOTOR LEARNING AND ITS VIEWPOINT-DEPENDENCY ON AUDITORY ERP ATTENUATION DURING ACTION OBSERVATION

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Heinrich Heine University, Düsseldorf

Descriptors: Auditory ERP attenuation, Action observation, Sensorimotor learning

Previously, we found viewpoint-dependent ERP attenuation for sounds caused by observed actions compared to un-cued external sounds, which could reflect a differential ease of learning to predict sensory effects of observed actions from a first-person compared to a third-person perspective. Here we directly tested such learning-related changes in auditory ERP attenuation during action observation and their viewpoint-dependency, while controlling for differences in temporal predictability between the two types of sounds. 86 participants underwent the action observation contingent paradigm (once with a first-person and once with a third-person perspective) after completing a training with one of four tasks related to the observed motor action (a button press): (a) execution-only, (b) observation-execution, (c) observation-imagery, or (d) observation-only. Since the N1 component is discussed to reflect motor-related predictions, we expected training and viewpoint effects primarily for the N1, but examined also the P2 component. For both components, we found a significant interaction between the type of sound and the viewpoint for the observation-imagery training group. However, subsequent simple slope tests did not show significant ERP differences between the two equally predictable sounds, independent of the training type or viewpoint. Thus, our results do not support the hypothesis that motor-related predictions, susceptible to sensorimotor learning, underlie auditory ERP attenuation during action observation, but rather suggest general predictive processes at work.

POSTER SESSION I-091 | FACE-SENSITIVE ERPS: THE INFLUENCE OF RACE, TASK DEMANDS, AND IMPLICIT RACIAL BIAS

Gizelle Anzures, Melissa Mildort
Florida Atlantic University

Descriptors: face perception, other-race effect, implicit racial bias

Visual perception and event-related brain potential (ERP) responses tend to differ for faces belonging to familiar and unfamiliar racial groups (Tüttenberg & Wiese, 2022). However, previous studies offer mixed results regarding amplitude and latency differences in face-sensitive ERPs to own- and other-race faces (Anzures et al., 2021). Here, we examine the influence of face race, task demands, and implicit racial bias on the P100, N170, and P200. White adults completed identity and race categorization tasks with White and Asian faces while electroencephalographic responses were recorded. Participants also completed an

implicit association test examining potential racial preferences. Preliminary results suggest that the P100 to own- and other-race faces were influenced by task condition, as well as by individual differences in implicit racial bias, Wald $\chi^2(1)=5.81$, $p=.02$. The P200 to own- and other-race faces was also influenced by participants' implicit racial biases, Wald $\chi^2(1)=11.95$, $p<.001$. Participants showed different patterns of N170 responses to own- and other-race faces corresponding to their implicit racial biases, but these contrasts did not hold their significance, $ps>.07$. Thus, task demands and individual differences in implicit racial bias are important factors that influence ERPs to own- and other-race faces. Our results also suggest that salience of/attentional allocation towards faces might vary with race and implicit bias, and differences in featural/configural processing of own- and other-race faces may be related to differences in implicit bias.

FUNDING: NIH.

POSTER SESSION I-092 | CARDIAC INTEROCEPTIVE ACCURACY IS NOT ALTERED BY ACUTE STRESS

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Descriptors: cardiac interoception, acute stress

Interoception is the sense to process and perceive inner bodily processes (e.g., organ activity). Stress affects and possibly alters interoceptive signal processing. For example, acute stress stimulates the cardiovascular system, thereby increasing organ activity, which may ultimately feed into enhanced cardiac perception, indicated by the ability to count one's own heartbeats (i.e., interoceptive accuracy/IAcc). Furthermore, cortisol release may also affect the processing of cardiac signals at cortical level. Hence, we hypothesized that an acute stressor enhances cardiac IAcc, dependent on augmented sympathetic activation (i.e., heart rate), and cortisol release. We investigated cardiac IAcc in a heartbeat counting task (HCT) before and after (0, 20, 40 min.) a stress test (SECPT vs. control; $n=33$ each). IAcc and heart rate (HR) were neither effected by stress, nor changed over time. In addition, the number of counted heartbeats did not change, although participants were significantly stressed (self-report and salivary cortisol). We also found a tendency of underreporting heartbeats by 56% independent of group and time. Furthermore, the given constant heart rate ($M=81.5$ bpm)

was positively correlated with IAcc ($M=.43$) independent of all conditions ($r=.962$, $p<.001$). IAcc in the HCT is determined by changes in organ activity (i.e., HR), but not by cortisol. As the SECPT did not change HR, the SECPT and/or the HCT may have limited suitability for investigating acute stress effects on cardiac interoception.

POSTER SESSION I-093 | BYPASSING INPUT TO V1 IN VISUAL AWARENESS: A TMS-EROS INVESTIGATION

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Descriptors: visual awareness, event-related optical signal, phosphenes

Early visual cortex (V1-V3) is considered critical for visual awareness, serving as the primary input to subsequent visual regions. However, it remains unclear whether visual awareness can occur without further involvement of early visual cortex, such as re-entrant feedback. Identifying the importance of feedback activity has been difficult due to the challenge of distinguishing feedback activity from feedforward activity because they overlap spatially and are temporally difficult to disambiguate. To address this issue, we applied single-pulse transcranial magnetic stimulation (TMS) over the left posterior parietal cortex (PPC) to elicit phosphenes in the absence of direct visual input to early visual cortex. Post-TMS activity was assessed using the event-related optical signal (EROS), which can measure activity under the TMS coil without TMS-induced artifacts. Our results show that: 1) activity in PPC 50 ms after TMS was predictive of phosphene awareness, and 2) activity related to awareness was observed in a small portion of V1 140 ms after TMS, but (3) activity in V2 was a more robust correlate of awareness. These outcomes suggest that re-entrant feedback to the occipital cortex plays a critical role in awareness. Additionally, the study observed activations of the anteromedial cuneus and lateral occipital cortex related to phosphenes, indicating a connection between these regions and early visual cortex in the feedback pathway.

FUNDING: This work was supported in part by the National Eye Institute of the National Institutes of Health (Grant R01EY022605-01).

POSTER SESSION I-094 | THE INFLUENCE OF PRESTIMULUS 1/F-LIKE VS. ALPHA-BAND ACTIVITY ON SUBJECTIVE AWARENESS OF AUDITORY AND VISUAL STIMULI

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Descriptors: alpha, auditory, visual

Fluctuations in alpha-band (~8-12 Hz) activity systematically follow the allocation of attention across space and sensory modality. Increases in alpha amplitude, which often precede failures to report awareness of threshold visual stimuli, are often suggested to exert an inhibitory influence on information processing. However, relatively little is known about how reported alpha-related effects are influenced by a potential confounding element of the neural signal: power-law scaling. In the current study, we systematically examine the effect of accounting for 1/f activity on the relation between pre-stimulus alpha power and behavior during both auditory and visual detection ($N=27$). The results suggest that, at least in the scalp-recorded EEG signal, changes in broadband parameters (exponent and offset of 1/f-like activity) may serve as better predictors of reported awareness of visual stimuli than changes in narrowband alpha power. Neither changes in posterior alpha power nor changes in 1/f-like activity reliably predicted detection of auditory stimuli. These results are consistent with the emerging understanding of the potential functional importance of broadband changes in the neural signal, and suggest that some re-evaluation of existing data on alpha-behavior relations (with an eye toward dissociating narrowband and broadband contributions) may be warranted.

POSTER SESSION I-095 | REDUCED PHYSICAL ACTIVITY AND SLEEP EFFICIENCY AS VULNERABILITY FACTORS FOR DEPRESSION: EVIDENCE FROM WRIST-WORN ACTIGRAPHY

Carola Dell'Acqua, Daniela Palomba, Nicola Cellini,
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University of Padua

Descriptors: Depression risk, Sleep-wake disturbances, Actigraphy

Reduced physical activity (PA) and sleep disturbances are considered key features of depression. Wrist-worn actigraphy has been leveraged to show objective sleep-wake disturbances in clinical depression. While a few

studies have suggested that self-reported reduced PA and sleep disturbances might be linked also to vulnerability to depression, objective actigraphy-based measures in vulnerable samples remain largely unexplored. Seven-day actigraphy data were collected from 20 (14 F) university students with a higher vulnerability to depression due to a family history of the condition but no current symptoms and 30 (21 F) controls with neither a family history of depression nor current depressive symptoms. Actigraphy data were processed using open-source software (GGIR) to generate PA estimates, namely gross motor activity quantified as average daily acceleration and time spent on moderate-vigorous PA (MVPA). Sleep efficiency was estimated as the percentage of time from sleep onset to wake-up time that was spent asleep. Preliminary data indicate that individuals with a familial risk for depression showed reduced daily acceleration and time spent in MVPA compared to the control group, particularly on the weekend during their free time away from scheduled activities. Sleep efficiency, particularly during the weeknights, was reduced in the at-risk group relative to the control group. Taken together, reduced PA and sleep efficiency, as assessed by wrist-worn actigraphy, might be early indicators of depression risk and not just mere correlates of the disorder.

POSTER SESSION I-096 | ASSOCIATIONS BETWEEN LONELINESS, HEART RATE VARIABILITY, AND THE ACTIVITY OF THE SOCIAL BRAIN REGIONS

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Łukasz Okruszek
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Descriptors: loneliness, fMRI, heart rate variability

Loneliness has been linked to altered patterns of neural activity of the social brain network, as well as to reduced parasympathetic regulation. According to the neurovisceral integration model, cortical control of the medial prefrontal cortex over the amygdala's automatic responses to unknown stimuli could be indexed by heart rate variability (HRV). Two studies aimed to examine these associations in regard to transient (Study 1) and trait (Study 2) loneliness. In Study 1 ($N=58$, 28F; $24.19y \pm 4.05$), experimental manipulation was used to induce either loneliness (Future Alone, FA; $N=29$) or feelings of belonging (Future Belong, FB; $N=29$), while for Study 2 ($N=92$, 45F; $24.03y \pm 4.31$) participants with low (L; $N=48$) and high (H; $N=44$) loneliness levels were invited. In both

studies, participants underwent two functional magnetic resonance imaging sessions, in which they were presented with social and nonsocial pictures of positive, negative, or neutral valence, while their cardiac response was measured with photoplethysmography. In Study 1, but not in Study 2, positive associations between changes in HRV from rest to task demands and the activation of the bilateral amygdala, ventromedial prefrontal cortex, and the temporoparietal junction to negatively valenced social compared to nonsocial content were found for the FB group. These results indicate that transient loneliness impacts parasympathetic response and activity of brain regions involved in the processing and regulation of negative social content, which might result in disrupted responding to environmental challenges.

FUNDING: This work was supported by the National Science Centre, Poland (Grant No: 2018/31/B/HS6/02848).

POSTER SESSION I-097 | INTERPERSONAL VIOLENCE EXPOSURE AND RESTING PARASYMPATHETIC ACTIVITY PREDICT TRAUMA SYMPTOMS IN ADOLESCENT GIRLS

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Descriptors: Interpersonal Violence, Trauma Symptoms, Parasympathetic

Interpersonal violence exposure (IVE) in adolescence is associated with maladaptive adjustment for mental health (e.g., depression, anxiety, and post-traumatic stress disorder) and altered physiological stress responses. These consequences likely result from altered physiological activation to complex interactions between the social environment and perceptions of violence. In particular, under-activation of the parasympathetic nervous system (PNS) has been associated with increased vigilance to threat. This study used a prospective longitudinal framework to examine the relationship between IVE, PNS activity, and trauma symptoms in adolescent girls. We predicted a positive relationship between IVE and trauma symptoms, and a moderation by resting PNS activity. Results showed increased IVE was associated with more trauma symptoms of preoccupation, sexual concerns, and dissociation. Resting PNS activity moderated the relationship between IVE and dissociation, such that the relationship is strongest with higher IVE scores and higher resting HF-HRV. These findings suggest physiological functioning may be one of the factors influencing outcome trajectories

resulting from a history of interpersonal violence. The longitudinal and prospective design of this study allowed for the examination of not only baseline IVE exposure but also the relationship between increased exposure and changes in psychophysiology and trauma symptoms over time. These findings have important implications for the prevention and treatment of trauma symptoms in adolescents exposed to interpersonal violence.

POSTER SESSION I-098 | CUMULATIVE SOCIO-DEMOGRAPHIC RISK SCORE ALTERS P300 AMPLITUDE AND BEHAVIORAL MEASURES OF EXECUTIVE FUNCTION IN FEMALES

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Michigan State University

Descriptors: Sociodemographic Risk, P300, Working Memory

Trauma, race, and childhood socioeconomic status (CSES) are stressors known to affect executive function (EF). EF is needed to manage daily life and regulate behavior. Allostatic load—the physiologic cost of adaptation to cumulative stressors over time—has also been associated with EF change. Importantly, sex differences in stress susceptibility are documented, yet little research directly evaluates how stressor accumulation impacts EF, particularly in females. We investigate how cumulative sociodemographic risk (CSR) impacts measures of EF in females. A sample of 130 18-25 year old females completed demographic intakes, N-Back Working Memory (WM) Tasks with concurrent EEG across 4 lab visits over 35 days, and the Structural Clinical Interview for DSM-V Disorders (SCID). Measures included race and CSES; N-back reaction time (RT), accuracy, and P300 amplitude; and SCID trauma criteria. Race, CSES, and trauma measures were summed into a composite score to index cumulative risk. Multilevel modeling analyzed CSR's impact on EF. Higher CSR significantly predicted decreases in P300 amplitude across all WM loads; increased RT at low and medium WM loads; and decreased accuracy at medium and high loads. Results support understanding sociodemographic risk factors (SRF)'s effects on EF in females as cumulative and reveal differential impacts on EF dimensions across low compared to high WM load. Overall, this work elucidates how SRFs aggregate to impact EF, which may aid in predicting deficits in managing daily life and regulating behavior.

FUNDING: Data used in this study came from the Brain Cycle Study, funded by the National Institute of Mental Health (NIMH, United States; grant number: 1R01MH108511-01).



POSTER SESSION I-099 | LANGUAGE IMPAIRMENT IN CHILDREN WITH AUTISM SPECTRUM DISORDER AND THEIR FIRST- DEGREE RELATIVES RELATED TO GAMMA- BAND NEURAL ACTIVITY IN EEG

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Descriptors: Autism Spectrum Disorder, Gamma oscillations, Language

Previous studies have shown that children with Autism Spectrum Disorder (ASD) and their first-degree relatives may have co-occurring language impairment (Kjelgaard & Tager-Flusberg, 2001), but the neural mechanisms are not clearly understood. In this study, we utilize a large sample of age- and sex-matched participants who took part in an EEG auditory statistical learning experiment (see *Method* in Arnett et al., 2018) and whose language abilities were measured with a standardized language test. 125 youth with ASD, 39 unaffected siblings (US) of youth with ASD, and 121 typically developing (TD) youth were included in the study (total $N=286$). Language abilities were assessed with the Clinical Evaluation of the Language Fundamentals-4; the Core Language Standard Score was calculated for each child. High density EEG was recorded. PSD values were calculated for 9 ROIs over central, posterior, and frontal areas (including 44 electrodes) for delta (3–3.99Hz), theta (4–5.99Hz), alpha (6–12.99Hz), beta (13–29.99Hz), and gamma (30–54.99Hz) frequency bands. The results showed significantly elevated gamma activity over the central and posterior regions in ASD and US groups in comparison to the TD group. Increased gamma power in ASD and US populations has been reported previously and may index excitation / inhibition imbalance. Importantly, the results revealed a relationship between elevated gamma activity in these regions and language abilities as higher power was related to lower language scores.

FUNDING: This work was supported by the National Institutes of Health ACE Network (Pelphey, R01MH10028).

POSTER SESSION I-100 | REASSESSING THE N400 AS AN INDEX OF LINGUISTIC PREDICTION

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Descriptors: Prediction, N400, RSA

Research over several decades has shown a close relationship between the neural responses to words and their cloze probability. The N400 evoked potential is typically larger (more negative) to words with a low cloze probability, potentially suggesting that readers predict upcoming words and that N400s index prediction error. However, there has been little systematic investigation of cloze probability effects on the N400 across a sentence, and if word position effects on the N400 reflect decreasing prediction error. Here, we investigated this question, and also leveraged Representational Similarity Analysis (RSA) to explore the link between neural activity and predictability. We collected cloze responses in an online task ($N=158$) in which participants guessed the identity of each upcoming word over the course of a sentence, which varied in its final word predictability (i.e., constraint). We then conducted a reanalysis of 10 EEG experiments using these sentence stimuli ($N=278$) and extracted word-by-word N400 amplitudes, as well as RSA measurements, in which pre-word activity was related to post-word activity to identify signals of pre-activation. Using mixed effects models, we computed the relationships among the N400, neural similarity, and measures of predictability. We found that the relationship between N400s and cloze probability changed across a sentence, whereas neural similarity measures were closely tied to word predictability and better predicted cloze RTs. This work suggest N400s reflect semantic activation, whereas neural similarity indexes rapid selection.

FUNDING: This work was supported by an N.I.A. grant (R01AG026308) awarded to K.D.F. and a Beckman Institute Postdoctoral Fellowship to R.J.H.

POSTER SESSION I-101 | SHIFTING EXPECTATIONS IN TIME: EFFECTS OF KNOWLEDGE AND TIMING ON PREDICTIVE PROCESSING DURING WORD-BY-WORD READING USING SELF-PACED ERPS

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Descriptors: language comprehension, prediction, ERPs

To understand language, we quickly link perceptual information with stores of knowledge. One way we accomplish this may be to actively predict upcoming word form and meaning. How does existing knowledge impact prediction? Having relevant knowledge seems necessary for making accurate predictions. However, the availability of rich, interconnected knowledge structures might eliminate the need for prediction, allowing people to access

(predictable) information “for free.” Here, young adults with more vs. less knowledge about a constrained domain (the narrative world of Harry Potter; HP) read sentences about general topics (Block 1) and HP (Block 2) at their own pace while we recorded ERPs. As in previous work, this knowledge had a rapid effect on access to word meaning in HP sentences: those with high knowledge showed larger N400 effects of contextual support (best continuations vs. implausible words). Critically, high HP knowledge led to a late, frontal positivity for words which were plausible (but not predictable) continuations of sentences about HP, suggesting those with high HP knowledge revised their predictions in real time (and, therefore, that they had predicted something in the first place). Frontal positivities were restricted to trials with the quickest reading speeds, corroborating reports that prediction may be yoked to the speed of linguistic input. Our results support a view of language comprehension in which predictive processes may be differentially engaged as a function of individuals’ knowledge about sentence contents, among other factors.

FUNDING: NIH AG026308 to KDF.

POSTER SESSION I-102 | INTERACTION OF ANTICIPATORY AND CONSUMMATORY REWARD PROCESSING IN PREDICTING DEPRESSIVE SYMPTOMATOLOGY

Ty Lees, Lisa Gatzke-Kopp
The Pennsylvania State University

Depression is often conceptualized as a deficit in reward processing that manifests clinically as anhedonia. However, reward processing is multifaceted and consists of: an anticipatory stage that reflects motivational drive to reward; and, a consummatory or response phase, reflecting receipt of reward and reinforcement mechanisms. It is unclear whether depression is associated with deficits in both stages of reward processing, or if deficits in either stage are sufficient to induce depressive symptoms. In the current study, we use recently collected data from a cohort of 320 young adults (aged 18.48 ± 0.45 years; 50.63% female, 26.56% African American or Black and 8.13% Bi- or Multi-racial) who have been longitudinally followed since birth to examine how ERP indices of anticipatory (e.g., the Cue-P3 and CNV) and consummatory (e.g., the RewP and FRN) reward processing generated from a monetary incentive delay task independently and interactively predict depressive symptoms (self-reported using the PROMIS Depression Symptoms survey). Using

this already collected data, our analysis will use between-person mixed effects models to investigate the independent contribution of individual differences within each ERP index and their underlying processes to depressive symptomology. In addition, we will use also use person-centered analytical approaches to investigate how these processes interact to form different reward processing phenotypes, and how these phenotypes predict depressive symptoms and describe multi- or equifinal presentations of depression.

Funding for this project was provided by the National Institute of Health (UH3 OD023332).

POSTER SESSION I-103 | ATTENUATING CONDITIONED FEAR RESPONDING THROUGH DIRECTED FORGETTING

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Extensive empirical evidence suggests that declarative memory encoding is sensitive to disruption, as subjects can be cued to intentionally “forget” information before it is stored, using directed forgetting manipulations. Recently, original research from our lab has revealed that directed forgetting may also be successfully applied to interfere with the encoding of emotional associative memories acquired through fear conditioning. To that end, we developed a novel, trial-unique, fear conditioning procedure with multiple conditioned stimuli, half of which were paired with a mild electric shock (CS+), while the other half were not (CS-). An acoustic forget cue was presented after half of all the trials, indicating that those trials were to be forgotten. SCR was included as an index of conditioned fear responding and declarative memory retention was probed with free recall and recognition tasks. Across a series of proof-of-concept experiments, subjects recalled and recognized fewer of the emotional associations that were followed by the forget cue. Most importantly, they developed weaker conditioned fear (SCR) in response to CS+ items that were instructed to be forgotten. In those early experiments, we measured physiological responding during the conditioning phase and examined memory retention afterwards. Here, I will report on a set of follow-up experiments where we included SCR and shock expectancy ratings during the conditioning phase, as to be able to compare implicit and explicit readouts of memory more directly, with the aim of confirming our original observations.

This work was supported by a personal postdoctoral fellowship of the Research Foundation Flanders (FWO) awarded to Anastasia Chalkia (grant ZKE0551-00-W01).

POSTER SESSION I-104 | A NOVEL VISUAL LEARNING PARADIGM FOR STUDYING THE NEURAL DYNAMICS OF FEEDBACK PROCESSING IN FREELY MOVING MICE USING A WIRELESS EEG RECORDING SYSTEM

Celina Pütz^{1,2}, Natasha Maurits², Monique Lorist¹, Martien Kas¹

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Processing feedback information from our environment allows us to learn to adapt our behaviour and to match environmental circumstances. Electroencephalography (EEG) measures have shown that neural activity underlying feedback processing occurs within tens to hundreds of milliseconds after the onset of feedback presentation. However, the EEG signal measured using scalp electrodes cannot provide details about brain activity patterns in key subcortical regions involved in feedback processing. We developed a visual learning paradigm to be used in combination with a novel wireless mouse EEG system that allows to record the underlying brain activity of feedback processing using scalp electrodes and subcortically placed depth electrodes simultaneously. Mice underwent daily testing sessions in a Y-shaped maze during which the animals had to learn that approaching one of two visual stimuli would yield a food pellet reward. Infrared beams placed along the arms of the maze allowed to time-lock specific events in the experiment to the EEG signal for subsequent electrophysiological analyses. All animals learned the visual reward association after an average of five testing days, and simultaneous EEG analyses are currently being performed. Taken together, our setup provides an innovative translational approach in rodents to establish high-resolution spatiotemporal brain activity patterns elicited by the reception of feedback during visual learning.

POSTER SESSION I-106 | LATE-BREAKING EXAMINING AGE-RELATED CHANGES IN KNOWLEDGE USE DURING LANGUAGE COMPREHENSION USING BRAIN ELECTROPHYSIOLOGY

Rachel Myers, Melissa Troyer, Kara Federmeier
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Descriptors: language comprehension, aging, EEG

Many studies have shown that general knowledge of events is rapidly used during language comprehension and shapes word understanding. However, little is known about how this use of event knowledge might be affected

by normal aging, which is associated with increases in world knowledge but also decreases in processing speed. The current study examined the use of event knowledge in older adults (age 55+) during language comprehension by measuring the N400, a component of the event-related potential (ERP) that has been associated with meaning access, from participants as they read short descriptions of real-world scenarios. We found reduced N400 responses for anomalous words related to the event being described in the scenario compared to unrelated anomalous words. This suggests that event knowledge structures are being activated while reading, thus facilitating the processing for related words even when those words are not linguistically appropriate continuations. These initial results are highly similar to those found in young adults by Metusalem et al. (2012) using the same materials and design, suggesting that the use of event knowledge during language comprehension is largely preserved across the lifespan.

FUNDING: Supported by a grant from the National Institutes of Health (R01 AG026308) to K.D.F.

POSTER SESSION I-107 | LATE-BREAKING ARTERIAL STIFFNESS, PRESSURE PULSATILITY, AND COGNITIVE FUNCTION: EXPLORING THE LINK THROUGH BEHAVIORAL OUTCOMES

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Descriptors: relational memory, carotid-femoral pulse wave velocity, augmentation index

The objective of this study is to investigate the relationship between central pressure pulsatility (cPP), arterial stiffness measures (carotid-femoral pulse wave velocity [PWV]) and standardized augmentation index [Aix]), and cognitive outcomes. We examined healthy individuals to potentially optimize cognitive function through vascular health before impairments arise. 48 adults (18-75 years) participated in a cross-sectional study. Cardiovascular markers were assessed using SphygmoCor® XCEL. General Cognitive Index (digit symbol matching and visual processing), spatial reconstruction (SR), and Mnemonic Similarity Task (MST) were administered for cognitive assessment. Regression models were used for analysis. Digit symbol matching was inversely related to PWV ($\beta = -0.40, p < .01$), Aix ($\beta = -0.31, p < .05$). No significant association was found for visual processing. Higher cPP ($\beta = -0.39, p < .01$) and PWV ($\beta = -0.31, p < .05$) were associated with lower performance on the MST. Higher cPP ($\beta = -0.31, p < .05$) was associated with decreased object location binding, while

higher PWV ($\beta = 0.295$, $p < .05$) and Aix ($\beta = 0.316$, $p < .05$) were associated with increased object misplacement during the SR. These results suggest that arterial stiffness and cPP may be linked to deficits in cognitive domains such as relational memory, processing speed, sustained attention, and short-term memory, but not fluid intelligence and non-verbal reasoning. These findings highlight the significance of vascular factors in studying individual variations in cognitive function.

POSTER SESSION I-108 | LATE-BREAKING BEHAVIORAL AND NEUROELECTRIC CORRELATES OF VERBAL AND NON-VERBAL WORKING MEMORY IN CLOSE-SKILL AND OPEN-SKILL SPORT PARTICIPANTS

Salim Ibrahim Onbasi, Nicholas Baumgartner,
Kyoungmin Noh, Shih-Chun Kao
Purdue University

Descriptors: Working Memory, Close-Skill and Open-Skill Sport, Neuroelectric

Participation in sports has been shown to have beneficial relations with working memory, however, whether such associations differ based on the type of sports, the verbal process, and the temporal stage involved in working memory remains to be determined. This study recruited 18–30 years old adults with experiences in close-skill (CS, $N = 26$ [male = 9]) and open-skill (OS, $N = 40$ [male = 25]) sports as well as a control group without sport experience ($N = 28$ [male = 12]). All participants completed a verbal and a non-verbal working memory task using a two-stimulus paradigm that presented the first stimulus (S1) and the second stimulus (S2) to elicit the encoding and retrieval processes, respectively. Task-related electroencephalogram was recorded and the P3 of event-related potential elicited by S1 and S2 was measured, respectively. Although the results showed no between-group difference in response time and accuracy during both the verbal and non-verbal working memory tasks, the CS group (6.04 ± 0.456 uv) showed larger S1-P3 amplitude compared with the OS group (4.43 ± 0.368 uv) across the two working memory tasks ($p = .022$). No difference in S1-P3 amplitude was observed between these two groups with the control group (4.84 ± 0.44 uv, $ps > .188$). No difference in S2-P3 amplitude was observed between groups. Findings in the differential patterns of attention engagement during the encoding stage of working memory between individuals with experiences in CS and OS suggest the role of sport participation in brain functioning in support of working memory performance.

POSTER SESSION I-109 | LATE-BREAKING EVALUATING THE P300 IN A SIMPLE WORKING MEMORY TASK WHICH FOCUSES ON MEMORY UPDATING

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Colorado State University

Descriptors: P300, Updating Memory, Decision Making

The P300 is a primary ERP component representing cognitive attention and memory updating (Scharinger et al., 2017). The context-updating hypothesis is used to describe the amplitude increase observed in the P300 when the presented stimulus differs from the prior stimulus held in working memory; however, this hypothesis has primarily been tested within the oddball paradigm or in dual tasks requiring high demands on attentional resources. This study investigates P300 changes in a sequential number task designed to elicit sustained attention and memory updating. Participants ($N = 20$) viewed continuous presentations of a single even or odd digit and were instructed to press a button after the occurrence of the third consecutive odd number. We analyzed the P300 peak-to-peak amplitude at Cz for the even, first-odd, second-odd, and third-odd number presentations. Results indicated a significant increase in P300 amplitude across conditions ($F(1,42) = 16.44$, $p < .001$), with significant pairwise differences between the third-odd presentation and the other number presentations. A significant linear trend was observed for amplitude ($F(1) = 22.08$, $p < .001$) indicating memory updating over the number series. A significant quadratic trend for amplitude ($F(1) = 17.82$, $p < .001$) was also found; indicative of a second factor, decision making evidenced by a button press. There were no significant differences for latency. These data demonstrate two factors contribute to P300 amplitude, memory updating, and decision making/button press within this simple novel task.

POSTER SESSION I-110 | LATE-BREAKING THE EFFECT OF ATTRIBUTE FRAMING IN INFORMATION PROCESSING AND DECISION- MAKING WHILE SHOPPING: PRELIMINARY FINDINGS

Harshi Lodha Jain, Laura Swain, Sanela Porca
University of South Carolina, Aiken

Descriptors: Attribute Framing Effect, Consumer Behavior, Brain Activity

Due to advancements in science and technology, consumers have an opportunity to choose from hundreds of brands



for one product they need. Even though having options may cause consumers to pick the one most suitable to them, to avoid information overload, consumers use various cognitive biases and decision biases consciously or unconsciously to arrive at a decision. One such bias is the attribute framing effect, where presenting the same choice in a positive or negative way can alter our decision outcomes. Although behaviorally well understood, the associated underlying neural mechanisms have not been revealed. Thus, the aim of this study is to examine the effect of attribute framing on consumer decision making process and brain activity, specifically P3, to determine if this can differentiate brain activity for positively and negatively framed advertisements. Using EEG (Electroencephalogram), participants rated their purchase intent for each product. Surveys were also administered to collect additional data on impulsivity and general consumerism behaviors. Currently, our data indicates a small difference in purchase intention, positively framed messages had higher purchase intention. Additionally, participants took longer to make purchase decisions when presented with negatively framed messages compared to positively framed messages. These findings have potential implications for marketing strategies toward this potential group of newer consumers.

FUNDING: Magellan Grant Award.

POSTER SESSION I-111 | LATE-BREAKING TOWARD PRECISE MODULATION OF THE NEURAL MECHANISMS OF ACTIVE COPING: DOES FUNCTIONAL MAGNETIC RESONANCE IMAGING REVEAL DIFFERENT NEUROCIR- CUITRIES OF ACTIVE ESCAPE AND ACTIVE AVOIDANCE?

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¹Medical University of South Carolina, ²Ralph H. Johnson VA Medical Center

Descriptors: Escape/ Avoidance Coping, Anxiety, fMRI

Numerous non-human animal studies suggest that escape (running from present threat) and active avoidance (running before threat arrives) are mediated by at least partially distinct neurocircuitries. To inform precise neuromodulation of anxiety-related escape/ avoidance changes, then, this study tested if distinct neural networks also underlie escape versus avoidance in human beings. 35 participants completed a task where three cue types predict whether a subsequent aversive image can be escaped (button press response after image onset), avoided (response before image onset), or not controlled (no response). Throughout the task, functional

MRI measured blood oxygen level-dependent (BOLD) signal change for each cue across the whole brain, and analyses then focused on regions previously implicated in emotion (right amygdala; medial prefrontal cortex, mPFC) and/or motor (anterior cingulate cortex, ACC; pre-supplementary motor area, pre-SMA) processing. Examining a general effect of cue type, differences in BOLD activity arose in each region, i.e., right amygdala (peak $F=14.9$), mPFC (peak $F=11.4$), ACC (peak $F=13.6$), and pre-SMA (peak $F=12.1$). Testing differences across specific cue types, then, BOLD was increased for escape relative to avoidance in right amygdala (peak $t=2.9$) and ACC (peak $t=2.5$) but no escape – avoidance difference arose in any voxels within mPFC and pre-SMA. Together, results suggest overlapping but also distinct neurocircuitries of escape and avoidance, and that escape might specifically recruit regions involved in fight/ flight priming of action.

FUNDING: This study was supported by the National Institute of Mental Health (NIMH; Grant # K23 MH123931-01A1).

POSTER SESSION I-112 | LATE-BREAKING ACETAMINOPHEN CHANGES MU RHYTHM POWER RELATED TO PAIN EMPATHY

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University of South Carolina, Aiken

Descriptors: Sensorimotor resonance, Pain empathy, Mu rhythm

Empathy is an intricate ability that entails the subjective feeling and understanding of emotions someone else may be experiencing. Acetaminophen, the active ingredient found in Tylenol, is among the most common pain medications consumed. There is new evidence, however, that suggests this common analgesic may also dampen empathic processes. However, no previous study has investigated the effect acetaminophen may have on pain empathy or mu power during a pain empathy task. Therefore, participants were randomly assigned to either an experimental (acetaminophen) or control (sugar) group in a double-blinded experimental research design aimed to measure mu power, using EEG, and behavioral responses to painful and non-painful images. Participants in the experimental group were administered 1000 mg of acetaminophen, and it was verified that participants were unaware of their group assignment. We found that mu suppression was greater in the acetaminophen group, which was strongest at electrode C3. Additionally, mu power differences between painful and non-painful images were related to trait empathy, and mu power during the painful images were positively correlated with empathy scores. Results from this study suggest that in addition to reducing physical pain,

acetaminophen may also change the neural response when perceiving others in pain. The implications of these findings could possibly lead to changes in how we prescribe and administer this common drug.

FUNDING: This work was supported by the Magellan Scholars Research Grant awarded to Sara Anne McCommon and Brooke Turk, funded by the University of South Carolina through the Advanced Support for Innovative Research Excellence.

POSTER SESSION I-113 | LATE-BREAKING DO PEOPLE ALWAYS WEAR THEIR HEARTS ON THEIR FACES? CONTEXT-DEPENDENT DIFFERENCES IN PHYSIOLOGICAL AND FACIAL EMOTIONAL EXPRESSION

Ariel Eshel, Stav Bar Maoz, Chen Erez, Ilanit Gordon
Bar Ilan University

Descriptors: emotion regulation, electrodermal activity, facial expressions

Emotional facial expressions do not always portray how people feel, but physiology has the potential to provide a more objective view of experienced emotions. We focus here on affective facial expressions (AFEs) and electrodermal activity (EDA) among emotionally regulated (ER) people assigned in groups with other individuals with similar ER abilities or to a group who has other individuals with low ER abilities. We expected higher modulations of EDA compared to AFE, especially in low-ER groups, due to an emotionally negative situation. 48 triads performed a anagrams task twice, watching an emotionally negative movie between tasks, while being videotaped and physiologically monitored. Triads included 1 person with average ER (person-of-interest) and either 2 average-ER or 2 low-ER people (self-report). Positive and negative facial expressions were analyzed by an AI-based tool. EDA activity was collected via two electrodes placed on the non-dominant palm. Standard Δ emotionality (post minus pre movie; dependent variable) variables calculated for both AFE and EDA. Contrary to our hypothesis, differences between emotionality in both domains were found, with Δ EDA indeed higher, but in the average-ER rather than the low-ER condition. We discuss the differences between EDA and AFE as indexes of felt emotions, and further elaborate on how these results may indicate emotional contagion processes, or speculate on how the low-ER group is a potentially a more regulated environment for group members.

POSTER SESSION I-114 | LATE-BREAKING NATURE OF SOUND: A PILOT-STUDY ON THE EFFECTS OF LISTENING TO SOUNDSCAPES ON AFFECT, BLOOD PRESSURE, SKIN CONDUCTANCE, AND HEART RATE VARIABILITY

Qiao Sun, Stone Preston, Nathaniel Thom, L. Page
Wheaton College

Descriptors: Soundscapes, Blood Pressure, Affect

INTRODUCTION: 68 percent of the global population is expected to live in urban areas by 2050. Studies suggest that urban environments negatively impact mental health and that natural environments enhance psychological well-being. Therefore, we examined the effects of listening to isolated urban/natural soundscapes on affect and measures of peripheral psychophysiology. **METHODS:** Fourteen subjects listened to three 8-minute soundscapes (anthrophony, biophony and geophony) while PANAS, blood pressure, EDA, and ECG were recorded. EDA and ECG were pre-processed using standard guidelines. The mean EDA and R-R intervals of minutes 5 to 7 were computed and used for statistical analysis via repeated-measures ANOVAs followed by RM-ANCOVAs to detect the effect of each physiological covariate on affect. **RESULTS:** All soundscapes reduced negative affect ($p < .001$, partial $\eta^2 = 0.62$); only geophony reduced positive affect ($p = .004$, partial $\eta^2 = 0.54$). Systolic blood pressure was marginally reduced by geophony and biophony ($p = .05$, partial $\eta^2 = .34$). The main effect of time for EDA was not apparent in the pairwise contrasts (all $ps > .15$) and mean R-R was unchanged (all $ps > .11$, highest partial $\eta^2 = .24$). **DISCUSSION:** Results demonstrate that urban and natural soundscapes reduce negative affect, but only natural soundscapes reduced systolic blood pressure. The underlying mechanism of the BP reduction is unclear given that we did not detect sympathetically-mediated changes in skin conductance nor parasympathetically-mediated changes in R-R intervals.

FUNDING: Wheaton College Ruth Kraft Strohschein Endowment.

POSTER SESSION I-115 | LATE-BREAKING THE PARADOX OF TRUST AND PHYSIOLOGICAL SYNCHRONY: EXAMINING THE RELATIONSHIP WITH A TRUST GAME

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Descriptors: Physiological Synchrony, Dyadic Interaction, Trust and Cooperation

This study aimed to explore the intricate relationship between trust and physiological synchrony, examining whether higher levels of physiological synchrony predicted greater trust. A total of 27 ($N=54$) dyads played a trust game in two conditions: while looking at each other, and while being separated by a blind. Their Skin Conductance (SC) and Heart Rate (HR) were measured throughout the experiment. The trust game role (Trustor, Trustee) was a between-subject factor. Physiological synchrony was quantified using the Windowed- Lagged Cross-correlation (WLCC) method which captures the alignment of physiological response over time. Contrary to our hypothesis, the results revealed a paradoxical relationship between SC synchrony and trust. Dyads displaying higher levels of SC synchrony exhibited significantly lower levels of trust ($F=6.113$, $p=.01$). However, no significant associations were found between HR synchrony and trust ($p=.45$). Moreover, against our expectation, we did not find an effect of condition on the level of synchrony ($p=.20$) or on trust ($p=.846$). These findings may be that heightened physiological synchrony may signal caution or defensive behaviors, rather than increased trust, during the trust game scenario. These unexpected results challenge prior assumptions and emphasize the need for a more nuanced understanding of the underlying mechanisms involved in trust dynamics. Future research should explore additional factors that may moderate this relationship, including individual differences in trust propensity or contextual factors.

POSTER SESSION I-116 | LATE-BREAKING EXAMINING THE INTERSECTION BETWEEN CHILDHOOD MALTREATMENT, OSCILLATORY CORRELATES OF THREAT IMMINENCE, AND PSYCHOPATHOLOGY

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Rutgers University, Newark

Descriptors: Oscillations, Threat processing, Childhood Maltreatment

Childhood maltreatment (CM) alters trajectories of brain development to affect circuits involved in threat-processing, and constitutes a major risk factor for adult psychopathology. Although the association between CM, threat-processing, and psychopathology are clear, the intersection between these variables is less understood. To address this issue, we combined assessments of CM exposure and clinical variables (anxiety, depression) with electrophysiological measures of threat responsiveness. We recorded EEG from 79 subjects (39

females; CM [$n=34$] vs non-CM [$n=45$], aged 18-32) engaged in a VR Risk-Reward Interaction task where subjects are presented with a threat conditioned cue either in the same (proximal) or different (distal) room location. We focused on two oscillatory components of threat imminence, right-posterior theta (4-8 Hz) associated with proximal threat, and central-parietal gamma (30-60 Hz) associated with distal threat. At a group level, we found CM group displayed elevated levels of depression ($p<.005$) and anxiety ($p<.05$); and displayed a slightly larger gamma ($M=.58$) response compared to non-CM ($M=.16$), $p=.06$. A positive correlation was also observed between gamma and state/trait anxiety ($p<.01$). Finally, our SEM model indicated that total CM score significantly predicted gamma ($\beta=0.28$, $p<0.05$), which in turn significantly predicted anxiety ($\beta=0.26$, $p<0.05$). Our results suggest that CM disrupts threat-related processes (gamma) by increasing the saliency of threat cues, possibly conferring vulnerability to the risk of psychiatric disorders (anxiety).

FUNDING: This study was supported by the 2020 Rutgers Center of Alcohol & Substance Use Studies pilot research grant.

POSTER SESSION I-117 | LATE-BREAKING RESTING-STATE PEAK 'ALPHA' FREQUENCY IN INFANTS AND TODDLERS: MATURATION AND ASSOCIATIONS WITH ADAPTIVE BEHAVIORS

Marybeth McNamee¹, Kylie Mol¹, Heather Green¹,
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Descriptors: Magnetoencephalography, Peak Alpha Frequency, Resting-state alpha

Neural alpha rhythms are of interest, associated with processing speed as well as local and long-range functional connectivity. Our understanding of alpha network development in infants and toddlers is limited, as the task often used to assess alpha activity – the resting-state (RS) eyes-closed task – works best in individuals who can remain awake with their eyes closed for an extended period. We have shown that RS alpha with a high signal-to-noise ratio can be obtained using a dark-room (DR) eyes-open task. The RS peak alpha frequency (PAF) increases as a function of age in older children, with the present study using the DR task to assess PAF maturation as well as its association with cognitive development in children 2.3-71.3 months old ($N=60$; 36 males). Magnetoencephalography data were obtained during a 5-minute DR eyes-open task, with 20s silent video and 30s total darkness alternating 6 times.

For each child, whole-brain maps of artifact-free RS activity during total darkness were localized using Minimum-Norm Estimation, and power spectrum density computed at each voxel (2-20Hz). FOOOF (fitting oscillations and one over f) was applied, and the PAF was identified as the frequency at which RS activity showed maximum power. The PAF was very tightly coupled with age ($r=0.94$, $p<0.01$), and a higher PAF was associated with a higher Vineland Adaptive Behavior Composite score ($r=0.32$, $p=0.05$). The present study demonstrates that the DR PAF provides a developmentally and clinically relevant non-invasive assessment of RS neural circuit activity in infants and toddlers.

FUNDING: This work was supported by the National Institute of Child Health and Human Development (NICHD) (R01HD093776 & P50HD105354 to Dr. J. Christopher Edgar); the National Institute of Mental Health (NIMH) (R01MH107506 to Dr. J. Christopher Edgar; K01MH108822 to Dr. Yuhua Chen); and the Eagles Autism Foundation (Pilot Grant to Dr. Yuhua Chen).

POSTER SESSION I-118 | LATE-BREAKING THE RELATIONSHIP OF SELF-COMPASSION AND PSYCHOLOGICAL FLEXIBILITY WITH HEART RATE VARIABILITY IN YOUNG PEOPLE.

Husna Hassan Basri, Wui Ling Chu, Vashti Berry, Anke Karl
University of Exeter

Descriptors: Self-compassion, Psychological flexibility, Heart rate variability

Self-compassion and psychological flexibility (PF) are protective mechanisms for depression, improving mental health, positive emotion, and well-being. Limited studies have been observed in the young people's population and related to the psychophysiological aspect. Evidence shows that self-compassion is protective by stimulating the calm/soothing physiological system. This physiological state is associated with enhanced parasympathetic activation assessed by the beat-to-beat variability in heart rate known as heart rate variability (HRV). HRV was recorded in 70 participants aged between 18 to 25 years old. The negative affect of psychological inflexibility (PIF) and self-criticism were assessed in investigating the positive trait of self-compassion and psychological flexibility. Multiple regression using the backward selection elimination was used to examine whether the variables significantly predicted HRV responses. The result indicates that the subscale of self-compassion (isolation, kindness, and mindfulness), and PF/PIF (acceptance and defusion/inaction) is the best-fitted model. The overall regression was statistically significant ($R^2 = .298$, $F(6,63) = 4.45$, $p = .00081$). The result

showed that mindfulness and acceptance were positively associated with higher HRV whereas isolation and inaction were negatively associated with HRV. A novel finding of this study is that acceptance showed a significant relationship with higher HRV. Suggesting that psychological flexibility (PF) can be associated with a protective mechanism to improve well-being and mental health.

FUNDING: Ministry of Education Malaysia and Universiti Sains Islam Malaysia.

POSTER SESSION I-119 | LATE-BREAKING I KNEW I DID WELL! EFFECTS OF PERCEPTIONS OF SUCCESS ON NEURAL CORRELATES OF FEEDBACK PROCESSING

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¹San Francisco State University, ²Boise State University,

³Auburn University

Descriptors: Reward Positivity, Feedback processing, Motor performance

Performance success has a bidirectional relationship with feedback-related brain activity. Specifically, feedback about successful movements act to reinforce the precipitating action, whereas feedback about unsuccessful movements signals that neural resources should be allocated to reprogramming the movement in future trials, so that the unsuccessful action is avoided, and the goal can be achieved. Importantly, an objective outcome can lead to feedback that is subjectively perceived as successful or unsuccessful. To investigate how perceived and objective success affect feedback processing, we recorded EEG from 50 participants while having them practice a motor skill with an objective (error magnitude) and a subjective outcome (whether the trial landed within a pre-determined zone of success). Mixed-effects regression models were used to uncover how perception of success, objective success, and practice trial number affected feedback processing as indexed by RewP amplitude. Results showed that both subjective (perception of success) and objective (error magnitude) reward significantly affected feedback processing, with the former having a larger effect. Additionally, results showed that learner's assigned criterion of success also influenced the relationship between feedback processing and error magnitude. Together, these findings suggest that giving subjective meaning to learners' performance outcomes can be an effective and simple way to manipulate the brain reward system during practice, which might lead to more effective motor skill acquisition.

POSTER SESSION I-120 | LATE-BREAKING TEMPORAL INEQUALITY OF RR INTERVALS LIKE A NEW PSYCHOPHYSIOLOGICAL INDICATOR OF MENTAL STRESS

Miguel Enrique Sanchez Hechavarria

Descriptors: Heart Rate Variability, Gini coefficient, Mental Stress

Introduction: Gini coefficient (Gini index or Gini ratio) is a parameter that is normally used in economy to measure the income distribution in a country or in the whole wide world, but it can be used to measure any kind of distribution. In the present study it is exposed an innovative proposal of application of the Gini coefficient to Heart Rate Variability (HRV) like a psychophysiological indicator of mental stress. Purpose: To assess the application of the Gini coefficient as a psychophysiological indicator of mental stress. Methods: The involved participants are 13 healthy individuals (age 19 ± 1.5 years). Heart rate was continuously recorded at rest (5 minutes) and during a mental stress (5 minutes). Linear and non-linear methods of heart rate variability were assessed, and 2 new indicators (Sequential and Non-Sequential Gini) were calculated and proposed to measure HRV differences between states. Results: When comparing rest and mental stress conditions, a sensible decrease of the traditional indicators of the HRV was founded ($p < 0.05$), an increase of the heart rate ($p = 0.004$) and of the Sequential Gini ($p = 0.004$) and Non-Sequential Gini ($p = 0.04$). Conclusions: The results suggest that temporary inequality of the RR intervals analyzed from the Gini coefficient could be an adequate indicator of sympathetic activity present during the mental stress, with great potentialities with the objective to assess the consequences of psychosomatic affections and anxiety disorders.

POSTER SESSION I-121 | LATE-BREAKING EFFECTS OF SUBCALLOSAL CINGULATE DEEP BRAIN STIMULATION ON HEART RATE VARIABILITY IN PATIENTS WITH TREATMENT RESISTANT DEPRESSION

Jacob Dahill-Fuchel¹, John Allen¹, Elisa Xu², Samantha Pitts², Jacqueline Overton², Christopher Rozell², Patricio Riva-Posse², Helen Mayberg², Allison Waters²

¹University of Arizona, ²Icahn School of Medicine at Mount Sinai

Descriptors: Heart Rate Variability, Deep Brain Stimulation, Depression

Modulation of autonomic nervous system (ANS) activity may play a role in the mechanisms by which deep brain stimulation (DBS) as an intervention for treatment resistant depression (TRD) exerts its antidepressant effects. Low heart rate variability (HRV) has been linked to depression and may serve as a useful indicator of treatment response to DBS for depression. Nine TRD patients received DBS to the subcallosal cingulate cortex (SCC). HRV metrics were derived from ECG recordings acquired pre-implant, and throughout 6 months of SCC DBS treatment. HRV was indexed by the root mean square of successive differences (RMSSD) and the log of the variance of the band-limited IBI time-series (RSA). Changes in RMSSD, RSA and The Hamilton Rating Scale for Depression (HRSD) across treatment were assessed. Depression severity decreased ($p < .001$) and HRV increased ($p < .05$) significantly over six months of DBS. At the individual level, HRV metrics increased over time in treatment ($p < .05$) in five patients (all female) but decreased ($p < .05$) in two patients (both male) and two did not show a statistically significant change (both male). Consistent with previous reports, HRV was inversely correlated with symptom severity in four patients ($-.429$ to $-.586$, $p < .05$), but showed the opposite association in three patients ($.373$ to $.613$, $p < .05$), and no relationship in two. The heterogeneity of change in HRV and covariation between symptom severity and HRV warrant further investigation of individual differences accounting for variance in the autonomic concomitants of and response to treatment with DBS.

POSTER SESSION I-122 | LATE-BREAKING COGNITIVE CONTROL DEFICITS ASSOCIATED WITH EARLY CHILDHOOD TRAUMA

Katharina Paul¹, Andrea Hildebrandt², Corinna Kührt³, Alisha Kuhnke¹, Erik Mueller⁴, Anja Riesel¹, Jan Wacker¹, Sven Mueller^{5,6}

¹University Hamburg, ²Oldenburg University, ³Technical University Dresden, ⁴Marburg University, ⁵Ghent University, ⁶Nencki Institute

Descriptors: cognitive control, early childhood trauma

Studies have reported impaired cognitive control in individuals who have experienced early childhood trauma, which may contribute to the development of psychiatric disorders. In our pre-registered study, we aimed to uncover the neural mechanisms underlying inhibitory control deficits in these individuals. We assessed trauma using the Childhood Trauma Questionnaire in the CoScience project's sample of 787 healthy young adults (18-30 years), with around 25% reporting moderate

to extreme trauma levels. Our investigation focused on various EEG components (N2, P3a, P3b, frontomedial theta and delta dynamics) and performance markers during a Go-NoGo task. Results revealed that participants who experienced more childhood trauma showed similar performance levels but exhibited lower N2 amplitudes and reduced frontomedial delta responses to Go and NoGo trials. Notably, these effects were strongest for individuals who endured physical or sexual abuse in childhood. Findings remained significant when controlling for Gender, trait Anxiety, trait Depression, but not when controlling for fluid Intelligence. This study sheds light on the association between early trauma and reduced cognitive control processes, specifically related to conflict detection and response inhibition. The association between childhood trauma and deficits in cognitive control underscores the need for targeted interventions and support for individuals who have experienced early adversity.

**POSTER SESSION I-123 | LATE-BREAKING
A BLUNTED ERROR-RELATED NEGATIVITY
AT ENTRY TO UNIVERSITY PROSPECTIVELY
PREDICTS INCREASES IN ALCOHOL
CONSUMPTION ACROSS THE FIRST YEAR**

Anna Walls, Loran Carpentier, Anna Weinberg
McGill University

Descriptors: error-related negativity, alcohol use

The transition to university is often associated with increased alcohol consumption, which can result in adverse mental and physical health outcomes. However, though a high level of alcohol consumption is normative on many campuses, not all university students will increase their consumption. Identifying risk markers for increased consumption across the first year may be helpful in targeted prevention efforts. This study considered the influence of pre-university consumption, peer influence, and neural markers of performance monitoring. More specifically, we examined the association between increases in consumption across the first year and the error-related negativity (ERN), which appears blunted in those with Alcohol Use Disorder (AUD). In their first month of university, 121 first-year undergraduates (79% female) completed the Alcohol Use Disorder Identification Test and self-report of peer alcohol use. At baseline, participants completed the Flanker Task while an electroencephalogram was recorded. We then followed participants across four time-points. Results

indicate that, at baseline, a blunted ERN was associated with greater alcohol consumption, as well as greater peer alcohol use. Additionally, those with a blunted ERN at baseline displayed greater alcohol consumption across their first year, even after adjusting for both baseline consumption and peer consumption context. These results suggest that the ERN may be a useful neural marker to identify individuals at increased risk of developing AUD and highlights peer contexts that may facilitate its development.

**POSTER SESSION I-124 | LATE-BREAKING
IT'S A SMALL WORLD, AFTER ALL: THE
GAMBLER'S FALLACY, SLEEP DEPRIVATION,
AND SMALL-WORLD FUNCTIONAL
CONNECTIVITY**

Andrew Armstrong¹, Timothy Murphy¹, Danielle Molnar¹, Natalia Kubishyn², Lacey Sherk¹
¹*Brock University*, ²*Western University*

Descriptors: Sleep Deprivation, Small-World Propensity, Gambler's Fallacy

How do cognitive impairments after sleep deprivation affect functional connectivity in the brain? Do cognitive biases such as the Gambler's Fallacy have a role in functional connectivity? Sleep deprivation can affect various cognitive processes. One specific example of a cognitive bias is the Gambler's Fallacy; the belief that previous independent events will affect future outcomes. To examine these questions, the Small World Propensity (SWP) was computed across three frequency bands, Alpha (9-13hz), Beta (14-30hz), and low Gamma(31-50hz). Functional networks in the small world model have lower path lengths and higher clustering coefficients compared to their random and regular network counterparts. Seventeen participants (12 f, Mage 22years) completed a gambling task functionally equivalent to a coin flip resulting in multiple instances of consecutive wins and losses. EEG was collected and the Small World Propensity was calculated by examining path lengths and clustering coefficients on the 2nd and 4th consecutive wins and losses in both alert and sleep-deprived conditions. Differences in the small world propensity and functional connectivity changes across these conditions were analyzed using 2-Way ANOVAs. The SWP was significantly greater for the 4th loss condition in the low Gamma frequency band. Path length in the Alpha and low Gamma bands were significantly longer for the 2nd loss. SWP in the Alpha band was significantly higher in the alert condition. These results indicate that SWP may be a useful tool in examining functional connectivity across various conditions.



POSTER SESSION I-125 | LATE-BREAKING HIERARCHICAL PRE-PROCESSING OF ORTHOGRAPHIC AND SEMANTIC PARAFOVEAL INFORMATION DURING NATURAL READING

Lijuan Wang, Yali Pan, Steven Frisson, Ole Jensen
University of Birmingham

Descriptors: parafoveal previewing, representational similarity analysis, natural reading

During reading, information about upcoming words can be extracted before we fixate on them, as shown by many eye-tracking studies. However, neural evidence supporting this parafoveal previewing is limited; Also, it remains unclear how different levels of parafoveal previewing - orthography and semantics - unfold over time. To investigate these questions, we concurrently recorded participants' eye movements and brain activity using an eye tracker and magnetoencephalography (MEG) while they silently read 360 sentences. We constructed sentences in triplets, wherein each sentence includes a target word, which could either be the critical word (e.g., "prize"), its orthographic neighbor (e.g., "price"), or its semantic neighbor (e.g., "award"). By employing representational similarity analysis (RSA), we observed significantly higher representational similarity between the critical word and its orthographic and semantic neighbors during the pre-target fixation intervals, compared to its non-neighbor. Furthermore, the previewing effect (as indexed by the difference in representational similarity) occurred earlier for orthography than for semantics. Importantly, we found that individual differences in orthographic and semantic previewing effects are both predictive of reading speed. These findings provide neural evidence that both orthographic and semantic information can be extracted parafoveally, but in a hierarchical way, and that this previewing ability underpins proficient reading.

FUNDING: China scholarship council (CSC) Welcome trust Biotechnology and Biological Sciences Research Council (BBSRC) The Royal Society James S. McDonnell Foundation.

Poster Session II

POSTER SESSION II-001 | IS THERE A FUNDAMENTAL DIFFERENCE BETWEEN OLDER ADULTS WHO COMPLETE OR FAIL TO COMPLETE A VO₂MAX STRESS TEST?

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Natural Medicine

Descriptors: Cardiorespiratory Fitness, Fitness, Methodology

The maximum rate of oxygen one's body is capable of using during exercise (VO_{2max}) is a measure of cardiorespiratory fitness (CRF) based on a stress test where subjects are pushed to their limit of physical exertion. VO_{2max} is used in a wide variety of studies as a gold-standard metric, including many investigating the relationship between cognitive performance and CRF. However, not all subjects are able to reach their maximum VO₂ during testing. In addition, few validation studies relate VO_{2max} to other fitness measures and cognition in older adults, who often do not reach VO_{2max}. In such cases, VO_{2max} is estimated, and these subjects are pooled with those who attain VO_{2max} to generate global statistics. However, older adults who reach VO_{2max} may actually differ from those who don't. Here we explored relationships between VO_{2max} and various measures of overall health and wellbeing, different measures of CRF, and cognition in older adults who did or did not reach VO_{2max}. We found distinct patterns of relationships between these two groups and that, in those who do not reach VO_{2max}, estimates of VO_{2max} are more predictive of CRF and wellbeing than in those who do. These results imply that even in similar age groups, pooling estimates of VO_{2max} with true VO_{2max} may not be advisable. Although actual and estimated VO_{2max} follow similar distributions, the underlying populations of those who do and do not reach VO_{2max} may be too different to analyze together. These results have broad implications for studies involving VO_{2max} as a fitness measure, especially in older samples.

FUNDING: National Institutes of Health
5R01AG059878-02.

POSTER SESSION II-002 | AGING AND CARDIORESPIRATORY FITNESS EFFECTS ON HIPPOCAMPAL SUBFIELD VOLUMES

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Descriptors: Aging, Fitness, Hippocampus

Aging leads to decreases in brain volumes, which are associated with cognitive decline, especially apparent in the hippocampus, a structure crucial for memory and implicated in dementia. These effects may be mitigated by improved cardiorespiratory fitness (CRF). The rodent literature shows that different subfields of the hippocampus may have different functions. In humans, there are methodological limitations that make it difficult to analyze hippocampal subfields separately. Here we analyzed hippocampal subfields using a newly validated semi-automatic method for estimating hippocampal subfield volumes, combining Automatic Segmentation of Hippocampal Subfields (ASHS) with manual error correction. Results show that hippocampal subfield volumes are differentially affected by age, with smaller volumes of the subiculum (SUB) associated with age and the entorhinal cortex (EC) showing age invariance. In keeping with these data, SUB volume, but not EC volume, positively correlated with CRF. This study provides insight into the mechanisms by which individual hippocampal subfield volumes contribute to the overall effects of age and fitness on the brain. Future research will explore the mediating effect of arteriosclerosis on these phenomena.

FUNDING: This work was supported by NIA grants R01AG059878 and RF1AG062666 to M. Fabiani and G. Gratton.

POSTER SESSION II-003 | ASSOCIATIONS OF ARTERIAL STIFFNESS AND CARDIAC INDEX WITH WHITE MATTER LESIONS – THE MODERATING ROLE OF SOCIOECONOMIC STATUS

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¹Nanyang Technological University, ²Singapore Management University

Descriptors: Arterial stiffness, White matter lesions, Socioeconomic status

White matter hyperintensities (WMHs) in the brain represent diffuse small vessel disease (SVD) implicating the cerebral, cardiac and systemic vasculatures. As the brain may be the end-organ of cumulative vascular disease, and socioeconomic status (SES) has been shown to be protective of both cardiovascular and brain health, we hypothesized that the association of cardiac index (CI) or stiffness index (SI) with WMHs will be modified by SES. We evaluated participants from the UK Biobank with neuroimaging measures of WMHs, SI quantified using finger photoplethysmography, and CI using cardiovascular MRI. We used multiple linear regression to evaluate the basic, independent, and interactive relationships of CI and SI with WMHs. Next, we determined if the relationships were moderated by years of education as a proxy of SES. 34,582 and 37,203 participants (mean age = 64) were included in the CI and SI analyses with WMHs respectively. Higher SI was associated with greater WMHs, and this association was independent of CI. Lower CI was associated with greater WMHs only in individuals who reported cardiovascular-related illnesses. Further, the relationship between SI and WMHs was moderated by SES, such that the association was present only in individuals with low SES. Higher SES may be neuroprotective against cerebral SVD by moderating the negative effects of systemic arterial stiffness on the cerebrovascular system. Low SES individuals with higher stiffness index may have substantial WMHs and at greater risk for vascular cognitive impairment.

FUNDING: Nanyang Technological University, Singapore M40824100 and MOE AcRF Tier 1 Grant M4012193.

POSTER SESSION II-004 | SEPARATE ASPECTS OF SOMATOMOTOR CONTROL ARE ASSOCIATED WITH VOLUMES OF DIFFERENT SETS OF BRAIN STRUCTURES

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Descriptors: Somatomotor Control, Fitness, Cognition

It is widely known that aging influences numerous bodily systems, but this effect can be partially prevented by physical activity and fitness. Here we investigated the relationships between the structural integrity of various brain regions involved in somatomotor control, fitness, and cognition across the lifespan (age 25-75). We hypothesized that fitness levels

would be correlated with brain volumes in regions related to somatomotor control as well as with cognition. Participants' abilities were assessed through a variety of tasks using the NIH Toolbox and measures of cardiorespiratory fitness. Global and regional volumetric measures were derived from T1 MRI images with Freesurfer 6.0. As expected, age was negatively correlated with cognition, motor abilities, and intracranial volume. Results revealed two independent aspects of somatomotor control, both associated with aging and fitness. The first was dexterity and gait, which were correlated with global cortical volumes as well as various measures of cognition. The second was balance, which was correlated with increased volume in subcortical regions, particularly the thalamus. Interestingly, balance and dexterity were not correlated with each other, and each had low correlations with the brain regions associated with the other. However, both are known to affect processing speed, which can subsequently influence other cognitive outcomes. Our results demonstrate the complexity of the relationships between aging, fitness, somatomotor control, and brain structures. FUNDING: NIA grants R01AG059878 and RF1AG062666.

POSTER SESSION II-005 | CORTICAL HYPERACTIVATION RELATED TO DECREASED COGNITIVE PERFORMANCE FOLLOWING CONCUSSION IN OLDER ADULTS

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Descriptors: Magnetoencephalography, Cognition, Concussion

We know that a concussion in adulthood is linked to alterations in specific brain activation patterns, but we know less about associated cognitive consequences. Using magnetoencephalography, this study aimed to establish links between clinical anatomical changes post-concussion and visual attention and working memory. 37 subjects (18 with prior mTBI and 19 matched controls) aged 50 to 72 performed a visual search task while we recorded their brain activity. Both groups were equivalent based on age, sex, and education. We identified three significant activation peaks (mN2pcA, mN2pcB and mSPCN). Regions of interest were isolated by cluster analysis to find statistically more activated vertex clusters according to the target spatial location. These found cluster components were then used for

between-group comparisons and correlated to cognitive test performance. mTBIs exhibited broader activation than CTRLs in frontal regions during mN2pcB and in frontal and temporal regions during mSPCN ($p < .05$). Several correlations with neuropsychology cognitive tests suggested that more active regions in mTBIs compared with CTRLs predicted worse performance. Results from this study show that, compared to controls, adults with recent concussions present patterns of hyperactivation in the frontal and temporal areas during components related to target selection and working memory (mN2pcB and mSPCN). Moreover, those observed differences are linked to poorer performance in several cognitive tasks.

FUNDING: CRIUGM.

POSTER SESSION II-006 | MANUAL LEARNING: EFFECTIVENESS OF A STRESS DETECTION ALGORITHM TRAINED USING HUMAN VISUALIZATION OF HEART RATE DATA

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Descriptors: Stress, Stress Detection, Algorithm

A novel approach to the development of stress-detection algorithms is human-performed data visualization. Twenty participants experienced a baseline relaxation period followed by a 15-minute acute stress event (Trier Social Stress Task; TSST). Within a training dataset ($N=10$), a stress expert viewed graphs of heart rate outliers from the baseline and stress periods and designed a series of stress classification rules based on these graphs. These rules were then manually iterated and adjusted until their graphed output reliably indicated stress responses during stress events but not during the baseline periods. These rules were combined into an algorithm which defined the onset and offset of acute stress responses in HR data streams. Heartbeats occurring between a response onset and offset were defined as a stress response. This algorithm was evaluated in a test dataset ($N=10$) to assess stress detection accuracy. The algorithm classified each of 30,328 test-set heartbeats as representing either 1) a normal stress level (heartbeats not occurring within a stress response) or 2) a stress response (heart beats occurring during a stress response). The algorithm correctly identified a stress response during 100% of the stress events and also correctly classified 92.5% of these heartbeats: 97.4% of baseline heartbeats were classified as no stress and 84.9% of the stress event heartbeats were classified as stress response.

This accuracy rate is extremely high relative to machine learning-based methods employed in comparable laboratory stress-induction paradigms.

FUNDING: This work is supported by Delos Living, LLC. This research has been reviewed by the Mayo Clinic Conflict of Interest Review Board and is being conducted in compliance with Mayo Clinic Conflict of Interest policies. Both the Mayo Clinic Conflict of Interest Review Board and the Institutional Review Board have reviewed the Financial Conflict of Interest for the authors related to this research and they have determined that this Financial Conflict of Interest poses no additional significant risk to the welfare of participants in this research project or to the integrity of the research.

POSTER SESSION II-007 | DETECTING AUDITORY TEMPORAL REGULARITIES: ELECTROPHYSIOLOGICAL INDEX OF TRACKING AND IDENTIFICATION OF DISAMBIGUATING INFORMATION

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Descriptors: EEG, Auditory, Predictive coding

Learning, and detection of regularities allows us to make predictions about our environment and process stimuli more efficiently. Using EEG, we found an electrophysiological signature linked to how the brain uses and interprets auditory information in the time domain. We used sequences of five tones with different pitches, with one of three distinct temporal regularities, using a short-long-short-long, long-short-long-short, or isochronous ISI pattern. They were designed so the second tone carried temporal-sequence information, by being presented after a short, medium, or long ISI, allowing recognition of the pattern. Participants heard two tone sequences with the same temporal regularity and had to indicate if the tone pitches were identical. In one experiment, the three types of regularities were randomly intermixed, whereas they were blocked in a control experiment. A frontal and frontocentral positivity [Z1] increased for the first set of the first experiment (when temporal pattern was not previously known), compared to that same set in the control experiment (pattern known), starting around the earliest time the second tone could be presented, and peaking shortly after actual tone onset. Although these temporal patterns were task irrelevant, and most participants [Z2] were unaware of them when asked, our results suggest the brain disambiguates its variable environment based on the earliest available

information, and that it does so rapidly, pre-attentively, and automatically.

FUNDING: The research was supported by grants from the Natural Sciences and Engineering Research Council of Canada, the Canada Research Chairs program, and the Canada Foundation for Innovation awarded to PJ.

POSTER SESSION II-008 | DIFFERENCES IN ACTIVATION PATTERNS OF THE ANTERIOR INSULA BETWEEN SWITCHING AND FEEDBACK STIMULI WITH REWARD INFORMATION

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Descriptors: reward, anticipation, stimulus-preceding negativity

The anterior insula (aINS) is involved in both salience processing and switching between brain networks. However, it is still unclear how the activation pattern of the aINS related to switching function is different from the one related to salience processing. In this fMRI study, we aimed to compare the aINS activations evoked by switching stimuli (SWS) and feedback stimuli (FBS) and explore the differences in their activation patterns. We hypothesized that the activation patterns for SWS and FBS would be different because SWS could facilitate switching brain networks while FBS conveys salient information to update behavior. Thirty-two participants performed a time estimation task where an SWS was presented after a time estimate, informing them whether they could receive monetary reward (RW condition) or not (NR condition) to change the activation level in the reward system. An FBS indicating the correctness of time estimation was presented after the SWS. Our analyses revealed that the aINS was activated by SWS only in the NR condition, and the right aINS was more activated in the NR than in the RW condition. In contrast, the activation in the bilateral aINS was found for both RW and NR conditions for the FBS, and there was no significant difference between the two conditions. Our findings suggest that the right aINS could play a pivotal role in the switching function, reducing the reward expectation when necessary, while the bilateral aINS could be involved in behavioral updates based on the feedback information.

FUNDING: This work was supported by JSPS KAKENHI Grant Number JP23K10778.

POSTER SESSION II-009 | AN EVENT-RELATED POTENTIAL EXAMINATION OF THE EMOTION ATTENTION BLINK TASK

Kyle O'Brien, Joseph Mathew, Bridget Kennedy, Priscillia Ihionkhan, Jacob Avendano, Joseph Coleman, Konan Guo, Nicholas Sims-Rhodes, Harrison Boynton, Jacob Brooks, Kyla Kiser, Erin Hulsman, Christian Lopez, Shanleigh Curry, Cameron Hicks, Lutavious Boone, Skyla Weeks, Sarah Sass
The University of Texas, Tyler

Descriptors: Anxiety, Emotion, Attention

Cognitive tasks used in attention bias assessment for anxious populations have been scrutinized for their reliability. One potential limitation of cognitive tasks, such as the dot-probe task, is that behavioral reaction time evidence cannot isolate separate attention processes that follow threatening stimulus presentation (e.g., initial orienting to stimuli, later attention avoidance, difficulty disengaging attention). The emotion attention blink task (EAB) may be well suited for measuring emotion-attention interactions by isolating discrete stages of attention processing. In the present study, we used accuracy and N200 amplitude data from the EAB in a student sample of non-patients reporting high ($n=24$) or low ($n=20$) levels of anxious apprehension. All participants also reported low levels of anhedonic depression. Our EAB task was novel in using facial images from the Racially Diverse Affective Expression stimulus set. Across participants, both accuracy and N200 amplitude data were modulated by emotionally arousing (angry and happy) faces when compared to neutral faces, suggesting that the EAB task was effective in eliciting an attention to emotion response. Contrary to expectation, the group with higher levels of anxious apprehension did not have a larger emotion effect than the control group in the EAB task. Results and implications of our findings are discussed in relation to assessment of attention bias and attention-training literature in anxiety.

POSTER SESSION II-010 | REAR BIAS IN SPATIAL AUDITORY PERCEPTION: PHYSIOLOGICAL REACTION TO SOUNDS OCCURRING OUTSIDE THE VISUAL FIELD

Natalia Frankowska, Michal Olszanowski, Aleksandra Tolopilo
SWPS University

Descriptors: attentional vigilance, affective reactions, Auditory perception

Presented studies explored the rear bias phenomenon, i.e., the attentional and affective bias to sounds occurring behind the listener. Physiological and psychological reactions (i.e., fEMG, EDA/SCR, Simple Reaction Task – SRT, and self-assessments of affect-related states) were measured in response to tones of different frequencies (Study 1) and emotional vocalizations (Study 2) presented in rear and front spatial locations. Results showed that emotional vocalizations, when located in the back, facilitate reactions related to attention orientation (i.e., *auricularis* muscle response and simple reaction times) and evoke higher arousal – both physiological (as measured by SCR) and psychological (self-assessment scale). Importantly, observed asymmetries were larger for negative and threat-related signals (e.g., anger) than positive/non-threatening ones (e.g., achievement). In turn, there were only small differences for the relatively higher frequency tones. The observed relationships are discussed in terms of one of the postulated auditory system's functions, which is monitoring of the environment in order to quickly detect potential threats that occur outside of the visual field (e.g., behind one's back).

POSTER SESSION II-011 | ACUTE AEROBIC EXERCISE BENEFITS ALLOCATION OF NEURAL RESOURCES RELATED TO SELECTIVE ATTENTION: MAGNETOENCEPHALOGRAPHIC EVIDENCE

Tomasz Ligeza¹, Marie Vens², Thea Bluemer², Markus Junghofer²

¹Jagiellonian University, ²University of Muenster

Descriptors: acute exercise, selective attention, magnetoencephalography

A single session of aerobic exercise has been shown to potentially benefit subsequent performance in a wide range of cognitive tasks, but the underlying mechanisms are still not fully understood. In this study, we investigated the effects of exercise on selective attention, a cognitive process that involves prioritized processing of a subset of available inputs over others. Twenty-four healthy participants (12 women) underwent two experimental interventions in a random, crossover, and counterbalanced design: a vigorous-intensity exercise (60%-65% HRR) or a seated rest (control) condition. Before and after each protocol, participants performed a modified selective attention task that demanded attending stimuli of different spatial frequencies. Event-related magnetic fields were concurrently recorded using magnetoencephalography. The results

showed that exercise, relative to the seated rest condition, reduced neural processing of unattended stimuli and increased processing of attended stimuli. The findings suggest that changes in neural processing related to selective attention may be one of the mechanisms underlying the exercise-induced improvements in cognition.

FUNDING: The study was supported by the National Science Center, Poland (grant no. 2021/43/D/HS6/02959) and by the German Research Foundation (DFG) – project number 44541416 (CRC-TRR 58: Project C08).

POSTER SESSION II-013 | VOLITIONAL SIGHING AND RESONANCE BREATHING ALTER CARDIORESPIRATORY PHASE

Neel Muzumdar, Samuel Zhang, Kelsey Piersol, Jennifer Buckman
Rutgers University

Descriptors: Breathing, Phase, Sighing

Structured breathing manipulations alter autonomic functioning, improve cognitive performance and enhance psychological well-being. For example, heart rate variability (HRV) biofeedback has ample therapeutic value across cognitive and emotional domains. At the root of HRV biofeedback is breathing paced at 0.1Hz, which elicits a resonance of respiratory and cardiac oscillations by constructive interference and likely augments parasympathetic activity. Our laboratory has been testing other structured breathing manipulations, including paced volitional sighing paradigms wherein participants self-induce a sigh every 15s or 30s. Early studies demonstrated that these paradigms elicit non-habituating sympathetic activation, which may produce destructive interference. This secondary data analysis aims to evaluate phase between respiration and inter-beat interval (IBI) at rest versus during a resonance (0.1Hz) breathing and two sighing (0.033Hz & 0.066Hz) tasks. Data from 35 students from a 2-year prospective study of changes to cardiovascular flexibility by college lifestyle behaviors, such as drinking, were evaluated. Significant within-person changes in phase were observed across tasks ($F=1.67$, $p=0.026$). As expected, a phase $\sim 180^\circ$ was found during resonance breathing. Cardiorespiratory phase shifts were more pronounced when sighing frequency doubled, but both shifts were substantially smaller than those observed during resonance breathing. It is possible that consistency of structured breathing can synchronize cardiorespiratory processes, regardless of autonomic influence.

FUNDING: This research was supported by R01 AA027017.

POSTER SESSION II-014 | ARE YOU, MY TYPE? A META-ANALYTIC REVIEW OF THE IMPACT OF TASK TYPE ON THE RELATION BETWEEN ANXIETY AND THE N200

Morgan Middlebrooks, Matt Judah, Hannah Hamrick, Russell Mach, Wesley Vaught, Grant Shields
University of Arkansas

Descriptors: N200, Anxiety, Cognitive Control

Increasing evidence has suggested that anxiety can have an impact on several cognitive processes, including cognitive control. However, there are inconsistencies in the directionality, size, and interpretation of that effect in the extant literature, which has led to uncertainty about the relationship between anxiety and cognitive control processes. These variable effects seem particularly evident in literature that uses the N200 as a neural marker of cognitive control. To address these inconsistencies, we conducted a meta-analysis followed by a meta-analytic review of the relation between anxiety and cognitive control. We found that there was not a significant association between measures of anxiety and the N200. These findings also indicated that moderating variables are likely to better explain the relationship between anxiety and the N200. Given the small sample of articles, we employed a systematic review to better understand if there were trends within the articles. Our findings indicate that the direction and effect size of the relationship between anxiety and the N200 seem to be related to task characteristics including the type of task. Our findings indicate a need for researchers to better understand that impact of task characteristics.

POSTER SESSION II-015 | P3A AMPLITUDE PREDICTS CUE-SPECIFIC EXPLORATION IN HAZARDOUS DRINKERS

Garima Singh¹, Ethan Campbell¹, Katie Witkiewitz¹, Jeremy Hogeveen¹, Eric Claus², Vincent Costa³, James Cavanagh¹

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Descriptors: Explore-exploit tradeoff, hazardous drinkers, P3a

Hazardous drinking is associated with maladaptive alcohol-related decision-making. We recruited 55 participants (Hazardous drinkers =27, Control=26) during EEG. Participants completed a three-armed bandit task with alcohol and non-alcohol beverage stimuli. We tested neural substrates of explore-exploit

behavior in hazardous drinkers. Results showed that participants tended to exploit more often than they explored ($MD=0.063$; $t(52)=2.73$, $p=.008$), but they also explored more often than they chose worst stimulus ($MD=0.064$; $t(52)=3.78$, $p<.001$). Importantly, explore-exploit behavior was predicted by an interaction between group and cue type ($b=-0.416$, $p<.001$). Hazardous drinkers explored alcohol stimuli more often than controls ($b=-0.208$, $p=.009$) and controls explored non-alcohol stimuli more often than hazardous drinkers ($b=0.208$, $p=0.009$). Probability of selecting novel stimulus was predicted by a three-way interaction between group, chosen cue type, and P3a amplitude ($b=0.155$, $p=0.025$). In hazardous drinkers, the decision to explore novel alcohol cues was associated with a larger P3a relative to controls ($b=0.133$, $p=0.007$). This is first study to show that hazardous drinkers demonstrate an alcohol cue-specific bias in explore-exploit tradeoff. Altogether, these results suggest the P3a can track how highly salient information informs maladaptive decision-making processes in hazardous alcohol use.

FUNDING: This work was supported by a University of New Mexico President's Grand Challenges pilot award, NIAAA R01AA023665 award for Dr. Claus and Dr. Witkiewitz. Dr. Hogeveen's effort while writing this manuscript was supported via NIGMS (P20GM109089). Dr. Cavanagh and Garima Singh were supported by R01MH119382.

POSTER SESSION II-016 | THE RELIABILITY OF COMMON BEHAVIORAL AND ELECTROPHYSIOLOGICAL MEASURES ASSOCIATED WITH STOP-SIGNAL TASK PERFORMANCE

Christina Thunberg, Thea Wiker, Carsten Bundt, Rene Huster
University of Oslo

Descriptors: *response inhibition, reliability, stop-signal task*
 Response inhibition is often investigated using the stop-signal task (SST), and the associated horse race model allows for quantifying an individual's stopping latency (stop-signal reaction time, SSRT). Individual differences in SSRTs are increasingly used to relate inhibitory capabilities to other cognitive measures as well as brain structure and function, and individual difference frameworks often conceptualize inhibitory capabilities as stable traits. However, recent work questions the temporal stability of the SSRT. We estimated test-retest reliability for a range of behavioral and electrophysiological measures from the stop-signal task using data from three different samples ($N=24$, $N=20$, $N=32$). Behavioral variables reflecting manifest behavior (e.g., go reaction times) appeared quite

stable across time, but variables presumably reflecting a latent inhibitory process less so - the SSRT and EMG variables associated with behavioral stopping were rather unstable, though the latter showed some variability based on estimation method. Stop-related EEG variables, like the amplitudes and latencies of N2 and P3 ERPs, on average appeared more stable than the SSRT and EMG variables regardless of estimation method, but they are unlikely to directly reflect an inhibitory process. This suggests that measures of behavioral stopping might be too unstable to capture trait-like differences, either because of methodological limitations or because they do not reflect a stable trait in the first place.

POSTER SESSION II-017 | ALEXITHYMIA PREDICTS RESPONSE INHIBITION-RELATED FRONTAL THETA POWER IN HEALTHY ELDERLS

Mary Polking, Elizabeth Paitel, Sarah Evans, Christian Otteman, Erik O'Reilly, Kristy Nielson
Marquette University

Descriptors: *Alexithymia, Theta power, Inhibitory control*
 High alexithymia via difficulty identifying feelings (DIF) is associated with deficits in cognitive control, such as decreased ability to appropriately inhibit responses to competing stimuli. Given that alexithymia increases and cognitive control decreases in older age, we examined the relationship of alexithymia, and specifically DIF, to frontal theta power, a neural correlate of cognitive control. Theta power typically declines with healthy aging, but elevated theta power in elders is associated with early-stage dementia. We hypothesized that DIF would predict theta power differently across age groups, and accordingly we investigated the contributions of age and DIF (Toronto Alexithymia Scale-20) to frontal and frontal-central theta power during successful stop-signal task response inhibition in young ($n=42$, 31 female, $Mage=19.9$) and cognitively intact older adults ($n=45$, 34 female, $Mage=79.7$). Older age predicted lower theta power, while DIF moderated the relationship between age and theta power at frontal midline and left frontal-central sites. Specifically, the conditional effect of DIF on task-related theta power was non-significant in young adults, while higher DIF predicted greater theta power in elders. Elders with higher DIF and greater theta power also had the poorest global cognition and working memory. These results suggest that in healthy elders, higher alexithymia via DIF may exacerbate age-related neurodegeneration, increasing risk for future cognitive decline.

FUNDING: Private contribution from Thomas J. Salentine (KN) and NSF grant #1854158 (KN).

POSTER SESSION II-018 | REPLICATING THE EFFECTS OF TEST ANXIETY ON COGNITIVE CONTROL: AN ERP STUDY

Rochely Negron-Martinez, Aminda O'Hare
Weber State University

Descriptors: Test Anxiety, Event-Related Potentials (ERPs), Go/No-Go Flanker

Previous research has found that individuals with higher levels of test anxiety produce larger N200 responses to stimuli that require behavioral inhibition (Wei et al., 2021). This indicates that test anxiety can interfere with executive attention and cognitive control even outside of a traditional academic testing environment. This study seeks to replicate this effect using a modified No-Go Flanker task while also examining the relationship among anxious apprehension, test anxiety and cognitive control using 64-channel EEG. Participants ($n = 64$) were found to have larger N200 responses to No-Go trials compared to incongruent and congruent trials; however, levels of trait anxiety nor levels of anxious apprehension were related to this effect. Delayed P3b responses to incongruent and no-go trials compared to congruent trials were also found, and as individuals increased in anxious apprehension the latency of the P3b response to incongruent trials got later. This indicates that anxious apprehension may be the stronger driver underlying the effects of test anxiety on cognitive control. In particular, anxious apprehension seems to delay continued processing and context updating of incongruent trials.

FUNDING: The first author was awarded a \$2500 research fellowship from Weber State University's Office of Undergraduate Research for this project.

POSTER SESSION II-019 | FRONTAL LOBE CONNECTIVITY DURING RESPONSE INHIBITION SHOWS AGE-RELATED VULNERABILITY DUE TO ALEXITHYMIA, ESPECIALLY IN WOMEN

Christian Otteman, Elizabeth Paitel, Mary Polking, Erik O'Reilly, Kristy Nielson
Marquette University

Descriptors: Functional connectivity, Alexithymia, Aging
Difficulty identifying feelings (DIF) is a facet of alexithymia linked to poorer executive functioning (EF), especially in older age, which might contribute to age-related cognitive decline. Yet, age- and DIF-related impacts on EF neural networks are under-studied. Using electroencephalography (EEG) source estimation,

we investigated EF-related frontal connectivity during successful inhibition in stop-signal task trials over the N200-P300 time window, associated with inhibitory subprocesses. We expected DIF to moderate the relationship between age and frontal lobe connectivity in cognitively intact older adults ($n=43$, 33 female, $M_{age}=79$). Those with higher DIF had lower right anterior cingulate cortex (ACC)-left superior frontal gyrus (SFG) connectivity (N200 and P300 windows), suggesting inhibitory and conflict processing difficulty. Further, females with higher DIF had greater right inferior frontal gyrus (rIFG)-bilateral ACC connectivity (N200), suggesting greater resources were needed for successful stopping. Right ACC-rIFG connectivity also correlated with better stop accuracy and faster stop-signal reaction time, supporting this network's role in successful inhibition. Overall, during successful inhibitory control, higher DIF was associated with reduced conflict processing efficiency and greater resource allocation for motor stopping, especially in women. Thus, alexithymia (via DIF) may exacerbate age-related EF dysfunction and risk for future cognitive decline.

FUNDING: Private contribution from Thomas J. Salentine (KN) and NSF grant #1854158 (KN).

POSTER SESSION II-020 | EXPECTING A SECOND TASK CAUSES REDUCED ERROR-RELATED BRAIN ACTIVITY IN DUAL-TASKING

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Catholic University of Eichstätt-Ingolstadt

Descriptors: Cognitive control, Error detection, Dual-tasking
Detecting errors in our own behavior is critical for improving task performance. A reliable error monitoring system is even more important in dual-tasking, where not only task processes but also multiple error monitoring processes may interfere with each other. While dual-tasking has been shown to cause reduced error-related brain activity, it remains unclear whether this effect is due to interference or is strategic in nature and reflects adaption to limited capacity. In the present study, we considered error-related brain activity in event-related potentials to investigate whether reduced error monitoring in a first task occurs even if a second task is only expected but does not occur. In a psychological refractory period paradigm, we manipulated the probability of the occurrence of a second task, and found that amplitudes of both the error negativity and the error positivity are predicted by the probability of the occurrence of a second task alone, while the actual occurrence of a second task had no additional influence. This provides

evidence that dual-task costs in error monitoring reflect expectancy-based strategies rather than dual-task interference.

FUNDING: Funded by the Deutsche Forschungsgemeinschaft (German Research Foundation) within a priority program "Multitasking".

POSTER SESSION II-021 | LONGITUDINAL TRAJECTORIES OF THE LATE POSITIVE POTENTIAL FROM CHILDHOOD TO YOUNG ADULTHOOD

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Descriptors: LPP, Development, Cognition

The late positive potential (LPP) is a neural index of sustained and elaborative processing of emotionally salient stimuli. Research suggests that the LPP reduces across childhood and adolescence, but there have been few longitudinal studies. The current study used multilevel modeling to examine the developmental trajectory of the LPP from childhood to young adulthood. The LPP was measured in response to neutral, pleasant, and unpleasant images during an emotional interrupt task. Longitudinal data from female participants ($N=306$) were collected across four timepoints with ages ranging from 8- to 23-years-old. Two 2-level multilevel models (random slopes and intercepts) tested the impact of age, image type, and their interaction on the LPP (300-1,000 ms) at Oz and Pz electrodes. The models showed that, as age increased, the LPP significantly decreased at the Oz electrode but not at Pz. An interaction between age and condition highlighted that, at Oz, the LPP decreased significantly greater in response to pleasant and unpleasant content compared to neutral. At Pz, only the LPP response to unpleasant content decreased significantly compared to neutral. Results showed that the LPP reduced across development from childhood to young adulthood, particularly for emotional stimuli. The impact of age on the LPP was most reliable at the occipital rather than parietal electrode site. These multilevel analyses provide additional evidence that neural reactivity indexing elaborative processing and sustained attention toward emotional stimuli reduces from childhood into young adulthood.

FUNDING: National Institute of Mental Health R01MH097767 (PI: Nelson) Klingenstein Third Generation Foundation (PI: Nelson).

POSTER SESSION II-022 | NEURAL CORRELATES OF AFFECTIVE INHIBITION IN REJECTION SENSITIVITY ACROSS SOCIAL AND ASOCIAL CONTEXTS

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University of South Florida

Descriptors: Rejection Sensitivity, Affect, Inhibition

Rejection sensitivity is the extent to which individuals anticipate and respond to potential rejections. People with higher levels of rejection sensitivity have shown reductions in top-down emotional regulation, but current research is primarily limited to the use of rejection-specific stimuli. This study investigates the relationship between rejection sensitivity scores, measured using the 18-question Rejection Sensitivity Questionnaire (RSQ), and inhibition, measured by the conflict N2 ERP component, across social and asocial affective contexts. The study employed two novel affective flankers to examine previously identified patterns in both social and asocial contexts: one featuring smiling and contemptuous faces, and one using human-free affective images sourced from the International Affective Picture System (IAPS). Highly rejection sensitive individuals demonstrated reduced N2 amplitudes compared to those with average rejection sensitivity regardless of social context, indicating overall reduction in inhibitory capacity. Results from the social-affective flanker showed that, while N2 amplitudes towards incongruent trials with rejection-congruent (contemptuous) expressions were undifferentiated across groups, highly rejection sensitive individuals showed a marked decrease in N2 for incongruent trials with smiling flankers compared to their less rejection sensitive peers, suggesting that high levels of rejection sensitivity are associated with a lack of positive bias within social contexts.

POSTER SESSION II-023 | MEASURING IMPLICIT EVALUATION OF FOOD USING THE CONCEALMENT INFORMATION TEST

Asuka Miyahara¹, Hana Muto¹, Kiyomitsu Niioka¹, Takayuki Yamamoto², Moe Arai², Ryo Tanaka², Rieko Fuji², Satoko Ishiguro², Hitomi Tsuchiya², Masato Kawamoto², Ippeita Dan¹

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Descriptors: concealment information test, fNIRS, implicit evaluation

We examined the possibility of applying the concealment information test (CIT), used in criminal investigations, to measure implicit evaluation of food. The CIT draws upon multiple autonomic responses when a suspect responds to one crime-relevant and several irrelevant questions. Similarly, when a person denies the fact that they ate something that they had in fact eaten, specific neural responses could be identifiable based on their recognition of the denial and cognitive inhibition. Fourteen subjects were asked to eat one sweet randomly chosen from among four sweets then underwent a task based on the CIT: they were required to answer “No” to all questions, such as “Did [name of a sweet] taste good?”. We measured cortical hemodynamic responses using fNIRS and 7 autonomic response indices, including normalized pulse volume (NPV), to evaluate differences produced by their answers to questions about the sweets they had eaten and those they had not. Their answers for the sweet they had eaten elicited lower NPV ($d=-0.57$) and greater activations on the left premotor and supplementary motor cortices than those for the sweets they had not ($d=0.61$). Activation on the right dorsolateral prefrontal cortex was only evoked by answers for the sweet they had eaten ($d=0.53$). Similar responses have been reported in CIT studies using mock crimes. Our results imply that two-faceted information processing, recognition of the sweet eaten and inhibition, is involved in an untrue denial response to a question and, thus, that the CIT could be applied for measuring implicit evaluation of food.

POSTER SESSION II-024 | CONCURRENT WORKING MEMORY LOAD MODULATES THE CARDIAC TIMING EFFECT ON CHOICE REACTION TIME

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Old Dominion University

Descriptors: Cardiac timing, Sensorimotor processing, Working memory load

Sensorimotor processing is inhibited during cardiac systole, which is known as the cardiac timing effect and has been explained by the inhibition of baroreceptor activation on central information processing (Lacey, 1967). Recent studies challenged the validity of cardiac timing effects and showed that the complexity of sensorimotor responses modulated the neural influences of baroreceptor signals (Adelhöfer et al., 2020; Larra et al., 2020). However, cognitive mechanisms underlying the modulation of response complexity on cardiac timing effects remain unclear. Forty-eight ($M_{age} = 21.9$ years; 32 female)

subjects performed a choice reaction time (CRT) task and a concurrent Sternberg working memory (WM) task. CRT stimuli were presented at cardiac systole or diastole. RT and response accuracy were submitted to 2 (no load or WM load) $\times 2$ (cardiac systole or diastole) repeated measures ANOVAs. While there was no main effect of cardiac timing, WM load prolonged RT, $F(1, 47)=45.6$, $p<.001$. Importantly, WM load interacted with cardiac timing, $F(1, 47)=9.6$, $p=.003$. Planned contrasts indicated that cardiac systole increased RT, $t(47)=11.3$, $p=.039$, under no load, whereas systole speeded RT, $t(47)=-13.6$, $p=.038$ under WM load. Moreover, no main effect or interaction of accuracy was evident, $ps>.26$. The results indicate that baroreceptor activation impairs automatic cognitive processes but improves effortful processing. Modulation of response complexity on cardiac timing effects may arise from different levels of WM resources that are required by sensorimotor response.

POSTER SESSION II-025 | FACE PROCESSING AND THE EXPRESSION OF RACE BIAS: EFFECTS OF BETWEEN-AND WITHIN-PERSON VARIABILITY IN MOTIVATION TO ENGAGE CONTROL

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Descriptors: ERPs, Social Neuroscience

Engagement of cognitive control is a dynamic process that varies both within individuals (across situations) and between individuals (e.g., according to goals and cognitive ability). A prominent theory holds that the expected value of exerting control, reflected in activation of dorsal anterior cingulate cortex (dACC), determines the extent to which control will be engaged. We used a regression disaggregation approach to characterize the dynamics of control as a function of within-person dACC activation (response-locked medial-frontal negativity; MFN) on a given trial tuning attention to control-related cues (stimulus-locked P2) on the next trial, and how this dynamic differs as a function of between-person motivations to engage control. Undergraduates at two American universities ($N=139$, 58% male, $M_{age} = 19.74$, 130 White, 6 Black, 9 Asian, 4 Hispanic/Latinx) completed the Internal (IMS) and External (EMS) Motivation to Respond without Prejudice scale prior to completing a lab task



designed to measure expression and control of race bias. Separate multilevel models showed that response-locked MFN amplitude on a given trial predicted attention to race (P2 amplitude) on the following trial, and that P2 amplitude on a given trial predicted control of bias behavior on that trial. Both effects were moderated by between-subject motivation: among high-IMS/low-EMS individuals, previous-trial MFN predicted next-trial P2 amplitude elicited by Black men's faces, which predicted better control of bias on that trial. Implications for models of control dynamics will be discussed.

FUNDING: NSF Grant BCS 0847872.

POSTER SESSION II-026 | EXAMINATION OF THE N2 EVENT-RELATED POTENTIAL DURING A FLANKER TASK IN AN ADULT INPATIENT PSYCHIATRIC SAMPLE AND ITS RELATIONSHIP TO ANHEDONIA: FEASIBILITY AND PRELIMINARY FINDINGS

Timothy McDermott^{1,2,3}, Mario Bogdanov^{1,2}, Jozi Tatham¹, Allyna-London Howell¹, Abdirahman Osman¹, Shafi Rubbani¹, Carmen Irujo¹, Joann Chen¹, Samantha Linton^{1,2}, Antonia Seligowski^{1,2}, Kerry Ressler^{1,2}, Diego Pizzagalli^{1,2}
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Descriptors: Electroencephalography, Event-related potentials, Psychiatry

The flanker task is used to probe response conflict and error monitoring, and the N2 event-related potential (ERP) is maximal at frontal electrodes and has been linked to cognitive control. Prior studies of adult outpatient psychiatric patients have linked reduced N2 amplitude to anhedonia. Few studies have examined this link in transdiagnostic psychiatric inpatients during hospitalization, which could provide valuable information regarding the relationship between cognitive control, anhedonia, and N2 amplitudes during acute psychiatric episodes. The present study examined N2 amplitudes during a flanker task in 30 adult inpatients who were recruited during admission at a psychiatric hospital (mean age=34.54 years, 12 men) and who completed 96-channel electroencephalography (EEG) and symptom surveys. Standardized data cleaning and artifact correction (independent components analysis) procedures were completed. N2 associations were tested with the Snaith-Hamilton Pleasure Scale (SHAPS). Results showed, as expected, that the N2 was significantly modulated by conflict with greater N2

responses during incongruent compared to congruent trials [$t(26)=2.68$, $p=.013$]. Additionally, EEG data were of good quality with 90% of recordings passing EEG data quality inspections (27/30). However, SHAPS scores were not significantly associated with N2 amplitudes ($r=-.27$, $p=.21$). Future work using a larger sample could examine associations with greater statistical power, but these findings support feasibility to study the N2 with high-density EEG in an adult inpatient sample.

FUNDING: This research was funded through a foundation grant from the Wellcome Trust Foundation. This grant titled, McLean Dissection of Anhedonia: From Neural Systems and Multiomics to Behavior, was awarded to Dr. Kerry Ressler and Dr. Diego Pizzagalli, who are co-senior authors for this poster presentation.

POSTER SESSION II-027 | RECONSIDERING THE FRONTAL HYPO-ACTIVITY HYPOTHESIS: INHIBITION-RELATED NEURAL ACTIVITY IN (POLY-)SUBSTANCE USERS PREDICTS SUBSTANCE-RELATED PROBLEMS BEYOND THE DEGREE OF SUBSTANCE USE

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 Technical University Dresden

Descriptors: Substance Use Disorder, Inhibitory Control, Dimensional

Inhibition-related frontal hypoactivity is considered a risk factor for substance use disorder (SUD) but studies comparing SUD to controls reported inconsistent results. This could result from distinctive associations of inhibition-related neural activation with substance-related problems and the degree of substance use, two correlated but distinct facets of SUD, reflecting a potential confounding effect. This preregistered study examined whether neural correlates of inhibition are specifically associated with substance-related problems and thus SUD. Past year substance use, substance-related problems and a fMRI stop signal task were assessed in 121 (poly-)substance users, 107 completed a follow-up. We tested the association between inhibition-related neural activation in regions of interest and substance-related problems controlling for the degree of substance use. Hypoactivity in the right inferior frontal gyrus predicted substance-related problems beyond substance use, while hyperactivity predicted variance in substance use beyond problems, both cross-sectionally (problems: $p=.048$, use: $p<.01$) and prospectively (problems at trend level: $p=.096$, use: $p=.01$). We show that inhibition-related frontal hypoactivity specifically relates

to substance-related problems, whereas hyperactivity may mediate resilience to SUD. Previous inconsistent results may be explained by not accounting for these opposing associations. Our findings argue for a dimensional approach, controlling for the degree of use, to examine specific links to substance-related problems.

FUNDING: This study was supported by the Else-Kröner-Fresenius Stiftung (grant no. 2020_EKEA.70 to RD) and the collaborative research center (TRR 265, B01).

POSTER SESSION II-028 | TASK MODERATES RELATIONSHIP BETWEEN N2 CONFLICT MONITORING, WORRY, AND ANHEDONIA

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Descriptors: Conflict Monitoring, N2

Impairments in conflict monitoring, as indexed by N2, are related to anxiety and depression symptoms. Two commonly used tasks to elicit N2 include the flanker and Stroop tasks, but it remains unclear whether N2 across each task is functionally distinct. Therefore, we sought to determine whether N2 uniquely relates to anxious apprehension (i.e., worry) and anhedonia symptoms during the flanker and Stroop tasks. We collected high-density EEG data from 128 participants while they completed flanker and Stroop tasks. Multilevel models predicted single-trial N2 amplitude from task, anxiety, and depression symptoms. There was a three-way interaction between task, worry, and anhedonia, where N2 differed by anhedonia across tasks at high versus low levels of worry. At low levels of worry, larger Stroop N2 is related to higher levels of anhedonia, but at high levels of worry, smaller Stroop N2 is related to higher levels of anhedonia. During the flanker task, across levels of worry, larger N2 was related to higher levels of anhedonia. These findings indicate that high levels of worry might compensate for the lower attention to conflict with high levels of anhedonia. These results indicate that task moderates the relationship between N2 and worry or anhedonia and imply the ways in which worry and anhedonia influence conflict monitoring across tasks may be functionally distinct. Future studies of psychopathology should consider both worry and anhedonia and question interpretations of effects that do not consider the task used for recording.

POSTER SESSION II-029 | WORKING MEMORY LOAD REDUCES ERROR-PROCESSING: AN ERP STUDY

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Descriptors: ERN, Pe, flanker task

Error monitoring is essential for avoiding costly mistakes. Moreover, error monitoring must sometimes occur alongside other cognitively demanding processes, such as concurrent working memory load. While some prior work suggests that error monitoring may be somewhat automatic, and should be unaffected by concurrent cognitive demands, other work has found the opposite. Here, we used a dual-task paradigm to examine whether ERP components, the error-related negativity (ERN) and error positivity (Pe), are reduced during high versus low working memory load. Fifty-four participants (33 females; M age = 19.70 years, SD = 1.45) completed an arrowhead flanker task, with trials presented under low (2 letter) or high (6 letter) working memory load. Frequentist and Bayesian statistics indicated that working memory load did not affect the ERN, $p > .33$, $BF = 0.348$. On the other hand, working memory load reduced the Pe, $F(1, 53) = 5.38$, $p = .024$. Additionally, high working memory load slowed reaction times, and faster reaction times for error versus correct responses were only observed on low-load and not high-load trials, $F(1, 53) = 7.11$, $p = .010$. No effect of working memory load was observed for flanker accuracy. Therefore, working memory load appears to attenuate later, more elaborated stages of error processing, though error detection may be unaffected. In addition, slower responses on high-load trials might facilitate comparable accuracy for high-load and low-load trials. When people make errors under high working memory load, the processing of error salience/significance is reduced.

FUNDING: This work was supported in part by NIMH R01 MH125083 (MacNamara).

POSTER SESSION II-030 | IS NEUROCOGNITIVE FUNCTION RELATED TO CARDIORESPIRATORY FITNESS AND AIR POLLUTION? - RESULTS FROM THE 4HAIE STUDY

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Descriptors: global cognitive score, cardiorespiratory fitness, air pollutants

Air pollution may affect cellular and molecular events in the brain. Exercise enhances brain plasticity processes and improves cognition. Whether the benefits of exercise on the brain also apply when exercise is performed in polluted air is poorly understood. We investigated the association among neurocognitive correlates, air pollution and cardiorespiratory exercise. Data of the Czech Healthy Aging in Industrial Environment study-Programme 4 were used. The sample for this presentation included 427 participants aged 40-65 yrs who lived either in high air-pollution or in a control region. Neurocognitive markers were global cognitive score (a summ of z-scores of memory and executive function tests) and a total grey matter volume. Neuroimaging was performed using 1.5T Siemens Magnetom Scanner. Participants were categorised into those with low, medium or high cardiorespiratory fitness, indexed by maximum oxygen uptake. Multivariable regression showed that after controlling for potential covariates participants with medium and high fitness had no differences in grey matter volume and cognitive score by area of living (polluted or control region) ($p > 0.245$). However in nonfit participants from polluted area we observed that grey matter volume was smaller ($p=0.01$) and executive functioning worse ($p=0.05$) as compared with nonfit participants from control area. Aerobic exercise may be a natural protective factor against the negative effects of air pollution and potentially support neuroplasticity and mechanisms of oxygen transport even in people living in areas with air pollution.

FUNDING: This research was co-funded by European union and Ministry of Education, Youth and Sports of the Czech Republic, grant number CZ.02.1.01/0.0/0.0/16_019/0000798 Program 4 Healthy Aging in Industrial Environment.

POSTER SESSION II-031 | EXCITATORY STIMULATION OF THE VENTROMEDIAL PREFRONTAL CORTEX REDUCES COGNITIVE BIASES IN A GAMBLING TASK

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³University of Siegen, ⁴University Clinic of Münster

Descriptors: Magnetoencephalography, Transcranial direct current stimulation, Rationality and Learning

Humans are subject to a variety of cognitive biases, such as the framing-effect or the gambler's fallacy, that lead to decisions unfitting of a purely rational agent. Previous studies have shown that the ventromedial prefrontal cortex (vmPFC) plays a key role in making rational decisions and that stronger vmPFC activity is associated with attenuated cognitive biases. Accordingly, dysfunctions of the vmPFC are associated with impulsive decisions and pathological gambling. By applying a gambling paradigm, we demonstrate that vmPFC excitation via transcranial direct current stimulation (tDCS) reduces the framing-effect and the gambler's fallacy compared to sham stimulation. Corresponding magnetoencephalographic data suggest improved inhibition of maladaptive options after excitatory vmPFC-tDCS. Our analyses indicate that the underlying mechanism is improved reinforcement learning, as effects only emerge over time. These findings encourage further investigations of whether excitatory vmPFC-tDCS has clinical utility in treating pathological gambling or other behavioral addictions.

FUNDING: Supported by the DFG (project JU 445/9-1) and the National Science Center (UMO-2018/31/G/HS6/02490).

POSTER SESSION II-032 | DIFFERENTIATING RISK FROM REWARD MOTIVATION IN DECISION MAKING

Xinyi Deng, Marlen Gonzalez
Cornell University

Descriptors: Risk tolerance, Reward sensitivity, multi-echo fMRI

As key phenotypes in decision making, risk tolerance and reward sensitivity are related but distinct. However, few neuroimaging studies have directly compared rewards with and without risk in the same context. To fill this gap, we modified a Balloon Analogue Risk Task (BART) to include reward-only trials and modeled neural correlates of reward anticipation with and without risk. During 10-min multi-echo fMRI scans of mesolimbic regions, 46 participants (all cis; 28 females) inflated balloons across three conditions: 1) earn monetary reward but risk loss if a balloon popped (RWR); 2) earn reward without risk (RWOR); and 3) no loss or gain (neutral). Multi-echo data were preprocessed with AFNI and Tedana and sequentially analyzed with FSL GLM and permutation testing (TFCE; 5000

permutations), using the number of pumps as parametric modulator. Compared to the neutral, anticipatory RWR showed greater activation in the insula, ventral- (VS) and dorsal striatum, brainstem (BS), thalamus (TH), prefrontal (PFC) and visual cortices (VC). Similarly, RWOR coincided with greater activation in the right frontal pole and middle temporal gyrus, and VC, surprisingly, not in VS. The contrast [RWR > RWOR] showed increased activity in the insula, right caudate, BS, TH, PFC, and VC. Our results suggest that RWR decision-making recruits canonical reward areas and insula, but risk involves greater recruitment of prefrontal and midbrain regions in the same task. We will further model risk-related differences in the consummatory phase to better differentiate risk tolerance from reward sensitivity.

POSTER SESSION II-033 | PAIN NOW! EXPLORING THE RELATIONSHIP BETWEEN PAIN AND INTER-TEMPORAL CHOICES

Taryn Berman, Mathieu Roy
McGill University

Descriptors: *Inter-Temporal Decision-Making, Pain, fMRI*
Accepting pain is counterintuitive, yet individuals willfully accept immediate discomfort to gain long-term benefits. Studies using hypothetical pain or short temporal delays suggest that people may prefer future pain to avoid immediate pain (Harris, 2012), while others propose that people prefer pain now to *get it over with* (Story et al., 2013). Our study sought to investigate how inter-temporal choices for pain are made, the underlying brain mechanisms, and what causes these inter-temporal differences. Participants ($N=60$) first underwent a sensory calibration procedure to assess their pain tolerance. Next, they performed an inter-temporal choice task in an fMRI, wherein they selected between two choices which differed in pain intensity and delay. We found that subjects accepted more pain to experience it sooner. Using multilevel modeling, we found that delay and pain intensity for each offer predict pain now decisions. Brain imaging analyses revealed clusters of neural activation in regions associated with imagining the future while thinking about temporal delay; moreover, dorso-medial prefrontal cortex activity was related to evaluative aspects of pain perception while pondering pain intensity. Overall, our results suggest that people would rather accept more pain now than wait for less. Neural activation patterns suggest a focus on delay – not pain – with increasing delay and that evaluative aspects of pain are more important than the pain itself. This study has important implications for

interventions aimed to reduce detrimental biases that lead to added suffering.

FUNDING: This work was funded by the Natural Sciences and Engineering Research Council of Canada; Healthy Brains, Healthy Lives; and the Fonds de recherche du Québec - Nature et Technologies.

POSTER SESSION II-034 | POSTTRAUMATIC STRESS DISORDER AND HISTORY OF CHILD SEXUAL ABUSE: BLUNTED RESPONSE OF MIDCINGULATE CORTEX TO AVERSIVE PICTURES

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Mariana Teixeira¹, Leticia Oliveira², Mirtes Pereira²,
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¹Federal University of Rio de Janeiro, ²Fluminense Federal University

Descriptors: *Child sexual abuse, fMRI, Midcingulate cortex*
Child sexual abuse (CSA) is the most severe form of child maltreatment. The effects of CSA are long-lasting and can precipitate severe and disabling mental disorders in adulthood, such as Posttraumatic Stress Disorder (PTSD). Considering the evidence of a special role of the midcingulate cortex (MCC) for integrating emotional and motor signals, activity in this region was investigated. Mutilation and matched control pictures were briefly presented to patients with PTSD ($n=20$). They also completed a questionnaire about sexual abuse during childhood, and according to the presence of CSA, equally separated into two groups, with and without CSA. fMRI data analyses were performed through the SPM12 and Marsbar softwares. BOLD responses to mutilation and neutral pictures were compared through t-tests, in each group. Correlation with MCC reactivity (mutilation-neutral) and the severity of CSA was tested through robust correlation analysis. Patients without CSA increased BOLD responses in the MCC to mutilation pictures compared to neutral ones (right MCC: $p=0.05$; left MCC: $p=0.01$). Patients with CSA did not show a significant difference between those pictures (right MCC: $p=0.37$; left MCC: $p=0.85$). Among all patients, there was a significant negative correlation between the severity of CSA and the left MCC reactivity ($\rho=-0.47$; $CI[-0.75 -0.03]$). The results in patients with PTSD and CSA point to a seemingly blunted MCC reactivity to aversive pictures, indicating an atypical, and probably dysfunctional, excitability of this brain region associated with the intense traumatic events of CSA.

FUNDING: This work was supported by the National Council for Scientific and Technological Development

(CNPq), the Carlos Chagas Filho Foundation of Research Support in Rio de Janeiro (FAPERJ), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES - Finance Code 001), and Financiadora de Estudos e Projetos (FINEP - Apoio Institucional 03/2016 - Ref 0354/16).

POSTER SESSION II-035 | PREDICTION OF EMOTIONAL STATES BY BODY ACTIVITY WITH MACHINE LEARNING

Roydon Goldsack, W. Bastiaan Kleijn,
Hedwig Eisenbarth
Victoria University of Wellington

Descriptors: Machine learning, Emotion, Movement

Previous literature focused solely on the *accuracy* of machine learning (ML) models when predicting emotional states with various inputs. Such studies overlook theoretical questions about the relationship between body activity and emotion in favour of maximising prediction accuracy. The current study applied a novel ML model to investigate *how* body activity can predict emotional state in positively and negatively valenced social interactions ($N=39$ dyads). In a $3 \times 3 \times 2 \times 2$ design we varied emotion measure, body activity measure, conversation valence, and whether the data trained/tested on was randomly generated data or real data. The prediction error of the ML models was the dependent variable in statistical analyses. The ML models trained/tested predicting emotion measures that assess the arousal and valence of an emotional state performed better than those with moment-by-moment ratings of arousal. Models with the participants' physiological activity as input predicted their emotional state more accurately than models with their movement as input. In addition, the models trained/tested on negatively valenced conversations predicted participants' emotional states significantly better than those for positively valenced conversations. Thus, an emotional state was best predicted when referring to reports of arousal *and* valence of the emotional state. The results underline the usefulness of physiological activity in understanding emotional states in a novel ML model. Results also indicate body language or movement may be less useful for predicting an emotional state.

FUNDING: Grant from the New Zealand Ministry of Business, Innovation and Employment.

POSTER SESSION II-036 | ASSOCIATION BETWEEN THETA PHASE SYNCHRONY DURING A CORTICAL PLASTICITY PARADIGM AND VISUAL PERCEPTUAL LEARNING

Holly Hamilton^{1,2}, Renée Dembo^{1,2},
Cassandra Marzke^{1,2}, Spero Nicholas^{1,2}, Brian Roach^{1,2},
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Descriptors: long-term potentiation, theta phase synchrony, cortical plasticity

Long-term potentiation (LTP), a form of experience-dependent synaptic plasticity, is the leading candidate mechanism of learning and memory. Visual stimulation paradigms show stimulus-specific response modulation of visual evoked potentials (VEPs) and provide a non-invasive index of LTP-like plasticity in human visual cortex. It remains unclear, however, how this form of LTP-like plasticity is associated with other basic mechanisms of learning. Participants ($n=45$) underwent EEG recording during a visual plasticity paradigm involving the presentation of a black and white checkerboard stimulus at baseline and 2, 40, and 52 minutes after exposure to 2 Hz visual stimulation for 10 minutes. Extending prior work using VEPs as readouts of plasticity, we examined stimulus-evoked changes in theta phase synchrony (intertrial coherence; ITC). Participants also completed a visual perceptual learning task involving speeded time-order judgment of two successive spatial frequency sweeps. Preliminary analyses ($n=19$) showed enhanced theta ITC from baseline to post-stimulation [$F(3,54)=2.95$, $p=.041$]. Greater gains in visual perceptual learning were associated with enhanced theta ITC across post-stimulation blocks ($r=.51$, $r=.62$, and $r=.60$, respectively, $ps<.035$). Results demonstrate visual stimulation-induced enhancements in theta synchrony, consistent with studies implicating theta oscillations in synaptic plasticity. Moreover, the observed associations between enhanced theta synchrony and perceptual learning further validate the LTP-like plasticity paradigm with respect to human learning.

FUNDING: This study was funded by Department of Veterans Affairs Grant IK2CX001878.

POSTER SESSION II-037 | EMOTIONAL FLOW FIRE UP EMBODIED PROCESSING AND RESPONSES TO COVID-19 VACCINE NARRATIVE PSA AMONG GEN Z

Yen-I Lee, Di Mu, Paul Bolls
Washington State University

Descriptors: Emotional Flow, Hope Appeal, Health Communication

Emotional flow is a crucial component of narrative engagement and subsequent persuasive influence due to narratives involving a series of emotional shifts over the story (Nabi & Green, 2015). Nabi and Myricks (2019) found messages with fear appeal's efficacy associated with feelings of hope and enhanced persuasion about sun safety, which indicates the effects of emotional shifts on health communication. Also, gain-loss framings elicit different emotional responses. Building on emotional flow, hope, and framing literature, this study argues to reconceptualize emotional flow as a cognitive and emotional process under the media psychophysiology paradigm (Potter & Bolls, 2012) and unfold the mechanism of how emotional flow is evoked and built across time to impact Gen Z's psychological responses while viewing Covid-19 vaccine media content. A 2 (hope begin vs. end) x 2 (gain vs. loss framing) mixed-factorial design was conducted. Participants (N = 120) completed a self-report survey after viewing each randomized video. Arousal, cognitive attention, and emotional responses were measured by skin conductance, heart rate, and corrugator facial EMG. Results showed the interaction effect of framing and time on negative emotion ($F(35, 2590) = 2.47$, $p = .012$) and cardiac deceleration ($F(35, 3815) = 2.06$, $p = .006$), but no significant results on arousal. The results evidence reconceptualizing emotional flow and suggest that media content with loss framing elicited more negative emotions and more cognitive resources were allocated to encoding the content across time.

POSTER SESSION II-038 | BUILDING AND EVALUATING AN AI GENERATED, STANDARDIZED AFFECTIVE PICTURE DATASET

Faith Gilbert, Ethan Smith, Hannah Engle, Laura Ahumada Hernandez, Arash Mirifar, Christian Panitz, Jourdan Pouliot, Caitlin Traiser, Mingzhou Ding, Ruogu Fang, Andreas Keil
University of Florida

Descriptors: AI, Affective images, LPP

Affective pictures have been widely used for emotion induction. Challenges with this approach include that pictures over time become less pertinent to new generations of observers, and researchers may require more pictures than are available to meet experimental demands. This study sought to address these challenges by building and evaluating an AI-generated database that aims to create emotional pictures with predicted standardized ratings and user-defined content using the AI diffusion models. Participants viewed original pictures from the International Affective Picture System (IAPS) as well as matched exemplars from the AI-generated database. Emotional responses were assessed using the late positive potential (LPP)—an ERP component driven by emotional intensity—as well as through ratings of hedonic valence and emotional arousal. Participants viewed 120 total pictures categorized as pleasant (20), neutral (20), and unpleasant (20) of original IAPS images (60 total), and 60 matched, artificially reproduced, counterparts. Ongoing analyses demonstrate that the ratings for AI-generated and original IAPS pictures did not differ, both showing the expected effects of heightened displeasure and arousal for unpleasant pictures, and heightened pleasure and arousal for pleasant pictures, compared to neutral. LPP effects of emotional category were more pronounced for original pictures compared to AI-generated exemplars. Overall, findings suggest that AI-generated affective stimuli represent a promising avenue for creating and maintaining state-of-the-art emotion induction protocols.

POSTER SESSION II-039 | DEPRESSION, RESTING PARASYMPATHETIC ACTIVITY, AND EVALUATIVE RESPONSES

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Descriptors: Evaluative Processes, Parasympathetic Nervous System, Depression

How individuals perceive and interpret emotional information in their environment is connected to their mental health. For example, depression is linked to perceptual and attentional shifts indicative of increased negative responses to emotional stimuli. Similarly, lower resting parasympathetic nervous system activity is associated with increased sensitivity to cues of threat and increased risk for depression. Despite this, these two constructs have rarely been investigated together in

relation to emotion perception. The present work examined the relationships between resting parasympathetic activity, depressive symptomology, and evaluative and attentional responses to emotional words and images. Participants with lower resting parasympathetic activity and those with higher levels of depressive symptomatology rated pleasant and neutral stimuli as more positive, and these differences appeared to be linked to attentional shifts measured via reaction times. These findings are in contrast to prior research and suggest depressive symptomatology and resting parasympathetic activity may influence evaluative processes differently in sub-clinical populations. This work illustrates the complexity of factors influencing evaluative processes and points to a need for additional research on positivity responses associated with depression.

POSTER SESSION II-040 | ASSOCIATIONS OF EMOTION REGULATION DIFFICULTIES WITH CARDIAC AUTONOMIC BALANCE AND REGULATION

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University of California, Irvine

Descriptors: Self-regulation, Emotion regulation difficulties, Autonomic activity

Emotion regulation (ER) is a critical psychological process linked with cardiovascular health via the parasympathetic and sympathetic branches of the autonomic nervous system. Yet, research has not yet explored the link between difficulties in ER and levels of cardiac autonomic balance (CAB), defined as the relative balance between the two branches, and cardiac autonomic regulation (CAR), defined as the total activity of both branches. We thus examined this in 151 participants. Resting cardiac data was collected, and CAB and CAR were calculated using root mean square of successive differences (parasympathetic measure) and left ventricular ejection time (sympathetic measure). Difficulties in ER Scale was also used, which contains six subscales ER difficulties. Adjusting for covariates, results revealed that greater overall ER difficulties predicted lower CAR ($p = .02$) but not CAB ($p = .08$). When examining ER subscales, greater difficulties in emotional clarity uniquely predicted lower CAB ($p = .01$), while greater difficulties with non-acceptance of emotional responses ($p = .03$), engagement in goal-directed behavior ($p = .05$), impulse control ($p = .001$), and accessing emotion regulation strategies ($p = .03$) uniquely predicted lower CAR. These findings provide novel evidence suggesting

that 1) Autonomic regulation, as opposed to autonomic balance, may be more influenced by ER difficulties, and 2) Certain ER difficulties may be uniquely linked with specific patterns of sympathetic and parasympathetic activity as indicated by differential associations with CAB and CAR.

POSTER SESSION II-041 | HEART RATE VARIABILITY PREDICTS MEAN AND VARIABILITY METRICS OF EMOTION BUT NOT COGNITION

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Towson University

Descriptors: Heart rate variability, Emotion, Cognition

Vagally-mediated heart rate variability (vmHRV) has been presented as a biomarker for both cognitive and affective processes. In past research, the strength, or even the presence, of the relationships have varied based on how these constructs have been operationalized. Few studies have concurrently tested the relationship between vmHRV and both cognitive and affective metrics. To do so, one hundred thirty-one undergraduates alternated between watching neutral videos and completing tasks of cognitive inhibition (Flanker, Simon, and Stroop). While completing the tasks, half listened to discordant and emotionally aversive music while the other half listened to white noise. Mean and variability metrics were calculated for emotion ratings and cognitive responses. Within group analyses revealed resting vmHRV to predict mean and variability emotion ratings; however, the same analyses revealed no significant relationships with metrics of cognitive inhibition. The continued use of vmHRV as a marker of cognitive inhibition is not supported by the current findings. Conversely, the relationship between vmHRV and metrics of regulated emotional responding remain.

POSTER SESSION II-042 | STRESS IS CONTAGIOUS: BEING IN THE SAME ROOM WITH OTHERS IN DISTRESS, IS ENOUGH TO TRIGGER A CARDIAC STRESS RESPONSE

Antonio Maffei, Elena Scarpa, Elisabetta Patron, Paola Sessa
University of Padova

Descriptors: Social Psychophysiology, Emotional Contagion, Stress Response

Negative emotions can spread among people, often without awareness. This emotional contagion is the building block of empathy but its understanding has been halted by the use of artificial experimental paradigms. To overcome this limitation we adapted an ecological stress induction paradigm for a dyadic setting. The goal was to characterize how the negative emotions experienced by one member of the dyad could affect the psychophysiological reactions of the other. Forty dyads (half romantic couples, half matched strangers) participated in the experiment. For each dyad, the target member underwent a stress-induction task consisting of the preparation and delivery of a public speech. The observer member was asked to observe without interacting with their partner. Cardiovascular reactivity and state anxiety were collected throughout the task from both members. Additionally, trait empathy was assessed. Cardiovascular reactivity in the observer mimicked the typical stress reaction elicited by the task in the target, with an increase in heart rate and a decrease in heart rate variability. Furthermore, this effect was stronger in individuals characterized by higher affective empathy and was independent of the relationship type. These results provide strong evidence that just being together with others experiencing a stressful situation triggers the activation of the stress response system. Furthermore, this happens without awareness, making these results relevant to the potential long-term health consequences of living in a stressful social environment.

POSTER SESSION II-043 | DEVELOPMENTAL TRAJECTORIES OF EMOTION REACTIVITY: INSIGHTS FROM EVENT-RELATED POTENTIALS AND LATENT GROWTH CURVE ANALYSIS

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Descriptors: Late Positive Potential, Developmental Trajectory, Adolescence

The late positive potential (LPP) is an event-related potential which indexes attention to and processing of affective stimuli. This activation is involved in the positive and negative valence systems which influence psychopathology risk. Previous work suggests that the LPP shifts toward anterior sites and decreases in magnitude as individuals age. The current study is the first to investigate longitudinal within-person trajectories of the LPP in two scalp regions across four waves of data from childhood through early adulthood. EEG was recorded from 268

youth to assess difference between reactivity to negative and neutral pictures (LPPNeg) and positive and neutral pictures (LPPPos). Latent growth modeling was employed to investigate trajectories of the LPP within occipital and parietal electrode pooling sites at ages 9, 12, 15, and 18. Growth models indicated significant linear slopes for both the LPPNeg and LPPPos for occipital, but not parietal, sites, indicating that the occipital LPP decreases with age, while the parietal LPP does not change with age. The LPP to both negative and positive stimuli appear to move out of the occipital sites from childhood to late adolescence. However, results do not indicate within-person change at parietal sites, as suggested by prior work.

FUNDING: This work was supported by NIMH grant R01MH069942 (Klein).

POSTER SESSION II-044 | STIMULATION OF THE VENTROMEDIAL CORTEX REVEALS CHANGES IN CONNECTIVITY DURING EMOTIONAL FACE PROCESSING

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Descriptors: ventromedial PFC, tDCS stimulation, affective perception

The ventromedial prefrontal cortex (vmPFC) is known for processing of positive and rewarding stimuli. We modulated this area with transcranial direct current stimulation (tDCS) to investigate the changes in neural coupling with other brain areas during watching emotional faces. 40 healthy volunteers (20F/20M) took part in two experimental sessions, each of them started with off-line tDCS stimulation in a counterbalanced order (excitatory/anodal and inhibitory/cathodal; 1.5 mA for 10 min) with a forehead active 3x3 cm electrode (AFz according to the 10-20 system) and extracephalic 5x5 cm reference under the chin. Next, affective stimuli (32 fearful and 32 happy faces) were presented during event-related MEG measurement. Preprocessing consisted of filtering, artifact rejection, identification of independent brain components, that were localized used MNE method. Signals for selected regions of interest were then reconstructed. Effective (directional) connectivity was estimated using the Directed Transfer Function. Results revealed a main effect of stimulation with increase of vmPFC outflows to the left temporal, bilateral parietal and visual areas after anodal vs cathodal stimulation. The observed negativity bias after cathodal session was reflected in a massive increase of

outflows from the right temporal area that is known for its associations with negative emotional arousal. The frontoparietal network shown an interactive effect that was interpreted as an increased top-down influence from the right dorsolateral area via intraparietal sulci, towards the visual cortex.

FUNDING: National Science Center (UMO-2018/31/G/HS6/02490) and Deutsche Forschungsgemeinschaft (JU 445/9-1).

POSTER SESSION II-045 | INTERGENERATIONAL TRANSMISSION OF NEURAL RESPONSE TO EMOTIONAL PICTURES

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¹McGill University, ²Columbia University

Descriptors: Neural oscillations, Intergeneration transmission, Emotion

Individual differences in neural responses to emotional content are associated with multiple forms of psychopathology and may be involved in the development and maintenance of these disorders. Previous research in adult twin samples has shown that neural responses to emotional pictures are heritable. However, how those brain responses are transmitted from parents to children is not clear. Yet understanding the intergenerational transmission of neural responses to emotional stimuli may be useful in understanding how risk for psychopathology is transmitted within families. In this study, 74 mothers and their adolescent daughters (ages 10 to 19) completed the Emotional Interrupt task where neutral and emotional (sad, fearful, angry, happy) faces were displayed. EEG was recorded during the task. Time-frequency principal component analysis was used to isolate delta activity, a frequency band shown to be sensitive to affective modulation, in the time window of the late positive potential. We found a significant positive association between power in the delta frequency band in mothers and daughters following the presentation of fearful faces, relative to neutral faces. These results suggest a familial concordance of the neural response to fearful stimuli in mother-daughter dyads. Future research should assess whether the transmission of the brain response to fearful faces plays a role in the intergenerational transmission of psychopathology. FUNDING: This project was supported by the Canadian Institutes of Health Research (CIHR) through the Canada Research Chair in Clinical Neuroscience (awarded to Dr. Anna Weinberg). Dr. Simon Morand-Beaulieu was supported by a CIHR fellowship. Dr. Aislinn Sandre and

Clara Freeman were supported by doctoral awards from the Fonds de recherche du Québec - Santé.

POSTER SESSION II-046 | SOCIAL OSTRACISM DECREASES NEURAL SENSITIVITY TO MONETARY REWARDS

Roslyn Harold, Kimberly Galvez-Ortega,
Skye Napolitano, Dan Foti
Purdue University

Descriptors: Reward Positivity, Ostracism, Affect

Ostracism is a well-studied social phenomenon that can increase feelings of hopelessness and depression when experienced chronically. Separately, a large neuroscience literature has generally linked reduced reward sensitivity to depression vulnerability. Of interest is the potential interplay between momentary experiences of ostracism and reward sensitivity as processes involved in depression vulnerability. To test this in a laboratory context, we collected EEG data during two validated paradigms: momentary ostracism was induced using the cyberball task, and reward sensitivity was evaluated using a simple guessing task. Neural sensitivity to rewards was assessed using the reward positivity (RewP), measured both before and after the ostracism manipulation. Data were collected from 62 undergraduate students (27 female; $M_{age} = 19.52$, $SD_{age} = 1.27$). Momentary affect was assessed throughout using the self-assessment manikin. As expected, affect ratings were more negative following the cyberball task ($t_{59} = -6.41$, $p < .001$). Amplitude of the RewP (win versus loss) was significantly blunted after the cyberball ostracism paradigm ($M_{pre} = 4.29$, $SD_{pre} = 3.55$, $M_{post} = 2.84$, $SD_{post} = 3.97$, $t_{58} = 2.93$, $p = .005$). This study provides evidence that social ostracism may acutely decrease neural sensitivity to monetary rewards. This may represent one pathway through which ostracism increases risk for depression.

POSTER SESSION II-047 | EXPLORING THE RELATIONSHIP BETWEEN PHYSIOLOGICAL AND BEHAVIORAL INDICATORS AND MOOD OF WORKERS BY FIELD MEASUREMENTS

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Descriptors: respiration, positive/negative mood, field study

In recent years, the importance of mental health in the workplace has been widely recognized. There are many studies that aim to estimate positive and negative affect by using physiological indicators that are closely related to mental state. However, few studies have collected and validated multiple physiological, behavioral, and psychological data over weeks in real work environments. Here we conducted an exploratory study to examine the relationship between workplace mood and behavioral and physiological indicators. A total of 14 drugstore employees were measured over three weeks using wearable sensors and questionnaires to determine whether physical information, such as gait and respiration, was associated with mood at two-hour and daily intervals, between and within individuals, using group comparisons, single regression analysis and correlation analysis. The results suggest that within individuals, even in the field, physiological and behavioral indicators can be used to track mood fluctuations, as approximately 82% of participants for whom correlation analysis was possible had indicators such as respiratory rate, stride length, and foot height that were significantly correlated ($p < 0.05$) with mood. The results also suggest that useful biomarkers may differ by time range, as changing the time range of the correlation analysis (2 hours/day) resulted in different indicators that significantly correlated with mood. These suggestions from this study may advance our understanding of the relationship between mood and physical parameters in daily life.

POSTER SESSION II-049 | ASSOCIATIONS BETWEEN DAILY PHYSICAL ACTIVITY AND COGNITIVE FUNCTIONING: EVIDENCE FROM STIMULUS- AND RESPONSE-LOCKED EVENT RELATED POTENTIALS

Nicholas Santopetro, Matthew Fantini,
Elaina Kokinakos, Elijah Toomey, Jessica Simon,
Greg Hajcak
Florida State University

Descriptors: P300, Pe, Physical Activity

There is extensive research linking physical activity to better cognitive outcomes such as improved executive functioning and memory related to increases in exercise. Alternatively, there is less consistent evidence demonstrating that higher levels of sedentary behaviors are associated to worse cognitive functioning. Furthermore, our understanding of the exact neural mechanisms underlying these modulations in cognitive functioning related to exercise or sedentary activity remains quite

elusive. Therefore, the current study examined the association between average daily exercise time and daily sedentary time with neural measures of attention allocation. More specifically, 145 undergraduate students ($age = 19.01$, $SD = 1.25$, 63% female) completed self-report measures of daily exercise and sedentary activities in the past week. Participants then completed a flanker task while EEG recorded to elicit the stimulus-locked P300 component and the response-locked error positivity (Pe) component. At the zero-order, individuals exhibiting higher P300 and higher Pe amplitude reported exercising more daily. There were no significant associations between these neural components and sedentary behavior. Furthermore, when placed into a model as simultaneous predictors of daily exercise, neither P300 nor Pe emerged as a unique predictor suggesting that both of these neural components are explaining overlapping variance related to time spent exercising. These results suggest that daily exercise is more distinctly associated to cognitive processes related to attention.

POSTER SESSION II-050 | THE REWARD POSITIVITY TO SOCIAL FEEDBACK MODERATES THE RELATIONSHIP BETWEEN DAILY SOCIAL INTERACTIONS AND POSITIVE AFFECT DURING ADOLESCENCE

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Brady Nelson¹
¹*Stony Brook University*, ²*Florida State University*

Descriptors: RewP, adolescence, EEG/ERP

A blunted reward positivity (RewP) has been associated with multiple forms of psychopathology, including depression and social anxiety. The RewP has largely been examined in response to monetary reward, but there is growing interest in other types of reward (e.g., social) that might be more salient for critical developmental phases associated with increased risk for psychopathology (e.g., adolescence). Further, it is unclear whether laboratory measures of the neural response to social reward relate to daily emotional and social functioning. The present study sought to examine whether the RewP to social reward moderates the relationship between daily social interactions and positive affect. A sample of 179 adolescent girls ($M_{age} = 17.9$, $SD_{age} = 1.9$) completed a social feedback task while electroencephalography was recorded to measure the RewP to social reward. Participants also completed an ecological momentary assessment to examine frequency of social interactions and positive affect. Results indicated that the social RewP moderated the interaction between frequency of

social interactions with friends and positive affect, such that individuals with a more enhanced social RewP were more likely to communicate with friends when their positive affect was low. Conversely, those with a more blunted social RewP more likely to communicate with friends when their positive affect was high. The present study suggests that laboratory measures of the neural response to social reward have real-world implications for adolescent daily emotions and social functioning.

FUNDING: R01 MH097767 to Dr. Brady D. Nelson.

POSTER SESSION II-051 | DEPRESSIVE AND HYPOMANIC SYMPTOMS ARE NOT ASSOCIATED WITH THE REWARD POSITIVITY IN A SAMPLE OF MIDDLE-AGED ADULTS

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Michigan State University

Descriptors: Mood Disorders, Electroencephalography, Reward
 Mood disorders exist along a spectrum of reward sensitivity (RS), with depression (MDD) being characterized as too little RS (i.e., anhedonia) and bipolar disorder (BD) as too much RS (e.g., increased drive). Psychophysiological indices can aid in operationalizing changes in dimensional constructs like RS. The Reward Positivity (RewP) is an event-related potential occurring 250-350ms post-feedback at midfrontal locations which tracks individual RS differences. MDD has been associated with reduced RewP amplitude; however, recent work suggests the effect may be most robust in adolescence. There is less research on the relationship between BD and RewP amplitude, but some studies have shown a larger RewP to be associated with hypomanic symptoms. This study aimed to assess the association between RewP amplitude and mood symptoms in a sample of community middle-aged adults ($n=125$; $M=34.53$ yrs., $SD=6.36$) who completed a randomized gambling task while undergoing electroencephalogram and completed the Global Behavior Inventory (measure of depressive and manic/hypomanic symptoms). A step-wise linear regression assessed associations between mood symptoms and RewP amplitude while taking age and sex into account. Neither depression nor mania/hypomania were significant predictors of RewP amplitude regardless of sex or age ($F(9,110)=1.40$, $p=.20$). Depressive and manic/hypomanic symptoms were related to each other ($r=.50$, $p<.05$) but not RewP amplitude ($p=.94$; $p=.11$).

These results support the literature suggesting RewP amplitude may not be related to mood disorder symptoms in adults.

FUNDING: This work was supported by National Institute of Drug Abuse grant 5R01DA039112 awarded to C. Emily Durbin, Brian M. Hicks, Robert A. Zucker, & Jason S. Moser.

POSTER SESSION II-052 | INVESTIGATING THE (IN)STABILITY OF RESTING BASELINE MEASURES OF CARDIAC ACTIVITY

Tess Reid, Alexandra MacVittie, Kaitlyn McMullen, Kristen Petagna, Jolie Wormwood
University of New Hampshire

Descriptors: Electrocardiology, Resting baseline

Standard practice for collecting and analyzing cardiac activity data involves establishing a baseline of cardiac activity and assessing deviations from this baseline. This approach necessarily assumes the relative stability of baseline measures within an individual over time, but empirical data on their stability remains sparse. Here, we collected respiration and electrocardiographic data from 95 participants during four separate 5-minute baseline sessions over a 6-week period. For each participant during each session, we derived minute-by-minute estimates of interbeat interval (IBI) and respiratory sinus arrhythmia (RSA). Using multilevel models (with minute nested within session nested within participant), we found that resting baseline estimates were only moderately reliable within participants over time. Intraclass correlation coefficients suggested that only about half of the variance in the data for each measure was attributable to the participant (IBI=55.2%; RSA=47.4%) and a third or more of the variance was attributable to the session (IBI=41.0%; RSA=33.2%). This suggests that there is considerable variability in resting baseline estimates within-subjects across different recording sessions. Surprisingly, we found limited variability for these measures across minutes within a session, particularly for IBI (IBI=3.8%; RSA=19.4%). We examine potential sources of session-level variance, including experimenter characteristics (i.e., number, gender, familiarity) and environmental factors (i.e., time of day, room temperature). Methodological implications are discussed.

FUNDING: Army Research Institute.

POSTER SESSION II-053 | NON-SUICIDAL SELF-INJURY AND FRONTAL ALPHA ASYMMETRY IN CHILDREN

Pooja Shankar, Brandon Gibb
Binghamton University

Descriptors: NSSI, children, frontal alpha asymmetry

Nonsuicidal self-injury (NSSI), reflecting intentional self-injury without intent to die, is a growing concern in youth. Given this, there is a need to identify markers of risk, including potential biomarkers. Research has posited frontal alpha asymmetry (FAA), derived from EEG and reflecting the relative balance of approach- versus withdrawal-related neural activity, as one such biomarker for suicidal behavior (e.g., Park et al., 2019). This said, findings regarding the clinical utility of FAA have been mixed and limited to adolescent and adult samples. The present study evaluated FAA in 7-11-year-old children ($N=574$; 46.3% girls; 49.3% non-Hispanic White) with and without a history of NSSI. NSSI was assessed through a structured interview and based on parent or child report. Of the children, 6.4% ($N=37$) had a lifetime history of NSSI. FAA was assessed during an eyes-closed resting condition and quantified as $\ln(F4) - \ln(F3)$, with lower FAA scores reflecting relatively less approach and greater withdrawal-related activity. Children with a history of NSSI, compared to those without NSSI, exhibited significantly lower FAA ($t(572) = -2.15, p = .03$). Exploratory analyses revealed that this relation was moderated by child gender ($t(570) = 2.22, p = .03$), such that it was significant for boys ($t(299) = -3.29, p = .001$), but not girls ($t(256) = -.129, p = .89$), and this relation was maintained even after statistically controlling for current depressive symptoms ($p = .02$). Future research is needed to determine whether FAA can be used to predict future risk of NSSI in boys.

FUNDING: National Institute of Mental Health grant MH098060 awarded to Brandon E. Gibb.

POSTER SESSION II-054 | EXAMINING PHYSIOLOGICAL SYNCHRONY IN PARENT-CHILD DYADS DURING COVIEWING OF EDUCATIONAL CONTENT

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³University of Tennessee, Knoxville

Descriptors: Physiological Synchrony, Educational Media Content, Parent-Child Coviewing

Parental coviewing influences how children cognitively and emotionally process media content. Findings suggest coviewing effects are not universal. Rather, media content itself may serve as a shared referent for aligning a coviewing dyad's physiology, which has been shown to improve task performance, memory, and emotional reactions. Past work demonstrates synchrony in coviewing dyads with relationships other than parent-child (e.g., sibling). This study investigates the relationship between physiological synchrony, a coviewing dyad, and an individual's resource allocation and arousal. Parent-child dyads ($N=27$; child age: $m=8.07$ years, $sd=1.09$) viewed episodes of *Dinosaur Train* and *Daniel Tiger's Neighborhood* in a coviewing or separate condition. Stimuli were educational television shows teaching scientific thinking skills and social-emotional strategies. Cross recurrence quantification analysis examined the synchrony of heart rate and skin conductance within parent-child dyads. The time delay and embedded dimensions were calculated for each dyad prior to calculating recurrence rate, percentage determined, and max line length for each show within each dyad. These outcomes were compared using a multi-level model. There was not a significant effect of coviewing or show on heart rate or skin conductance level synchrony between the dyads ($p > .05$). Additionally, an investigation of intersubject correlations demonstrated a surprising lack of synchrony (Spearman's $r < .02$) between the heart rate and skin conductance of parent-child dyads, regardless of coviewing condition.

POSTER SESSION II-055 | SKIN CAROTENOIDS AND MISMATCH NEGATIVITY IN TODDLERS

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Descriptors: Mismatch Negativity, Skin Carotenoids, Toddlers

Background: Carotenoids are antioxidant pigments found in fruit, vegetables, and eggs that accumulate in the human body (i.e., skin, adipose, and brain) and can serve as biomarkers for higher diet quality. The present abstract aimed to understand the relationship between skin carotenoids and auditory-evoked mismatch negativity (MMN) in toddlers. Methods: Cross-sectional analyses among toddlers between 12-18 months ($N=42$) were conducted. Skin carotenoids were measured using reflection spectroscopy (i.e., VEGGIE METERTM). A passive auditory oddball task was used to elicit MMN. Results: Skin carotenoids were negatively related to MMN peak latency, controlling for daily intake frequency of carotenoid food sources ($Rho=-0.35, p=0.02$). No significant associations were observed between

skin carotenoids and MMN peak amplitude ($Rho=0.23$, $p=0.09$). Conclusions: Greater skin carotenoids were related to shorter MMN peak latency in toddlers, indicating that greater skin carotenoid status may be related to faster sensory memory and change detection abilities. Pending longitudinal data have the potential to provide insights into the impact of changes in carotenoid intake on cognitive development during early life.

FUNDING: Egg Nutrition Center.

POSTER SESSION II-056 | MOTHER-INFANT RSA SYNCHRONY BUFFERS AGAINST THE ADVERSE EFFECTS OF POSTPARTUM DEPRESSIVE SYMPTOMS ON INFANT BEHAVIOR PROBLEMS

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Descriptors: respiratory sinus arrhythmia, synchrony, mother-infant interaction

Parent psychological problems may undermine physiological synchrony; however, respiratory sinus arrhythmia (RSA) synchrony may buffer against the adverse effects of poor parent mental health. Consistent with the biobehavioral synchrony model, we hypothesized that mother-infant RSA synchrony would attenuate the effect of maternal postpartum depressive (PPD) symptoms on infant behavior problems. Among a sample of 322 low-income, Mexican-origin dyads, mothers reported on 24-week PPD symptoms and on 12-month infant behavior problems. At 24 weeks, two-thirds of the sample participated in a free play interaction, during which time parent and infant ECG was continuously assessed. Per person, second-by-second RSA estimates were derived from cleaned ECG data. Mother-infant RSA synchrony was calculated as the Fisher transformed cross-correlation between the first-differenced RSA series. Results of regression analyses indicated that there was an interaction effect between RSA synchrony and maternal PPD symptoms on infant behavior problems, $Est = -2.61$, $SE\ Est = 0.69$, $p < .001$. Post-hoc probing indicated the positive relation between maternal PPD symptoms and infant behavior problems was only evident at average or below average ($-1\ SD$) RSA synchrony. At high ($+1\ SD$) levels of RSA synchrony, there was no effect of maternal PPD symptoms on infant

behavior problems, $p = .9$. Results suggest, among families for whom chronic, uncontrollable stressors may undermine synchrony and contribute to behavior problems, physiological synchrony may buffer against the effects of poor maternal wellbeing.

FUNDING: NIMH R01 MH083173-01; NIMH F32 MH132254-01.

POSTER SESSION II-057 | EFFECTS OF BRAIN STIMULATION BY SPECIFIC DELTA AND THETA FREQUENCIES PRODUCED BY A MAGNETIC FIELD EMITTING THERAPEUTICAL DEVICE

Diana Henz

Stiftung für Gesundheit und Umwelt

Descriptors: EEG, brain stimulation, theta rhythm

Numerous studies have reported effects of brain stimulation on brain activity, cognitive functions, and mental states. To date, less is known on the effects of frequency-based therapeutical approaches that do not use transcranial electrical or magnetic stimulation but rely on exposure to simulated natural electromagnetic frequencies. In the present study, we investigated effects of a magnetic field emitting device on EEG brain activity and the mental state. Subjects were exposed to distinct frequencies in two experimental conditions (delta: 3.05 Hz, theta: 7.83 Hz), and one control condition (no application) by using the device Amplifield mini (ROM-Elektronik GmbH, Germany/Gabriel-Tech GmbH, Germany) in a randomized double blind design. High-density EEG was recorded continuously from 256 electrodes before, during, and after each condition, as well as mood. Each condition was tested for 10 minutes. Results on spontaneous EEG showed increased overall theta and posterior alpha power with decreased beta power in frontal, central and temporal areas compared to the control condition during and after application of both frequencies with subjects reporting increased relaxation. Further, theta power in frontal, temporal, and limbic areas increased with an overall beta power decrease when the delta frequency was applied compared to theta stimulation. We discuss the results and possible fields of application in terms of activation of distinct neural circuits by application of the frequency-based therapeutical approach tested in the present study.

POSTER SESSION II-058 | DOES STRESS PRIOR FEAR ACQUISITION IMPACT FEAR EXTINCTION OR THE SPONTANEOUS RECOVERY OF FEAR MEMORIES?

Marta Andreatta^{1,2,3}, Christopher Klinke²,
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Descriptors: classical conditioning, spontaneous recovery, stress

Individuals, who experience stress prior to fear acquisition, exhibit persistent defensive responses, suggesting impaired extinction learning. The long-term effects of stress-induced impairment of fear extinction remain unclear. In this study, we investigated fear and extinction memories in 115 participants, who underwent either a socially evaluated cold pressure test or a sham protocol on Day1. All participants underwent fear acquisition on Day2 and fear extinction on Day3. Half of the participants were tested 24 hours after extinction (Day4), while the other half was tested two weeks later (Day17). Visual stimuli were used as conditioned stimuli and mildly painful electric shocks as unconditioned stimulus (US), delivered during acquisition at the offset of one conditioned stimulus (CS+) but not at the offset of the other stimulus (CS-). Successful fear acquisition was indicated by higher fear and US-expectancy ratings, as well as stronger skin conductance response (SCR) and startle potentiation to CS+ compared to CS-. All participants showed reduced defensive responses during extinction. Affective defensive responses (startle response and fear ratings) spontaneously recovered in those participants tested two weeks after extinction, but not in those tested one day later. Apparently, stress did not influence either extinction or spontaneous recovery of conditioned fear. These findings suggest that fear memory as compared to extinction memory is more stable (or it decays more slowly), while distal and mild stress does not modulate either learning or consolidation processes.

FUNDING: CRC TRR58, B08.

POSTER SESSION II-059 | THE ROLE OF LOVED FAMILIAR FACES IN EXTINCTION LEARNING: A CLASSICAL CONDITIONING STUDY

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Descriptors: Extinction learning, Loved-familiar faces, Peripheral physiology

Though recent studies have shown that the use of pictures of highly supportive figures enhance extinction learning in classical conditioning protocols, it is not known whether these beneficial effects translate to individuals with deficits in inhibitory learning. To clarify this issue, twenty-five participants underwent a classical conditioning protocol (habituation, acquisition, extinction) in which two neutral unknown faces served as CS+s, while a third face served as a CS- during the acquisition block. State/Trait anxiety scores, skin conductance, startle eyeblink, heart rate, and corrugator EMG responses were collected. During the extinction phase, the aversively conditioned faces were paired with either a photograph of a stranger or a photograph of the participants' romantic partner, whereas the picture serving as CS- was presented alone. The results yielded no effect of the levels of trait anxiety on any variable, during either acquisition or the extinction blocks. On the other hand, the pairing of conditioned stimuli with pictures of loved ones evoked a pattern of physiological responses that have been consistently associated with a highly positive emotional state: inhibition of corrugator EMG activity, increases in skin conductance, and a biphasic pattern in heart rate. Taken together, these data underline the necessity of further research on new ways of improving the efficacy of exposure-based interventions for anxiety disorders.

FUNDING: This research has been funded by the Spanish Ministry of Science and Innovation through a grant awarded to Pedro Guerra Muñoz (ref. PID2020.119549GB. I00).

POSTER SESSION II-060 | ACUTE STRESS AFTER HEARTBEAT PERCEPTION TRAINING INCREASES INTEROCEPTIVE ACCURACY IN THE HEARTBEAT COUNTING TASK, BUT NOT IN THE HEARTBEAT DISCRIMINATION TASK

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Descriptors: Interoception, Stress, Perceptual learning

Acute stress during the consolidation phase can improve declarative memory. It is so far unknown whether perceptual learning is also influenced by stress. This question is relevant as perceptual learning plays a role in interoception, while altered interoception might be an important mechanism for symptom generation in stress-related

disorders. Therefore, the aim of this study was to investigate whether heartbeat perception training (HBPT) can increase interoceptive accuracy (IAC), and whether acute stress during the consolidation phase enhances this learning effect. 99 healthy participants completed either a HBPT or a visual perceptual task (VPT) and then underwent either socially evaluated cold pressor test (SECPT) or a control task (=4 groups). IAC was measured at three occasions using a heartbeat counting task (HCT) and a heartbeat discrimination task (HDT), i.e. (1) before training, (2) 30 minutes after SECPT/control task and (3) one day later. The SECPT induced a significant increase in heart rate and blood pressure. The group that underwent the HBPT and the SECPT also showed a significant increase in IAC in the HCT from occasion (2) to (3). IAC in the HCT, but not in the HDT, increased over measurement occasions (1-3). The results imply that the HBPT can increase IAC in the HCT if acute stress is experienced in the consolidation phase. This effect could play a role in symptoms generation in stress-related disorders. As the HDT is typically described as more difficult than the HCT, these enhancing effects may be limited to interoceptive tasks of moderate difficulty.

FUNDING: Luxembourg National Research Fund (FNR).

POSTER SESSION II-061 | NEURAL SIGNATURES OF CONTINGENCY AWARENESS

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Descriptors: conditioning, EEG, contingency awareness

The recognition of the conditioned-unconditioned stimulus (CS-US) association in human fear conditioning is referred to as contingency awareness. A common view is that such simple forms of associative learning are independent of awareness. We challenge this view in an experiment where only some participants learned the association between CS and US. In this preregistered study (<https://osf.io/vywq7>), the participants heard words paired with tactile stimulation followed by either a neutral sound (CS-) or unpleasant loud noise (CS+). The condition depended on the word+vibration side compound. The participants were only instructed to listen carefully. Based on structured interviews, the participants were divided into aware (N=50) and unaware (N=31) groups. Questionnaires were administered to explore potential predictors of contingency awareness. Only the aware group showed signs of learning as expressed in a larger CS+/CS- difference in stimulus preceding negativity developing shortly before the US. In terms of oscillatory brain activity, the aware

group showed stronger alpha-beta suppression before and in response to the vibration. Moreover, the aware group scored higher on the intolerance to uncertainty scale and had a narrower distribution of trait anxiety. These findings support the notion that associative learning cannot occur without contingency awareness. We conclude that contingency awareness is indexed by generally amplified neural patterns reflecting expectation of an aversive event and informative cues, as well as violation and confirmation of the expectation.

FUNDING: The study was supported by the German Research Society (Deutsche Forschungsgemeinschaft, DFG), grant KO-1753/13-4.

POSTER SESSION II-062 | ADAPTIVE MODULATION OF WORKING MEMORY LOAD BY REDUNDANCY

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Descriptors: Working memory, Contralateral delay activity, Alpha power

Working memory (WM) is a capacity-limited system that serves the temporary maintenance, manipulation and updating of information for guiding flexible and goal-directed behavior. So far it has been shown that WM load can be influenced by perceptual grouping of objects, which allows for an efficient use of storage. The present study investigated whether semantic redundancy also reduces WM load. Two electrophysiological indices of WM load were considered: the contralateral delay activity (CDA) and alpha power (8-12 Hz). On each trial, participants encoded two laterally presented and differently colored memory lists that contained two digits each and subsequently had to perform a recognition task on these memory lists. In each memory set, either all corresponding positions contained different digits (e.g. 7 6 and 5 2), only one corresponding position contained different digits (e.g. 7 6 and 5 6) or all corresponding positions contained the same digits (e.g. 7 6 and 7 6). Both CDA amplitude and alpha power varied significantly with the amount of differing digits indicating a higher load when all digits differed at corresponding positions compared to when all digits were the same. This suggests that, although the number of digits was always the same on a perceptual level (i.e., four digits), information represented in WM can be grouped on a semantic level which leads to a reduction of WM load.

FUNDING: Deutsche Forschungsgemeinschaft (DFG; STE 1708/5-1).

POSTER SESSION II-063 | EFFECTS OF VISUAL AND VERBAL PRESENTATION, AMBIENT LIGHTING, AND FONT COLOR ON PUPIL SIZE DURING PERFORMANCE OF A WORKING MEMORY TASK

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Descriptors: pupillometry, working memory, effort

Changes in pupil size due to effortful control of attention in working memory are not only dependent on cognitive factors but can also depend on external influences such as ambient lighting, sensory modality of the memory items, and their brightness. In this study, a group of 40 participants were presented with a working memory task involving perceiving (passive listening or viewing) or active memorizing of sequences of 9 digits at a rate of one per second, followed by serial recall. The modality of the stimuli (auditory or visual presentation), color of the stimuli (black or white on grey background), and ambient lighting (lights off or on) were varied, and during the presentation of auditory stimuli, # and ¥ symbols alternated on the screen every second to balance the conditions. The results showed that accuracy was only affected by the modality of the stimuli, with the auditory version of the task being producing less accurate responses. As expected, the difference in pupil size between the passive and active tasks increased with the load, ranging from 1 to 9 digits. This difference was moderated by modality (with a larger difference in the auditory task), light (with a larger difference when the lights were off), and color (with a larger difference in the black font condition). Therefore, the most significant effect of working memory load on pupil size was observed when the lights were off, with black font on a grey background, and with auditory presentation of the memory items.

POSTER SESSION II-064 | P3 EVENT-RELATED POTENTIAL RESPONSE TO ALCOHOL CUES FORECASTS REAL-WORLD ALCOHOL USE BEHAVIOR BY EMERGING ADULT DRINKERS

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Descriptors: clinical utility, addiction, affective significance

Neural measures of alcohol cue incentive salience have been linked to riskier retrospective measures of alcohol

use behavior. Here, we examined the ability of one such measure, alcohol cue-elicited P3 event-related potential (ERP) response magnitude, to forecast alcohol craving and consumption during real-world alcohol use episodes. Participants ($N=259$; $M_{age}=19.54$; 56% female) completed a 21-day ecological momentary assessment (EMA) protocol in which they recorded alcohol craving and consumption. Before EMA, participants completed a laboratory task in which EEG was recorded during exposure to visual cues for everyday objects (Neutral), non-alcohol drinks (NonAlc), and alcohol beverages (Alc). Cue-elicited P3 ERP response magnitudes were scored on an occipitoparietal electrode cluster. Multilevel modeling indicated positive associations between within-episode alcohol use measures (estimated blood alcohol concentrations [eBACs], cumulative drinks) and P3 to Alc, NonAlc, and Neutral, but not residualized alcohol cue reactivity P3 difference scores (ACRP3: AlcP3-NonAlcP3). Follow-up analyses controlling for associations with NonAlcP3 confirmed a robust positive association between AlcP3 and eBAC over time within episodes. AlcP3 and ACRP3 also were positively associated with episode-level measures (max eBAC, max drinks). There were no associations between P3 scores and EMA-based craving measures. Thus, individual differences in neural measures of alcohol cue incentive salience appear to predict the speed and intensity of real-world alcohol consumption, but not craving. FUNDING: Funding for the project was provided by NIH grant R01 AA025451.

POSTER SESSION II-065 | NOVEL VIDEOGAME TASK FOR EXAMING REWARD PROCESSING: EVALUATING EVENT-RELATED POTENTIALS

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Northern Michigan University

Descriptors: Reward processing, Event-related potentials

Reward processing is commonly measured through event-related potentials (ERPs) time-locked to feedback, indicating success or failure with associated gain or loss. Feedback is delivered following some behavior, typically with an anticipation period between them; this common characteristic is an accepted element in ERP paradigms as a method to reduce noise. However, this design leads to longer tasks, resulting in less engaging and less interesting circumstances than the complex environments underlying everyday human behavior. The present study presents a more ecological paradigm in the form of a real-time reaction time task modeled after "running" games, in which participants respond to avoid oncoming obstacles with instantaneous success and failure

feedback. ERP components time-locked to feedback show outcome differentiation from 100-400ms, while components time-locked to response show outcome differentiation starting from 250-500ms. These results demonstrate this novel task's validity for examining reward processing and human motivation. Methodological challenges, potentially confounding motor and visual processing, and common reward processing ERP components are considered.

POSTER SESSION II-066 | THE ROLE OF CONDITIONED CUES IN THE PROBLEMATIC USE OF SOCIAL MEDIA: A PSYCHOPHYSIOLOGICAL INVESTIGATION

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Descriptors: Problematic use of social media, Event-Related Potentials, Alpha oscillations

The extent to which problematic use of social media constitutes a psychopathological condition remains under discussion, with some researchers proposing that social media may work as a vehicle for expressing an individual's addictive focus on specific behaviors (e.g., online gambling), which represent the “true” problematic focus. We questioned whether people who may be addicted to online behaviors are those who may also be addicted to the same offline behaviors. In this view, it would be important to characterize how online behaviors differ from their offline counterpart. A key feature of internet-related addictive behaviors, which is often not shared with any other offline behaviors, is the number of available visual/auditory/tactile cues to which many users are exposed. Conditioned environmental cues may significantly influence online behavior by promoting early attentional bias to social media rewards and enhancing conditioning to such rewards. We will go through some results from our psychophysiological studies highlighting the incentive properties of social media-related cues leading to urges to use social media in problematic users. Specifically, we conducted three studies using cue-reactivity and emotional Go/noGo tasks while recording the EEG. Internet-related cues seem to be motivationally relevant stimuli that capture attentional resources in the earlier stages of “motivated” attentional allocation. We argue that internet-related cues may make some online behaviors “more addictive” than their offline counterpart.

POSTER SESSION II-067 | CAN FLOW BE THE PRODUCT OF COACTIVATION IN THE APPETITIVE AND AVERSIVE SYSTEM?

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Descriptors: Flow, Cognitive Effort, Motivated Processing

The experience of flow during media interactions has been the subject of many theoretical conceptualizations and empirical efforts. Here we define flow as the dynamic balance of effort and reward over time. To create this balance, we used an open-source, simplistic video game: Asteroid Impact. This study had two goals. First, to conceptualize effort in media interactions as a simultaneously aversive and appetitive action. Second, to better understand the time dynamics of the onset of flow compared to situations where the reward and effort are unbalanced. Predictions across these three conditions for the resulting appetitive and aversive motivational activation—indexed by zygomaticus major and corrugator supercilii—and arousal—indexed by skin conductance level—were made using the Limited Capacity Model for Motivated Mediated Message Processing. Participants ($N = 123$) played through the conditions in a random order. Multi-level models were used to demonstrate that instances of high effort and reward elicit coactivation in the motivational systems (evidenced by higher corrugator over time, $\beta = .022$, $p < .001$, higher zygomaticus over time, $\beta = .173$, $p < .001$, and lower skin conductance, $\beta = -1.495$, $p < .001$). However, this coactivation would seem to be the product of the pairing of effort and reward as we do not see similar results for the other two combinations of these concepts. Together, these results demonstrate that effort that leads to reward can be thought of as coactive in nature, and that flow is elicited when this effort and reward are balanced.

POSTER SESSION II-068 | THE IMPACT OF TRAUMATIC BRAIN INJURY ON SLEEP, BRAIN, AND COGNITION IN OLDER ADULTS

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Northeastern University

Descriptors: Traumatic Brain Injury, neuroimaging, memory

Traumatic brain injury (TBI) negatively impacts the lives of an estimated 3 million Americans yearly. Shear and tensile forces placed upon the brain leads to diffuse axonal injury, which can often lead to behavioral and cognitive dysfunction, impacting sleep and memory with age. Delineating the effect of modifiable behaviors, specifically sleep on the pathophysiology of TBI and long-term memory function could lead to public health guidance for older adults living with TBI. To assess the impact of sleep on axonal injury and its effect on memory in TBI, we sampled from an open access dataset (ADNIDOD) of veterans ages 65-80. We analyzed diffusion-weighted images, Pittsburgh Sleep Quality Index, and 1-year change scores in delayed recall from Rey Auditory Verbal Learning Test from 147 veterans with a history of TBI and 99 without, controlling for PTSD and depression. We found that the effect of sleep ($p < 0.01$) on axial diffusivity in the internal capsule was greater in those with a history of TBI. We found higher axial diffusivity in the internal capsule associated with greater delayed recall change in those with TBI ($p < 0.01$). These results demonstrate the potential importance of high sleep quality on axonal injury in those with TBI. These data also show that sleep-related axonal injury is related to longitudinal memory function in those with a history of TBI. Taken together, these results suggest a possible pathway through which modifiable lifestyle behaviors, such as sleep, can positively effect brain and cognition in older adults living with the consequences of TBI. **FUNDING:** Data collection and sharing for this project were funded by the ADNI (NIH grant U01 AG024904) and Department of Defense ADNI (DOD award number W81XWH-12-2-0012).

POSTER SESSION II-069 | EFFECTS OF MULTIPLE SCLEROSIS EXTEND TO INTRA-INDIVIDUAL VARIABILITY IN THE P3 ERP COMPONENT

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Descriptors: Intra-individual variability, Multiple Sclerosis Multiple sclerosis (MS) is a demyelinating neurodegenerative disease that leads to cognitive impairment in the majority of cases. Intra-individual variability (IIV) in ERPs could provide insights into the neurophysiological

stability in MS; thus, we investigated differences in outcomes of central tendency and IIV through standard deviation (SD) of ERPs between persons with MS (PwMS) and healthy controls (HC). PwMS ($n=56$) and age-sex matched HC ($n=56$) aged 34-67 completed a Flanker task with concurrent EEG. The N2 and P3 components were assessed using measures of central tendency and IIV for latencies and amplitudes. Repeated measures ANOVA were conducted with congruency (i.e., congruent vs incongruent) and diagnosis (i.e., MS vs HC) as a within- and between-subjects measure, respectively. There were no interaction effects observed for any outcomes. There was a diagnosis effect for P3 peak latency ($F_{1,110} = 31.66$, $p < 0.01$) and P3 latency SD ($F_{1,110} = 9.08$, $p < 0.01$), wherein PwMS exhibited delayed latency ($p < 0.01$) and greater latency SD compared to HC ($p < 0.01$). No significant effects were observed for mean or standard deviations for N2 amplitudes or latencies. PwMS exhibited a delayed latency and increased latency variability in the P3 compared to HC but not the N2. These differences suggest MS may selectively impair stimulus evaluation or processing speed, as well as their stability. These results contribute to a better understanding of the temporal neural underpinnings of cognitive processes in MS and warrant further research examining IIV in ERPs among persons with MS.

FUNDING: This research was funded by the National Multiple Sclerosis Society (NMSS) and the NIH REACT Center.

POSTER SESSION II-070 | PHYSPREP: PHYSIOLOGICAL DATA PREPARATION WORKFLOW ADAPTED FOR MR SETTINGS

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Descriptors: fMRI, physiological activity, preprocessing Peripheral biosignals are valuable for capturing fluctuations in cognitive and affective states, making it possible to characterize brain-body interactions in neuroimaging setup. The relevance of these measures when acquiring neuroimaging data and the subsequent increase in the amount of data processing highlight the importance of establishing reliable processing practices for biosignals acquired in magnetic resonance (MR) contexts, but a standardized workflow has yet to be proposed. We present "Physprep", an open-source code base to provide the community a user friendly workflow for biosignal preprocessing. Physprep was originally developed to process

physiological data acquired concurrently with large-scale individual functional MRI as part of the CNeuroMod project (<https://github.com/me-pic/physprep>). This workflow combines well-maintained, community-based Python libraries such as Phys2bids and NeuroKit2, and relies on the BIDS standard. The biosignals preparation workflow is constituted of two separate modules: 1) Metadata generation: a set of functions to summarize physiological files associated with each subject, and automatically co-register the physiological files with the MRI files; 2) Processing: a set of functions to clean cardiovascular, electrodermal, and respiratory signals by removing MR-related artifacts. A signal quality report is also generated. Physprep is an easy-to-use and flexible open access workflow working with BIDS compliant datasets to clean and process physiological data. Future steps include adding visualization tools and tutorials to the workflow.

FUNDING: CNeuroMod is made possible by a generous donation to PB from the Courtois foundation, Québec, Canada.

POSTER SESSION II-071 | PARTICIPANT DIVERSITY FROM 2010-2020 IN PSYCHOPHYSIOLOGY

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Descriptors: Content analysis, Participant diversity

Social sciences have tended to rely on WEIRD (Western, educated, industrialized, rich, and democratic) samples (Henrich et al., 2010). The Society for Psychophysiological Research and *Psychophysiology* have worked to increase diversity and inclusion in their society, conference programming, and the field of psychophysiology, with many initiatives starting since 2010. To address the question of participant diversity in psychophysiological science and whether there may be changes related to SPR's diversity initiatives, we content analyzed the articles published in *Psychophysiology* from 2010 through 2020 (Volumes 47-57; n=1500). Based on the APA Journal Article Reporting Standards, we evaluated eight major participant demographics, the amount of missing and unusable data, and if/how demographics were used in analyses. Results indicated reporting of biological sex in 99% of studies and reporting of average age in 89% of studies. Age range and educational attainment were reported in over 50% of studies, while race or ethnicity were reported in only 17%. Socioeconomic status, income, gender identity, and sexual orientation were almost never reported. In over 60% of studies at least one major demographic variable was reported,

but was not used in preliminary, main, or supplementary analyses as a covariate, moderator, or otherwise. We recommend the development of journal article reporting standards for *Psychophysiology*, increased engagement in open science practices by psychophysiologicalists, and ethical analysis of demographic modulation of psychophysiological mechanisms.

POSTER SESSION II-072 | BRIEF PULSES OF TRANSCUTANEOUS AURICULAR VAGUS NERVE STIMULATION INDUCE PUPILLARY MARKERS OF PHASIC NORADRENERGIC ACTIVITY

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Descriptors: vagus nerve stimulation, noradrenaline, pupil dilation

Transcutaneous auricular Vagus Nerve Stimulation (taVNS) is a non-invasive technique increasingly applied as a neuromodulatory tool in clinical, psychophysiological, and behavioural research. Yet, the mechanism of action remains unclear, and the effects on neuromodulatory systems are poorly understood, largely due to considerable differences in stimulation parameters across studies. Recently, it was proposed that vagal stimulation leads to changes in putative physiological markers of noradrenergic activity including pupil dilation, salivary alpha amylase, P300, and alpha oscillations. In this pre-registered study, we focus on phasic pupil dilation as a potential marker of noradrenergic activity in response to brief, 1s pulses of taVNS. Pupil diameter of both eyes was measured in 57 participants undergoing taVNS on the left cymba conchae, sham-controlled with equivalent stimulation intensity of the left earlobe, while fixating on the screen at rest. Supporting recent results, pupil dilation significantly and rapidly increased following active taVNS stimulation, and was larger than following sham stimulation, before returning to baseline. Notably, extending past work, we show that even a 1 s-long stimulation pulse is able to elicit robust pupil dilation in both eyes, likely reflecting phasic noradrenergic activity. This result suggests that brief taVNS pulses may be used as an event-related phasic noradrenaline manipulation in behavioural tasks. The implications for unified protocols and differences from extended, tonic-like stimulation, are discussed.

FUNDING: This work is supported by the Deutsche Forschungsgemeinschaft (DFG) grant JO-787/6-1.

POSTER SESSION II-073 | EXPLORATION OF IMPROVEMENT IN THE HEARTBEAT COUNTING TASK: EVALUATION OF TASK PERFORMANCE BY SIMULATION

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Yuri Terasawa, Satoshi Umeda
Keio University

Descriptors: heartbeat counting task, simulation, interoceptive accuracy

The heartbeat counting task (HCT) is commonly used in research to assess interoceptive accuracy, where participants count their heartbeats for various time intervals, and the ratio of reported heartbeat to actual heartbeat is used as the score. However, experimental conditions have not been standardized across studies, such as the durations to count heartbeats and the number of trials used to calculate the score. In this study, we evaluated the performance of the conditions used in many studies to explore optimal conditions through simulations. We assumed that reported heartbeats would be normally distributed with a bias, which reflects an individual's interoceptive accuracy, toward actual heartbeats and sampled from this distribution as the simulated data for 100 subjects at every 20% bias increment. The results showed that the two distributions of the scores from groups differing by 20% in interoceptive accuracy overlap almost half of the areas. According to the actual data, a 20% difference in scores involves 25% of the total number of people in the dataset, meaning that an individual's interoceptive accuracy can vary with each iteration of the task. These results suggested the potential for improving conditions in HCT. We also applied this method to explore conditions that may be more reliable and proposed new conditions. To detect a 20% bias difference reliably, a trial with an average duration of 55 seconds would need to be repeated seven times. These results are preliminary due to the limitations imposed by the above assumption and require empirical validation.

FUNDING: Japan Science and Technology Agency MOONSHOT Research & Development Program.

POSTER SESSION II-074 | COMBINING STANDARD PREPROCESSING TECHNIQUES WITH AUTOMATIC PIPELINES FOR LARGE-SCALE EEG DATA ANALYSIS

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Olave Krigolson
University of Victoria

Descriptors: Electroencephalography, Data Analysis

Advancements in electroencephalography (EEG) technology have made large-scale data collection more feasible. With larger data sets comes the challenge of standardizing analysis techniques: the goal being to maintain the generalizability across inquiries while still improving data quality. Indeed, many traditional preprocessing pipelines for EEG data rely on subjectivity (ex. choosing channels to remove), making them time-consuming to apply to large data sets and their resultant outputs too specific for subsequent analysis. Recently, some groups have produced software tools for automatic EEG preprocessing, such as the PREP pipeline and HAPPE, that address the aforementioned issues and have the added benefit of still giving the researcher agency over several preprocessing choices. Here, we applied several of these pipelines to a large set of participants who completed a battery of experiments testing learning and working memory, as well as a baseline recording, while EEG data were recorded. Our goal was to determine how applying our standard preprocessing steps, such as filtering, in different permutations may improve or harm the success of these pipelines in cleaning EEG data. Results showed that packages that were already successful in cleaning data had improved performance when certain processing steps, such as bandpass filtering, were applied in certain sequences. Importantly, we argue that these processes are relatively innocuous and may not reduce the generalizability of the resultant data, making them suitable for integration with automatic processing pipelines.

POSTER SESSION II-075 | DOES THE HUNGER HORMONE GHRELIN INFLUENCE THE BRAIN'S RESPONSE TO PAIN?

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Descriptors: Gut-brain axis, fMRI, ghrelin

Previous animal research has described anti-nociceptive and anti-inflammatory effects of the stomach-derived "hunger" hormone ghrelin. In contrast, human research has reported enhanced pain sensitivity after a fasting period with high ghrelin concentrations. Addressing these inconsistencies, this pre-registered functional imaging (fMRI) study investigated how natural ghrelin concentrations are related to pain experience and neural responses. In a within-group design consisting of two sessions, inducing either high (no-meal) or low (liquid-meal) ghrelin concentrations, 66 healthy volunteers (26 women, 39 men, 1 undisclosed) were exposed to 5 trials of 15 sec deep tissue pain (cuff algometry) during 3T fMRI. Subjective pain experience did not differ between the no-meal and

the liquid-meal test session, and neither were ghrelin concentrations related to experienced pain. The task did induce reliable activation in the pain matrix (whole brain), but no activation differences between no-meal and liquid-meal session were found. A ROI analysis testing for ghrelin associations in nodes of the pain matrix did not result in significant associations. The current results speak against the modulation of pain processing by naturally varying ghrelin concentrations during short-lasting deep tissue pain. Ghrelin concentrations might not have been high enough to corroborate the findings in animal models. Alternatively, a different pain administration method, for example one that mimics inflammatory pain, could be better suited to capture ghrelin's effects on pain processing. **FUNDING:** This study was funded by the Research Council of Norway (project number 275316), ERA-NET-NEURON, JTC 2020/Norwegian Research Council (grant number 323047), and the South-Eastern Norway Regional Health Authority (grant number 2021046).

POSTER SESSION II-076 | P3A, P3B, AND N2 CORRELATE WITH SENSATION SEEKING

Laura Billings, Amy Guerrero, Edgar Villarreal, Paola Campos-Luis, Erlin Rodriguez, Jeffery Sable
Christian Brothers University

Descriptors: P300, Sensation Seeking, ERPs

We sought to clarify both behavioral and neural characteristics of sensation seeking. In particular, we were interested in how aspects of sensation seeking relate to the P3a and P3b components of event-related brain potentials (ERPs) elicited during a modified novelty oddball paradigm involving a response inhibition task. Participants completed self-report questionnaires to measure their sensation seeking (overall and subscales). ERPs were measured during a task with three types of visual stimuli presented in randomized order at a rate of approximately one every 1.25 s: (1) non-targets (a letter), to which participants were to make a response, and (2) targets (a number) and (3) novel stimuli (high-arousing images), to which they were to withhold a response. P3a and total sensation seeking were positively correlated, but the relationship was small and not statistically significant. P3b was moderately positively correlated with total sensation seeking. To our surprise, response accuracy was not correlated with total sensation seeking. In exploratory analyses, we found correlations involving the N2 and correlations between ERP components and subscores of the sensation-seeking scale (e.g., boredom susceptibility and disinhibition). These findings may be useful in identifying

individuals who are likely to engage in risky, sensation-seeking behaviors.

POSTER SESSION II-077 | ANTISACCADE PERFORMANCE IN SPIDER PHOBIA AND ITS ASSOCIATION WITH MULTIMODAL CORRELATES OF FEAR

Fabian Breuer¹, Anne Hildebrand², Johannes Finke², Leandra Bucher², Udo Dannlowski¹, Tim Klucken², Kati Roesmann², Elisabeth Leehr¹

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Descriptors: Spider Phobia, Antisaccades, Inhibitory control

Introduction: Anxiety disorders feature excessive fear and an attentional bias to threat, and may involve impaired inhibitory control processes. The antisaccade task measures inhibitory control and has identified impairments in subclinical fearful individuals. As clinical studies are lacking, we investigated inhibitory control in spider phobic individuals as well as potential associations with multimodal indices of fear. **Methods:** 30 spider phobic (SP) and 33 healthy control (HC) individuals completed an emotional antisaccade task (schematic stimuli of spiders and flowers). Multimodal fear indices (self-reported fear of spiders (SPQ), avoidance behavior (BAT), heart rate, electrodermal activity, fear-potentiated startle reflex) were obtained. Differences in antisaccade performance were assessed using a 2x2 mixed ANOVA for antisaccade latencies and error rate, respectively. Regression analyses were performed in SP to predict antisaccade performance from multimodal indices of fear. **Results:** SP showed significant shorter antisaccade latencies than HC, irrespective of stimulus condition. Analyses on error rates were non-significant. Although fear indices pointed towards robust group differences, none of them predicted antisaccade performance in SP. **Discussion:** Results indicate enhanced inhibitory control in SP, indexed by shorter antisaccade latencies, highlighting differential effects of inhibitory control performance in subclinical versus clinical populations. Furthermore, results point towards an attentional avoidance pattern in SP not modulated by multimodal indices of fear.

FUNDING: The study was funded by the DGPs (German Society for Psychology: Biological Psychology and Neuropsychology) and Movisens (Peer-Mentoring-Program, awarded to FB and KR), and the Innovative Medizinische Forschung (IMF) of the medical faculty of the University of Münster (awarded to E.J.L., grant numbers: ME121805; LE121904). A.H. was supported by the German Research Foundation (Research Training Group 2493/1: 398510439).

POSTER SESSION II-078 | THE PERCEPTION-FILTER MODEL: PATIENTS WITH SOMATOFORM DISORDERS AND MAJOR DEPRESSIVE DISORDER SHOW STRONGER CARDIAC SIGNALS, BUT NORMAL FILTER FUNCTION AND CARDIAC PERCEPTION

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Descriptors: Interoception, Stress, Somatization

In the perception-filter model it is posited that three consecutive stages contribute to the generation of medically-unexplained symptoms (MUS): (I.) Stronger afferent bodily signals, (II.) an impaired filter function to differentiate relevant from irrelevant signals, and (III.) disturbed perception of bodily signals, ultimately feeding into MUS. As these assumptions have not yet been tested in the same sample, we assessed indicators of stages (I.-III.) based on cardiac interoception in patients with somatoform disorders (SFD), patients with major depressive disorder (MDD) and healthy control (HC) individuals. Heart rate (variability; HR/HRV) and blood pressure served as indicators of bodily signal strength (I.); heartbeat-evoked potentials (HEPs) assessed during a heartbeat counting task (HCT) and a distraction task indicated filter system function (II.); cardiac interoceptive accuracy (IAC) in the HCT was interpreted as an index of perception of bodily signals (III.). All indicators were assessed before and after a socially-evaluated cold pressor stress task (SECPT; to manipulate bodily signal strength) and a control intervention. SFD patients (n=24) showed higher average HR and diastolic blood pressure, as well as lower HRV than HC individuals (n=22), but there were no differences in HEPs or IAC. Neither were there significant differences between the SFD and the MDD groups (n=24), nor any stress effect on HEPs or IAC. Our findings suggest that stronger bodily signals (I.) is the only model assumption that could be supported for patients with fully-developed SFD.

FUNDING: Project: "Interoception in medically-unexplained symptoms" (INMEDEX) Grant recipients: André Schulz (PI), Claus Vögele Funding body: Research Support Department of the University of Luxembourg.

POSTER SESSION II-079 | THE RELATIONSHIP BETWEEN POST-ERROR SLOWING, SKIN CONDUCTANCE RESPONSE, AND POST-ERROR ACCURACY IN HEALTHY INDIVIDUALS AND PATIENTS WITH OCD

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Descriptors: error processing, skin conductance response, obsessive-compulsive disorder

Flexible, goal-directed behavior requires monitoring of ongoing actions and initiation of adjustments when errors occur. This process may be altered in individuals with obsessive-compulsive disorder (OCD). While error-related brain activity has been extensively studied in OCD, post-error slowing (PES) as a behavioral adjustment has received less attention. To shed further light on the functional significance of PES, we examined its relation to skin conductance response (SCR), a component of the orienting response, and post-error accuracy, an index of control-related adjustment. We then examined whether these post-error adjustments are altered in OCD. Two studies were conducted, one with 30 healthy individuals using a go/no-go task and another with 28 patients with OCD and 28 healthy controls using a flanker task. In both studies, errors led to enhanced SCR, PES, and an increase in accuracy. SCR positively predicted PES at the single-trial level, and larger PES was associated with higher post-error accuracy across individuals, indicating that PES may represent a manifestation of both an orienting response and a control-related adjustment of the speed-accuracy trade-off. No group differences were observed in PES and post-error increase in accuracy, consistent with the notion that behavioral indices of error monitoring are unaltered in OCD. We found no evidence for group differences in the relation between PES and both SCR and post-error accuracy, suggesting that mechanisms underlying post-error behavioral adjustment are similar in individuals with OCD and healthy individuals.

POSTER SESSION II-080 | REDUCED VARIABILITY OF SMALL WORLD PROPENSITY IN SCHIZOPHRENIA: EEG TASK ANALYSIS AND SYMPTOM PREDICTION

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Descriptors: *Small World Propensity, EEG, Schizophrenia*

Functional segregation and functional integration are well-studied principles of brain organization which are often studied in the context of small world networks, where neighboring nodes have dense connections or form clusters, but any two distant nodes can be reached through relatively few long-range connections (Watts and Strogatz, 1998). The study of small-world architectures has furthered our understanding of how the brain performs different cognitive functions, and how these functions may be disrupted in individuals affected by brain and mental health disorders. Evidence shows altered small world architecture in individuals with schizophrenia, with decreased small “world-ness” in active and executive tasks, and mixed findings for resting or passive tasks. The present study is the first to apply small world propensity (SWP, Muldoon et al., 2016) to characterize the average clustering and characteristic path length in the EEG from resting (eyes-open and eyes-closed), auditory (music), and visual (emotional face) tasks in 42 patients with schizophrenia and 42 healthy controls. Functional networks were computed for participant and for each task in delta (1-3 Hz), theta (4-7 Hz), alpha (8-12 Hz), and beta (13-30 Hz) frequency bands. The mean SWP did not differ between groups; yet patients with schizophrenia exhibited decreased variation in their SWP across tasks in all frequency bands (delta, theta, beta, $p < 0.05$; alpha, $p = 0.052$). Moreover, using cross-validation, SWP and SWP variation accounted for 23% of the variation in PANSS positive symptom scores for the patients.

FUNDING: This research was supported by a Natural Science and Engineering Council of Canada (NSERC) grant (RGPIN-2019-05418) awarded to WM, NSERC (203710-2011) and Social Sciences and Humanities Research Council of Canada (SSHRC) (410-2008-1595) grants awarded to LAS, and a NSERC (122222-2008) grant awarded to SJS.

POSTER SESSION II-081 | DECREASED GLOBAL BUT NOT LOCAL NEURAL RESPONSE TO REWARD RELATES TO INCREASED DEPRESSIVE SYMPTOM SEVERITY IN YOUNG CHILDREN

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Descriptors: *Reward, Depression, Children*

Reduced neural activation to reward may be associated with depressive symptom severity during early childhood.

We characterized neural reward responding in 137, 4-7-year-old children using EEG/ERP and fMRI techniques during reward gain and loss. The reward positivity ERP (RewP) was identified using data-driven EEG microstate analysis of gain minus loss activity, which revealed 7 group-level microstates, or periods of stable spatiotemporal topographies. Of these, Microstate 4 (M4) represented the 232-380 ms period and captured activity of the RewP. How well M4 was represented in each child's data was quantified as the average spatial correlation between M4 and each timepoint of activity during the 232-380 ms period. The RewP was calculated as the residualized gain-loss mean amplitude score during the same period at Cz. In a subsample of 77 children who also had fMRI data during the same task, amygdala reactivity to gain minus loss was quantified. Decreased representation of M4 (reduced global reward response), but not the RewP associated with increased children's depressive symptom severity, controlling for caregiver's depressive symptom severity ($R^2 = .11$, $p = .01$). Increased representation of M4, but not RewP associated with increased amygdala gain reactivity ($R^2 = .10$, $p = .02$). Results suggest that global (M4), but not local (RewP) EEG neural dynamics of reward responding reflect individual differences in children's depressive symptom severity, and that global neural dynamics relate to activity of the amygdala, whose functioning has been shown to be disrupted in depression.

FUNDING: This study was supported by the National Institute of Mental Health (R01MH110488 to Michael S. Gaffrey).

POSTER SESSION II-082 | REDUCED VARIABILITY IN THE ERN RESPONSE PREDICTS GREATER EXTERNALIZING PSYCHOPATHOLOGY AND TRAITS

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Descriptors: *externalizing, trial-level analysis, ERN*

The error-related negativity (ERN) is a response-locked event-related potential (ERP) component that peaks approximately 50-100ms after an incorrect response is made (Gehring et al., 1993). The ERN is thought to be part of a general response monitoring system (Bernstein, Scheffers, & Coles, 1995) and has been shown to be responsive to the value of an error (Hajcak et al., 2005). The clinical significance of the ERN has historically been discussed in terms of its relationship with anxiety (Hajcak, McDonald, & Simons, 2003) and other internalizing disorders; however, some work has

demonstrated a connection to externalizing psychopathology (Hall, Bernat, & Patrick, 2007). The current project intends to further investigate the ERN's role in externalizing by utilizing multilevel structural equation modeling to analyze the trial-level structure of the ERN. The mean amplitude, slope (change across task as a function of the number of errors), and variability of the ERN response elicited in an Erikson flanker task was evaluated in relation to trait disinhibition and PID-5 estimated borderline and antisocial personality disorder scores collected from 206 college and community participants who completed the task and filled out a series of questionnaires. Results show that participants who were higher in externalizing psychopathology showed less variability in their ERN response, with no significant relationship to the mean or slope of the response. This could indicate a diminished responsiveness to error context and relative significance of an incorrect response.

POSTER SESSION II-083 | THE REWARD POSITIVITY TO MONETARY AND FOOD REWARDS BEFORE AND AFTER AN ACUTE REAL-WORLD STRESSOR

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Descriptors: Reward Positivity, Stress, Electroencephalography
Abnormalities in reward sensitivity have been implicated in multiple forms of psychopathology, and these abnormalities may stem, at least in part, from exposure to stressors. Past research has found that both chronic real-world stressors and laboratory stress inductions can reduce measures of reward responsiveness derived from event-related potentials (ERPs). However, the impact of acute *real-world stress* on neural correlates of reward sensitivity is less clear. In a sample of 28 undergraduate students (20 women, 67% White), we assessed the reward positivity (RewP)—an ERP component that reflects neural sensitivity to rewards—elicited by monetary and food rewards before and after a real-world stressor: university examinations. To do so, we measured participants' RewP at the very beginning of the semester, before midterms start, and again within a few hours of a midterm or final examination, or an acutely stressful presentation. These real-world stressors did not lead to significant blunting of the RewP elicited by

either monetary or food rewards. Future studies with larger sample sizes, and considering the effects of other types of stressors (e.g., interpersonal stress), might be needed to clarify associations between stress and the RewP.

POSTER SESSION II-084 | RELATIONSHIP BETWEEN ERROR-RELATED NEGATIVITY AND INTERNALIZING-EXTERNALIZING SYMPTOMS: A STRUCTURAL EQUATION MODELING APPROACH

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Descriptors: Performance Monitoring, Error-Related Negativity, Internalizing-Externalizing Symptoms

Relationships between psychopathology and performance monitoring are typically examined using only one task (e.g., flanker, Stroop, go/nogo). However, this approach might miss important task-related differences in ERP-symptom relationships. Therefore, we examined task-specific relationships between error-related negativity (ERN) and internalizing or externalizing symptom dimensions using structural equation modeling. We recorded high-density ERPs in 115 healthy undergraduates (84 women) while they completed a modified version of the Eriksen flanker task, a Stroop task, and a go/nogo task. Internalizing and externalizing symptom dimensions were assessed using the Achenbach Adult Self Report questionnaire. A two-factor model with ERN and correct-related negativity (CRN) fit the data better than a model with only one performance-monitoring factor. However, separate regression analyses between internalizing and externalizing symptom dimensions and ERP components at the task and latent factor level were not significant. The two-factor model successfully parsed CRN and ERN latent factors, but symptoms did not predict CRN or ERN either at the task level or as latent factors. These findings suggest that internalizing/externalizing symptoms are not strong predictors of performance monitoring, as indexed by CRN and ERN, in a healthy undergraduate sample. Therefore, future research might examine clinical samples to understand distinct relationships between internalizing/externalizing symptoms and performance monitoring.



POSTER SESSION II-085 | THE POTENTIAL FOR SUSTAINED MODULATION OF P50 GATING IN FIRST-EPISODE SCHIZOPHRENIA

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Descriptors: sensory gating, schizophrenia

Schizophrenia (SZ) is associated with a reduced capacity to filter out extraneous stimuli in order to facilitate processing of pertinent information, a process known as *sensory gating*. Typically measured using the P50 ERP component during a paired-stimulus passive listening task, the P50 response to the second stimulus is “gated” or suppressed relative to the P50 response to the first stimulus. SZ show suppression impairments, which are associated with cognitive symptoms of the illness, including attentional difficulties. Prior work (Yee et al., 2010) has demonstrated that P50 suppression impairments in SZ can be modulated transiently by directing voluntary attention, resulting in P50 suppression that mirrors patterns observed in healthy comparison (HC) individuals and suggesting potential malleability of this process. The present study examined whether a similar modulation to the P50 effect in SZ could be observed longer-term, after patients completed a 6-month intervention designed to improve cognitive symptoms, including inattention. Baseline and 6-month follow-up EEG and behavioral data were collected from 46 clinically-stabilized first-episode SZ outpatients and 28 HC participants. Preliminary data from a subsample of these individuals suggest that, although attentional functioning may be strengthened in the long-term, P50 gating in SZ may not be as amenable to sustained changes, with potential implications for treatment design and theoretical mechanisms.

FUNDING: This work was supported by the National Institute of Mental Health (R01 MH110544 and R01 MH110544-S1) and the UCLA Division of Graduate Education.

POSTER SESSION II-086 | HIGH LEVELS OF DISPERSION IN PREADOLESCENT GIRLS' RESPIRATORY SINUS ARRHYTHMIA DURING PARENT-DAUGHTER DISCUSSIONS: A NOVEL TRANSDIAGNOSTIC BIOMARKER

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University of California, Los Angeles

Descriptors: respiratory sinus arrhythmia

Excessive respiratory sinus arrhythmia (RSA) responsivity may indicate overtaxation of physiological regulatory systems and reflect transdiagnostic risk for behavioral difficulties. We evaluated linear and quadratic effects of child RSA dispersion on concurrent behavior problems among a sample of at-risk girls ($n=28$; 6-12 years, $M_{\text{child age}} = 8.5$). Second-by-second estimates of child RSA during 5-min. pleasant event-planning and conflict discussion tasks were obtained from cleaned ECG data; dispersion during each task was operationalized as the coefficient of variation (CV) in RSA ($CV_{\text{child rsa}}$). Children's behavior problems T-scores were calculated from parent report on the CBCL. $CV_{\text{child rsa}}$ during the conflict discussion task accounted for 22.1% of the variance in total behavior problems, $F(2,22) = 3.12$, $p = 0.06$. Results indicated a moderately-sized, positively accelerated relationship between the $CV_{\text{child rsa}}$ and total problems, $\text{Beta} = 0.43$, $p = .03$. Similarly, the $CV_{\text{child rsa}}$ during the pleasant event-planning task accounted for 13.8% of the variance in total behavior problems, $F(2,24) = 1.92$, $p = 0.17$. Results indicated a marginally significant, moderately-sized positively accelerated relationship between the $CV_{\text{child rsa}}$ and total problems, $\text{Beta} = 0.46$, $p = .08$. Post-hoc analyses indicated moderate-to-large quadratic effects of $CV_{\text{child rsa}}$ on social problems, rule-breaking, attention problems, and aggressive behavior (p 's $< .12$). Excessive $CV_{\text{child rsa}}$ during emotionally-salient discussions may be a transdiagnostic biomarker, especially across the externalizing spectrum.

FUNDING: NIMH F32 MH132254-01 (Somers); NSF GRFP (Cannova).

POSTER SESSION II-087 | RESTING HEART RATE VARIABILITY IS INDIRECTLY ASSOCIATED WITH ANXIETY SYMPTOMS THROUGH ANXIETY SENSITIVITY AND PERCEIVED STRESS

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Descriptors: Heart-rate Variability, Anxiety, Stress

Low resting state heart-rate variability (HRV) metrics, reflecting autonomic activity, have been observed in anxiety disorders. However, it is presently unclear what may account for this association. Anxiety sensitivity (AS), which is fear of anxiety symptoms, and perceived stress (PS) are two risk factors of anxiety disorders that have been related to HRV in recent studies. We hypothesized a serial mediation consisting of an indirect effect of HRV on

anxiety symptoms explained by AS, because it represents negative interpretations of autonomic activity, and PS, because interpreting autonomic activity as negative may be stressful. Undergraduate students ($N=88$; 76% women; 69% White) completed the ASI-3, GAD-7, and PSS-10, while also undergoing a resting state HRV task. We estimated the 95% CI for model effects using a total of 5,000 bootstrap iterations. Consistent with theory, RMSSD, an HRV metric reflecting parasympathetic tone, was associated indirectly with generalized anxiety symptoms when mediated by AS and PS ($B = -0.02$, 95% CI $[-0.03, -0.01]$). Additionally, there was an indirect effect through AS ($B = -0.01$, 95% CI $[-0.02, -0.00]$), but not PS ($B = 0.02$, 95% CI $[-0.01, 0.05]$). Results supported the hypothesized serial mediating effect. These findings advance a candidate mechanism by which HRV is linked to self-reported anxiety. Follow-up longitudinal studies must be conducted to support the temporal claims of this model.

POSTER SESSION II-088 | NOVEL PARAMETERIZATION OF EVENT-RELATED POTENTIALS: A STEP TOWARDS CHARACTERIZING THE BIOPHYSICAL ORIGINS

Dillan Elise Cellier¹, Eena Kosik¹, Michael Preston¹, Parsa Seyfourian^{2,3}, Leslie Claar², Lydia Marks², Irene Rembado², Bradley Voytek¹

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Descriptors: event-related potentials, visual processing, thalamocortical connectivity

Event-related potentials (ERPs) are foundational in linking human electroencephalography (EEG) to cognition and disease. For decades, systematic variation in ERP timing and amplitude have been linked to various perceptual and cognitive states, and have been leveraged in clinical applications ranging from anesthesia to brain-computer interfaces. Despite their wide adoption and utility, the biophysiological origins of ERPs remain largely unknown. Here, we test the hypothesis that early visual evoked potentials are driven by thalamic excitatory projections to input layers of primary visual cortex (V1). We make use of large scale single-unit and local field potentials (LFP) recordings using NeuroPixels probes in head-fixed mice targeting the visual thalamic nuclei and V1, in conjunction with biophysically informed models. We also introduce a novel ERP parameterization approach that quantifies each ERP waveform in terms of its onset, amplitude, time-to-peak, duration, and peak-sharpness. Using simulated LFP and our novel ERP parameterization approach, we demonstrate that visual evoked potentials are driven by

thalamocortical excitatory postsynaptic currents (EPSPs). These currents, which have a sharp temporal onset and slower decay, integrate such that when thalamic spikes are temporally aligned, the resulting V1 ERP is sharper and has a larger magnitude. When thalamic spikes are more temporally variable, the resulting EPSPs in V1 integrate into a slightly smoother ERP. These results further our understanding of the ERP origins and their biophysical interpretability.

FUNDING: NSF GRFP (to D.C.) NIH National Institute of General Medical Sciences grant R01GM134363-01 (to B.V.) The Tiny Blue Dot Foundation, Templeton World Charity Foundation, (to Allen Institute).

POSTER SESSION II-089 | EXPERTISE IN THE DETECTION OF DECEPTIVE ACTIONS: AN ERP STUDY ON FOOTBALL

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Descriptors: deceptive perception, event-related potential, N1

Performing deceptive actions is a widely-used technique in competitive sports, and research on deception in sports has been conducted extensively in the past decade. However, neural mechanisms underlying deception detection were still not fully understood. By using event-related potentials (ERP), we investigated the neurophysiology of deceptive action detection between skilled and novice footballers. Eleven players and 13 college students were presented with temporally-occluded video clips of opponents dribbling the ball toward them and then turning to the left or right. Half of the videos were non-deceptive actions, while the other half were deceptive actions in which the opponents performed a stepover action that pretended to move in one direction before going in the other. Behaviorally, we found a significant interaction effect between expertise and deception on reaction times ($p < 0.05$, $\eta^2 G = 0.013$). *Participants were faster in the non-deceptive than the deceptive trials, and the time difference was significantly smaller for experts than novices* ($p < 0.05$, Cohen's $d = 0.943$). *Neurophysiologically, we found a larger centro-parietal N1 (time-locked to the deception onset) for experts than novices in both deceptive and non-deceptive trials* ($p < 0.05$, $\eta^2 G = 0.133$). *Moreover, a larger fronto-central N2 component was also found in the deceptive than the non-deceptive trials for both groups* ($p < 0.001$, $\eta^2 G = 0.277$). *Our results suggest that experts have attentional superiority in processing the task-relevant scene, which seems to benefit their detection of deceptive actions.*

POSTER SESSION II-090 | VIOLATING INTERNALIZED RULES AFFECTS PREDICTION PROCESSES IN MUSICIANS

Thomas Hartmann¹, Nathan Weisz^{1,2}

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Descriptors: Prediction, Musicality, Auditory

In their seminal article from 2019, Demarchi et al., introduced a method to analyze prediction processes. In a nutshell, they used Multivariate-Pattern-Analysis (MVPA) to measure the similarity between MEG recorded cortical activity during anticipation of a predictable sound and during its actual perception. The rationale is, that if the similarity is sufficiently high, this would confirm the hypothesis put forward by predictive coding frameworks that prediction activity should be in fact very similar to activity caused by perception. Predictability is induced in these experiments by presenting a highly ordered sequence of 4 tones which leads to rapid internalization of this rule. In the current study, we expanded the paradigm by evoking a rule that is internalized depending on musicality. The tones would either create a perfect A major chord or slightly detuned version of it. The hypothesis was that higher musicality, measured by the Goldsmith Musical Sophistication Index (GOLD-MSI) would correspond to better internalization of this rule and thus would have an influence on these prediction processes. Using musicality as a factor in a linear model estimating prediction related activity as in the Demarchi et al. 2019 study, we indeed found that the slope of the musicality factor was outside of the 94% HDI and thus significantly lower than 0 at 125ms to 75ms before the onset of the stimuli. This confirms our initial hypothesis that internalized rules have an impact on prediction related activity that can be measured with the MEG.

POSTER SESSION II-091 | THE RELATIONSHIP BETWEEN HEART RATE VARIABILITY AND SYMPTOM PERCEPTION

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Descriptors: HRV, dyspnea, pain

Heart rate variability (HRV) is considered as a marker of flexible physiological reactivity. Resting HRV was shown to predict the perception of symptoms. However, research to date focused exclusively on pain, showing that higher HRV was related to lower pain intensity. This study extends this by examining the associations between HRV and another highly prevalent symptom: dyspnea.

Secondary data analysis was performed on four studies in healthy participants (N=62-92, 71-100% female). Resting HRV was measured during a 5-min baseline; pain was induced with thermal (cold) stimulation (Study 1); dyspnea with rebreathing task (Studies 1-4). Symptom (average/peak pain/dyspnea and symptom checklist) and threat ratings were collected post-trial. Trait questionnaires measured negative affectivity, habitual symptom reporting and symptom catastrophizing. Correlations between all variables were followed by hierarchical regression models, with RMSSD and high-frequency (HF) power included as predictors of symptom ratings, controlling for potential covariates. Neither RMSSD nor HF-power was associated with average/peak pain/dyspnea. In Study 4, HRV indices were related to more post-trial symptoms ($r_s = .2$). However, this became non-significant when controlling for covariates. In three studies, RMSSD showed low to moderate negative associations with trait dyspnea catastrophizing. Findings suggest that resting HRV is not a significant predictor of induced dyspnea intensity. Our future research will further explore if dyspnea ratings are related to another aspect of HRV – its reactivity.

FUNDING: This study was supported by a postdoctoral research grant from the Research Foundation Flanders (12W6420N) and an infrastructure grant from the FWO and the Research Fund KU Leuven, Belgium (AKUL/19/06; I011320N).

POSTER SESSION II-092 | EXPLORING THE ASSOCIATION BETWEEN INTEROCEPTIVE FEATURES AND CARDIAC VAGAL ACTIVITY

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University of Padova

Descriptors: Interoception, Heart rate variability, Parasympathetic activity

The autonomic nervous system (ANS) balance, regulated by the Central Autonomic Network (CAN), has an important role in the modulation of emotional states. Vagally mediated heart rate variability (vmHRV) is an index of parasympathetic activity on the heart. Interoception is the ability to perceive and interpret ANS functions and is also thought to be linked with emotion regulation. Intriguingly, brain regions involved in interoception tasks overlaps with the CAN. To date, the association between cardiac vagal activity and interoception is still unclear. In a normative sample of young adults ($n = 50$), resting-state vmHRV, interoceptive accuracy (heart-beat detection task, heart-beat discrimination task), and interoceptive sensibility (body perception questionnaire, BPQ) were collected. A positive association between interoceptive

abilities (accuracy and sensibility) and vmHRV emerged. In addition, interoceptive accuracy (heartbeat detection task) was associated with interoceptive sensibility (body awareness, BPQ). Taken together, these findings support an association between interoceptive patterns (subjective and objective) and vmHRV. Given that both reduced vmHRV and interoceptive abilities relate to emotion regulation, the interaction between these two mechanisms in exacerbating vulnerability to psychopathology should be further explored.

POSTER SESSION II-093 | UNPREDICTABLE AUDITORY LATERALIZATION CHANGE ENHANCES SLOW POTENTIALS AT THE AUDITORY MIDDLE LATENCY RESPONSE RANGE

Kazunari Ikeda
Tokyo Gakugei University

Descriptors: auditory middle latency response, lateralization, change-related potential

The auditory middle latency responses (MLRs) associated with unpredictable lateralization change are recently reported, whereas discrepancies in latency and polarity exist among previous studies. This study compared two settings of EEG bandpass frequency for confirming the reproducibility of the lateralization change-related MLR. Sixteen participants received either low-passed (<1000 Hz) or high-passed (2000 Hz <) clicks with intensity at 30 dB SL and stimulus onset interval at 180 ms. In the predictable condition stimulation among ears (binaural, left monaural, right monaural) was fixed to a location, while in the unpredictable condition it was randomized among ears. Participants conducted auditory and visual tasks during the stimulation. The two EEG bandpass frequencies used were 0.16-100 and 20-2000 Hz. We calculated the difference waveform by subtracting the left and right monaural waveforms from the binaural waveform. At the EEG bandpass of 0.16-100 Hz, waveforms related to lateralization change were stably observed in a time window of 20-57 ms. The summed monaural waveforms revealed a negative peak that was enhanced in the unpredictable condition compared to the predictable condition. The same effect of stimulus conditions was found for a positive peak in the difference waveform. Such a significant stimulus condition effect was identified only for the Nb difference waveform at the EEG bandpass of 20-2000 Hz. This suggests that the lateralization change-related MLR is reproducible with an EEG high-passed frequency involving slow potentials.

POSTER SESSION II-094 | THE LONELY MIND: INVESTIGATING HOW LONELINESS IMPACTS THE NEURAL MECHANISMS OF COGNITIVE REAPPRAISAL IN YOUNG ADULTS

Marta Chrustowicz, Szymon Mąka, Łukasz Okruszek
Polish Academy of Sciences

Descriptors: loneliness, cognitive reappraisal, electroencephalography

According to the Evolutionary Theory of Loneliness, a prolonged feeling of loneliness may increase bottom-up processes associated with orienting toward social stimuli (e.g., hypervigilance to social threats) while decreasing top-down processes necessary for producing adequate emotional response (mentalizing and emotion regulation). The study aimed to examine the impact of loneliness on the ability to engage in cognitive reappraisal. It investigated the response to altercations compared to neutral social interactions presented by point-light agents. 151 young adults from the whole spectrum of loneliness were asked to reappraise or watch negative stimuli, while the electroencephalography was recorded. Altercations were found to be rated as more negative and more arousing than neutral interactions. Larger amplitudes of Late Positive Potential (LPP) were also observed in response to altercations compared to neutral interactions. However, use of cognitive reappraisal techniques, which involves re-evaluating a situation to mitigate its emotional impact, was found to decrease the abovementioned behavioral and neurophysiological effects in participants. Interestingly, we found no correlation between loneliness levels and how participants responded to stimuli. However, several limitations (e.g., inability to include participants with very elevated loneliness scores in nonclinical sample) may have dampened the effects observed in the current study. Still, current study can have important implications for interventions that aim to help individuals cope with negative social interactions.

FUNDING: The National Science Centre, Poland, supported this work, Grant No: 2019/35/B/HS6/00517.

POSTER SESSION II-095 | PREDICTING THE PERPETRATOR OF UNFAIR TREATMENT: A SOCIAL-HEALTH PSYCHOPHYSIOLOGICAL PERSPECTIVE

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University of California, Irvine

Descriptors: Heart rate variability, In-group bias, Racial identification

In-group bias (IGB) can be defined as a predisposition toward members of one's own social group and a propensity in responsiveness toward out-group members, which is linked with a tendency to perpetuate discrimination toward members of marginalized outgroups. In two pilot studies, we examined the relationship between resting heart rate variability (HRV) and IGB factors, and how racial identification (RI) might moderate these associations. *Study 1* utilized a target detection task that required White participants ($n = 33$) to indicate the positioning of Black or White male faces displaying neutral emotion to assess IGB. In *Study 2*, participants (47 White, 51 Black) answered the social dominance orientation scale, which assesses the degree to which individuals support group-based hierarchies and is a strong predictor of IGB. In both studies, HRV was measured during a 5-minute baseline period, and the RI scale required participants to rate how strongly they identified with their racial group. In *Study 1*, lower HRV was linked with poorer accuracy to Black faces only among White individuals higher in RI ($B = .051$, $p < .05$). In *Study 2*, lower HRV was linked with higher social dominance orientation only among White individuals higher in RI ($B = .41$, $p < .050$). These data suggest that inhibitory control, as indexed by HRV, is linked with IGB in White individuals higher in RI. This is important, as resting HRV might partially explain recent research linking poorer health with discrimination in the perpetrator. Real world implications and future directions will be discussed.

POSTER SESSION II-096 | RESTING PARASYMPATHETIC ACTIVITY, LONELINESS AND SOCIAL APPROACH BEHAVIORS

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Descriptors: Loneliness, Approach, Motivation

Loneliness, or perceived social isolation, is thought to increase social approach motivation while simultaneously increasing vigilance to threat. These tendencies may work together to reduce feelings of loneliness by increasing the likelihood of fostering relationships while avoiding social rejection. Nonetheless, it remains unclear when states of loneliness result in approach as compared to avoidance. Increased resting parasympathetic activity is linked to more flexible and adaptive motivated responding, and as such may moderate how individuals react to loneliness. Indeed, research has found that lonely individuals with high resting parasympathetic activity are more likely to demonstrate

approach behaviors when making decisions about whether to approach or avoid valence-conditioned stimuli. Here, we examined whether this effect is more pronounced for social information. Participants completed an instrumental learning task where they were asked to make decisions about whether or not to approach or avoid social or non-social positive and negative images. Measures of resting parasympathetic activity and loneliness were collected. Loneliness was associated with increased approach behaviors but only for individuals with higher levels of resting parasympathetic activity. This effect depended on the sociality of images. This research suggests that how individuals respond to feelings of loneliness depends on a variety of factors. We discuss these findings in terms of the role resting parasympathetic activity may play in facilitating adaptive responses to loneliness.

POSTER SESSION II-097 | SIMILAR PROCESSING OF OBSERVED ERRORS IN INTERACTION WITH HUMAN AND ARTIFICIAL AGENTS

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Descriptors: social error monitoring, human-machine interaction

Human and artificial agents differ in several aspects, one of which is how consistently and reliably they respond to one's own commands. As a consequence, processes responsible for error monitoring might differ when interacting with a social or a non-social partner. In the current study, we investigated this issue by comparing event-related potentials induced by human and machine errors in an interactive setting. Participants directed their partner to perform one of four response options and they could monitor whether the second agent made an error by observing visual stimuli generated by the partner's responses. In separate conditions, participants were led to believe that they were interacting with a human (social condition) or with an artificial partner (non-social condition). We compared the processing of the partners' errors in the two conditions by assessing observed-error-related negativity (oERN) and observed-error positivity (oPE). These error-related components did not differ between the two conditions, suggesting that processing of the partner's errors in an interactive task is influenced by the relevance of the errors with regard to the agent's own goals but not by expectations with regard to human-machine differences.

FUNDING: This work was supported by the German Research Council (Deutsche Forschungsgemeinschaft; DFG: PF 853/2-2).

POSTER SESSION II-098 | PERSONALIZED TRANSCRANIAL ALTERNATING CURRENT STIMULATION OVER SUPPLEMENTARY MOTOR AREA IMPROVES SPEECH MOTOR CONTROL IN NEUROTYPICAL ADULTS

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Descriptors: Speech production, SMA, tACS

Speech production depends on dynamic interaction between multiple neural systems in human brain. Converging evidence supports the involvement of supplementary motor area (SMA) in planning, execution and control of speech production. Recent studies have shown that non-invasive brain stimulation techniques such as transcranial alternating current stimulation (tACS) within beta band (13-30 Hz) over SMA can improve various aspects of motor functions in neurotypical adults and patients with movement disorders. However, some studies reported high between-subjects variability following tACS, indicating that stimulation parameters should be personalized to the subject's brain wave. For the first time, here we applied a personalized tACS protocol that was tailored to each participant's pre-movement beta activity in left SMA. 23 neurotypical adults (age: 20 ± 1.53 ; Females: 19) received transcranial alternating current stimulation (tACS), random noise stimulation (tRNS), and sham over left SMA. Each stimulation session was followed by a speech production experiment where participants were instructed to produce speech sounds in response to visual cues. Both tACS and tRNS over left SMA facilitated reaction times (RTs) for speech production compared to the sham condition. However, the improvement in RTs was significantly greater in the tACS tuned to peak beta frequency of speech compared to tRNS. These findings suggest that personalized tACS within beta band over SMA is an effective non-invasive approach to improve speech production and has clinical implications for speech-motor disorders.

FUNDING: Research reported in this study was supported by a grant from Louisiana Board of Regent Research Competitiveness Program (award number: AWD-004500).

POSTER SESSION II-099 | DID YOU SAY BRAIN OR BRAVE? AN ERP INVESTIGATION OF THE TIME COURSE OF FALSE HEARING

Jack Silcox, Karen Bennett, Brennan Payne
University of Utah

Descriptors: Prediction, N400, Language

Most of the time, relying on predictions can help listeners better comprehend perceptually challenging speech. However, when the acoustic signal does not match what is predicted a listener can occasionally experience false hearing, or hearing a word that was not said (e.g., hearing the word "pen" when "pet" was said). A "post-perceptual resolution" account of false hearing has been proposed in which a listener selects one of two or more phonologically similar competitors *after* a word has been spoken. False hearing research has relied almost exclusively on offline behavioral outcomes, making it difficult to determine if a post-perceptual account is correct. We ran two ERP experiments in which target words were either in a cue-target pair (Exp. 1) or in a constraining sentence (Exp. 2). Target words could be of three types: congruent words (CON), incongruent baseline words (IB), or phonological lures (PL). Importantly, the PL were phonologically similar to the CON while the IB were not. Participants were to identify the target words embedded in background noise. Participants frequently reported hearing the CON word when the PL word was spoken. ERP results across both experiments showed that the N400 response to both IB and PL words was larger than the response to CON words. Critically, the N400 to falsely heard PL words was more like the CON response than the IB or PL response. These findings are more in line with an account in which the brain immediately responds as though it is truly hearing the reported word rather than engaging in post-perceptual resolution processes.

POSTER SESSION II-101 | EXPLORING THE ROLE OF POST-ERROR PROCESSING IN SOCIAL ANXIETY ACROSS DEVELOPMENT

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Florida International University

Error monitoring (EM), a neural process reflecting self-detection of errors, has been proposed as a marker of social anxiety. However, the way in which this marker relates to social anxiety is not consistent across development, as older children/adolescents with anxiety exhibit heightened EM and younger children with anxiety exhibit diminished EM. One way to contextualize this inconsistency and provide insight into childhood social anxiety is

to examine the less-studied consequences of EM, termed post-error processing. We employed computational modeling to estimate post-error (vs. post-correct) attentional control during a Flanker task, within a sample of 155 treatment-seeking youth aged 7-17. Youth reported social anxiety symptoms via the Screen for Child Anxiety Related Disorders (SCARED). Mixed-effects regression analyses revealed a three-way interaction ($p=0.016$) between trial type (post-error/correct), age, and social anxiety symptoms. Higher social anxiety predicted diminished post-error control in children, but this effect changed across age, with higher social anxiety no longer predicting diminished post-error control by adolescence. Studying the functional consequences of committing errors – post-error processing – provides additional context for understanding the relationship between social anxiety and EM. These data elucidate important changes in the relationship between social anxiety and post-error processing across development, and therefore underscore the need for developmentally sensitive assessment and treatment of pediatric social anxiety.

R01MH131637 (Buzzell, Pettit).

POSTER SESSION II-102 | EMOTIONAL RESPONDING TO LOSS: DISTINCTIONS BETWEEN EUROPEAN AMERICANS AND CHINESE AMERICANS

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Virginia Polytechnic Institute and State University

There is evidence that Europeans tend to perceive salient objects in the foreground, while East Asians tend to perceive holistically, including interrelationships between context and object. We studied how this distinction in perception might affect responding to a film clip on grief following an exposure to loss of connection (a social affordance) playing Cyberball, a ball-tossing videogame. We hypothesized that the European Americans (EA) would feel sadness more intensely, in terms of decreased heart rate (HR) and increased RSA, at an earlier time during the clip than the Chinese Americans (CA). CA were predicted to show no difference from controls. Subjects played Cyberball with computer-generated players and then watched the film clip. ECG and facial electromyography (fEMG) data were acquired from 51 subjects (38 EA, 13 CA, 25 male, mean age 21.1) in a between-subjects design. 26 subjects (19 EA, 6 CA) received 2 out of 48 balls tossed and the controls received 10. Most subjects reported feeling sad during the clip. fEMG of the corrugator muscle revealed EA activated higher peak intensity 5.5 seconds earlier than CA (increased 1.571 vs 0.844).

EA had decreased HR and increased RSA, a sign of withdrawal in sadness, 30 to 60 seconds after start of the clip. To a lesser extent, CA also had decreased HR and almost no change in RSA 30 seconds later. Throughout the clip, EA's and CA's HR were above and below that during Cyberball, respectively. Evidence suggests exposure to loss had stronger effect on EA to increase their arousal and sensitivity thereafter.

POSTER SESSION II-103 | LATE-BREAKING THE RELATIONSHIP BETWEEN EUDAIMONIC WELL-BEING AND HEART RATE VARIABILITY

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Descriptors: psychological well-being, electrocardiogram, cardiovascular function

The young populations have tended to suffer from mental problems, which are related to Eudaimonic (e.g., purpose in life) (EWB) and Hedonic (e.g., pleasure and satisfaction) well-being (HWB). It is known that higher levels of EWB, but not HWB, are positively associated with arterial stiffness. While heart rate variability (HRV) may be associated with psychophysiological health such as perceived chronic stress and cardiovascular function, it is unclear whether higher HRV is associated with a higher level of EWB in young ages. Here, we assessed the relationship between well-being and HRV. Twenty-six young men and women (26 ± 5 yrs) took part in surveys of EWB (Ryff's psychological well-being) and HWB (Positive affect and life satisfaction) in the morning. Meanwhile, we assessed HRV by using an electrocardiogram (ECG) at rest in the supine position for 10-min. The R waves from the ECG recording were checked using the LabChart. The HRV during the last 5-min was analyzed in the frequency domain (HF-HRV; High-Frequency 0.15-0.4Hz) using a Python package with the normalized unit. For the statistical analysis, Spearman's correlation was used. Neither EWB nor HWB showed a significant correlation with HRV, whereas HWB showed positive correlation trend with HRV ($r_s=0.367$, $p=0.065$). On the other hand, EWB predominance (EWB-HWB) was negatively associated with HF-HRV ($r_s=-0.421$, $p=0.032$), suggesting that relatively lower level of HWB compared with EWB may be associated with lower HRV. In conclusion, EWB predominance was negatively correlated with HF-HRV in a young population.

POSTER SESSION II-104 | LATE-BREAKING DOES SOCIAL SUPPORT IN AMERICAN INDIANS INFLUENCE N2 AND P3A EVENT- RELATED POTENTIALS (ERP) TO STOP SIGNAL PROCESSING?

Ricardo Wilhelm, Breanna McNaughton, Mara Demuth, Danielle Bethel, Lizbeth Rojas, Nicole Baughman, Eric Mann, Robin Aupperle, Martin Paulus, Jennifer Stewart, Evan White

Laureate Institute for Brain Research (LIBR)

Descriptors: Executive Control, Protective Factors, American Indians

Sociocultural factors may buffer adverse mental health in American Indians (AIs). Executive control regulation is a viable mechanism for reducing such risks, but links with sociocultural factors in AIs are unknown. Thus, we studied the role of social support in cognitive control resources reflected by N2 and P3a ERPs, markers of attention allocation measured by electroencephalography (EEG). Participants ($n=59$) self-identified as AI, completed a Stop Signal Task during EEG recording, and completed a scale of social support (SOSS). ERPs were assessed at FCz to stop-signal onsets for N2 (132-220ms) and P3a (250-430ms) for correct/error trials. Linear mixed effects for each ERP modeled the trial*SOSS interaction. Johnson-Neyman slope regions (JNSRs) analyses described interactions. N2s reflected a trial*SOSS interaction, $F=8.21$, $p<.01$. JNSRs indicated N2s were greater for correct (vs. error) trials when SOSS was $\geq .71SD$ (1SD: $\beta=-1.54$, $SE=.66$, $t=-2.34$, $p<.03$). P3as reflected a trial*SOSS interaction, $F=5.86$, $p<.02$. JNSRs indicated P3as for correct (vs. error) trials were greater when SOSS was $\geq .42SD$ (0SD: $\beta=2.51$, $SE=.74$, $t=3.37$, $p<.01$; -1SD: $\beta=4.23$, $SE=1.07$, $t=3.97$, $p<.01$). Results support executive control efficiency as a mechanism whereby protective factors may buffer mental health risks. Those reporting high SOSS levels had greater levels of early selective attention (N2) but not sustained attention processing (P3a). These provide an essential step in neuroscience research for identifying target mechanisms that may improve AI mental health resilience.

FUNDING: Funding for this project came in part support from NIH grant 4K99MD015736-03.

POSTER SESSION II-105 | LATE-BREAKING SEDENTARY TIME IS RELATED TO DECREMENTS IN RESPONSE INHIBITION: AN ACCELEROMETRY AND ERP STUDY

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Descriptors: Inhibition, ERP

This study examined the relationship between accelerometer-measured ST (min/d) and behavioral and neuroelectric indices of response inhibition, measured with NoGo task, in 121 adults (76 females, $M_{age}=33.4 \pm 6.5$ [range: 20-46] years, $BMI=30.4 \pm 5.8$ [range: 19.4-47.9] $kg \cdot m^{-2}$). We tested the mediating effects of Go RT and the amplitude of the NoGo P3b-ERP component on the associations between ST and response inhibition defined as NoGo accuracy and NoGo N2 amplitude. We predicted that faster Go RT would mediate negative ST-NoGo accuracy and ST-N2 amplitude relationships. We also predicted poorer response inhibition with higher ST despite increased attentional resource allocation (larger NoGo P3b amplitude), suggesting poorer neural efficiency. Finally, we tested Go RT and NoGo P3b amplitude as parallel mediators of the ST-NoGo accuracy relationship. Adjusting for wear time, age, sex, BMI, education, IQ, and moderate-to-vigorous physical activity, faster Go RT mediated a negative association between ST and NoGo accuracy ($\beta=0.21 \pm 0.06$, 95% bootstrap CI [95% CI for short]: 0.09, 0.35) but not NoGo N2 amplitude. NoGo P3b amplitude did not mediate the ST-NoGo accuracy relationship. However, the combined mediated effect of Go RT and NoGo P3b amplitude fully mediated a negative association between ST and NoGo accuracy (total mediation effect: $\beta=0.26 \pm 0.07$, 95% CI: 0.13, 0.41, direct effect: $p=0.83$). Our study reveals that more sedentary adults may be more impulsive in their responses and do not compensate for decrements in response inhibition by upregulating attentional resources.

POSTER SESSION II-106 | LATE-BREAKING FRONTAL MIDLINE THETA IS SENSITIVE TO EMOTION SPECIFICITY

Nathan Chabin, Darin Brown

Pitzer College

Descriptors: Cognitive Control, Emotion, Frontal Midline Theta

Recent evidence from neuroimaging studies have highlighted key neural structures that underlie the processes of cognitive control and affect. These investigations have led to a common view purporting that negative affect initiates cognitive control processes. We conducted a series of experiments aimed at testing if affective processes influence the generation of a neural signal of cognitive control: Frontal-Midline Theta (FMT). In the first experiment, participants performed a modified Go/No-Go task where the color of the screen indicated whether the participant would press a button on the controller or would refrain

from pressing a button. Overlaying the colored screens were negative or neutral images. The results revealed a negative > neutral evoked FMT power for No-Go trials. Although these results appear to support the view that cognitive control processes are directly tied to negative affect, they may instead suggest that this is simply influenced by unsigned affective processes, regardless of the valence. In order to tease apart these dueling interpretations, a follow up experiment was conducted where participants performed the same modified Go/No-Go task with the inclusion of positive images. Results from this experiment once again revealed a significant enhancement of FMT for negative No-Go trials, while FMT for positive and neutral images did not differ, suggesting a specificity in the emotional influence for this signal. Together, these results further support the view that cognitive control systems can be thought of as a process initiated by negative affect.

POSTER SESSION II-107 | LATE-BREAKING INVESTIGATING THE EFFECTS OF EXERCISE AT VENTILATORY THRESHOLD ON NEUROCOGNITIVE FUNCTION

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Cheyenne Godby, Sydney McNorton, Karina Falkstrom,
Ryan Olson
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Descriptors: Exercise, ERP, P3

The positive effects of exercise on cognitive function are well-established; however, the precise physiological point where exercise no longer confers cognitive benefits remains unclear. Recent evidence suggests that cognitive decline may occur near the ventilatory threshold (VT), a point where ventilation exceeds oxygen consumption resulting in a shift to anaerobic metabolism. The primary objective was to examine changes in neurocognitive function following exercise at VT, 10% below VT, and 10% above VT. Nine (5 male; 4 female) subjects between the ages of 18-35 years old visited the lab on four separate occasions. VT was identified on day 1 via a maximal aerobic fitness test. On days 2-4 (counterbalanced), subjects completed a pre- and post-exercise oddball paradigm while EEG data were recorded. A reaction time main effect revealed significant reductions from pre- to post-exercise ($p = .04$). No additional main effects or interactions for reaction time or response accuracy were found ($ps > .05$). Similarly, no significant effects were identified for P3 amplitude or centroid latency ($ps > .05$). However, trends existed

for increases in P3 amplitude during rare trials following exercise at 10% below VT compared to at VT and 10% above VT conditions. Results from this study may aid in the development of exercise prescriptions tailored to enhance cognitive function or mitigate cognitive deficits. Furthermore, data from the current investigation may contribute to a deeper understanding of the underlying neurobiological mechanisms of the exercise-cognitive function relationship.

POSTER SESSION II-108 | LATE-BREAKING CHRONIC STRESS OF WORKING PARENTS AND THE IMPACT ON FAMILIES AND THEIR CHILDREN'S HEALTH

Olga Pollatos, Lorenz Rapp
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Descriptors: work-related stress, parental distress, emotion regulation

Background: Research indicates that parental stress, including work-related stress, can have an impact on the well-being of children. However, there is a need to further explore potential spill-over or cross-over effects within families with young children, where both parents are currently employed. Methods: This study involved 62 families with parents (mean age 35-39 years) working full or part-time and children (31 females, 31 males) aged 3-7 years (average 5.2 years). Questionnaires were used to collect data on work-related stress, chronic stress, and educational behavior. Psychophysiological data, specifically hair cortisol stress levels, were also assessed in the children over a three-month period. Results: The findings revealed positive correlations in perceived chronic stress between both parents ($r=.47$, $p<.01$). Additionally, the number of work hours and experienced time pressure were positively associated with work-related stress in both mothers ($r=.34-.55$) and fathers ($r=.38-.63$). A spill-over effect was observed, where the chronic stress of the mother was linked to reduced emotion regulation abilities in the child, and this effect was moderated by the chronic stress of the father ($b=-.17$, $p<.05$). However, no clear effects were observed when examining long-term stress using hair cortisol measures. Discussion: The study highlights the interaction between work-related stress and overall stress levels within families. It suggests that factors such as social support and educational behavior may serve as resources to buffer the impact of stress.

POSTER SESSION II-109 | LATE-BREAKING UNCOVERING INDIVIDUAL FREEZING- LIKE BEHAVIOR IN RELATION TO THREAT PROXIMITY IN THE CONTEXT OF THREAT AND UNCERTAINTY

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Descriptors: threat imminence, freezing, uncertainty

When facing threat, defensive circuits are activated to ensure survival. In the context of survival, blunted physiological responding is associated with action preparation, but little is known about humans responding to threat imminence. Here we present a paradigm which is intended to capture defensive psychophysiological responding and action preparation under varying levels of threat imminence, uncertainty and safety. In a multi-methodological approach, we combine the human postural sway, a proxy for freezing-like behavior in humans, and fear potentiated startle (EMG) and behavioral task performance as outcome measures. First results (n = 250) revealed a generally reduced freezing-like behavior on the stabilometric-force platform in the experimental conditions of threat imminence and uncertainty as compared to safety. Strikingly, we observed decreased EMG responding during preparation for action under threat as compared to responses in the inter-trial interval. On a behavioral level, high threat conditions resulted in faster reaction tendencies at the expense of accuracy as compared to low threat. The findings extrapolate from animal models on the defensive mechanism of shifting from freezing to action under threat, unveiling a crucial valence-specific response pattern and provide empirical evidence for the contribution of defensive reactions such as postural freezing and startle inhibition in action preparation.

POSTER SESSION II-110 | LATE-BREAKING THE PROCESSING OF EMOTIONAL BODY ODORS IN INDIVIDUALS WITH DEPRESSIVE SYMPTOMS: A HIGH-DENSITY EEG STUDY

Elisa Dal Bò¹, Cinzia Cecchetto¹, Alejandro Callara²,
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Descriptors: Depression, EEG, Body odors

In the study of social motivation, researchers have focused on the acoustic and visual aspects of social

interaction. However, humans transfer socially relevant information (e.g., age) and emotional states also via body odors (or chemosignals) and individuals exposed to emotional body odors show a partial reproduction of the affective state of the sender. Studies on olfaction indicate altered smell perception and altered emotion recognition in individuals with depression, but there is no information about the transmission of social information via emotional body odors. A high-density EEG study was conducted to investigate how body odors collected in a happiness and a fearful condition modulate the neural processing of neutral faces in individuals with depressive symptoms (n=22) and healthy controls (n=22). Time-frequency analysis was performed to simultaneously investigate the affective disposition and cognitive processing of faces presented in the context of emotional body odors. In the group with depressive symptoms, the cluster-based statistics revealed a reduction in delta power and a reduction in theta power relative to controls for the neutral faces presented in the clean air condition, reflecting both an altered affective disposition and cognitive processing. No difference emerged when the neutral faces were presented with emotional body odors. This study suggests that the social information conveyed via body odors may help individuals with depressive symptoms in extracting the social meaning of the situation, leading to a correct evaluation of the neutral stimulus.

FUNDING: European Commission Horizon 2020 research and innovation program [grant number 824153] to the POTION project.

POSTER SESSION II-111 | LATE-BREAKING A STRONG TEST OF THE NEGATIVITY BIAS AND POSITIVITY OFFSET: P300 AMPLITUDES ARE LARGER TO BIG LOSSES THAN BIG WINS; AND TO SMALL WINS THAN SMALL LOSSES

Anastasia Erley, Shruthi Srivastan, Catherine Norris
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Descriptors: oddball, gambles

Negative stimuli carry greater weight than positive stimuli of the same intensity; this phenomenon is known as the *negativity bias* (Cacioppo & Berntson, 1994; Ito et al., 1998; Norris, 2021). However, the literature supporting the negativity bias is plagued by several challenges, including: difficulties in matching positive and negative stimuli, over-reliance on self-report measures, and a lack of research on the psychological processes underlying the negativity bias. The current study aimed to address these challenges, as well as to probe the neural mechanisms underlying the processing asymmetry implicated in the

negativity bias, specifically examining the P300 event-related potential (ERP) component. Participants played a lottery task designed as a modified oddball paradigm, in which they rated how randomly generated wins and losses made them feel while continuous EEG was recorded. 80% of trials consisted of negligible magnitude outcomes; whereas 20% consisted of small and large magnitude outcomes. P300 amplitudes were larger for rare large losses than rare large wins, consistent with a negativity bias. In addition, P300 amplitudes were larger for frequent negligible wins than frequent negligible losses, consistent with a positivity offset (i.e., a second psychological principle). These data provide preliminary support for a neural basis for the negativity bias (and positivity offset), using well-matched stimuli and neural measures.

POSTER SESSION II-112 | LATE-BREAKING THE INFLUENCE OF EMOTION PROCESSING DURING SENTENCE COMPREHENSION IN OLDER ADULTS: EVIDENCE FROM BRAIN POTENTIALS

Jing-Yi Huang, Po-Heng Chen, Wei-Hung Lin, Chia-Lin Lee
National Taiwan University

Descriptors: Aging, Emotion, Predictive processing

This study investigated how sentence reading is influenced by contextual as well as lexical-level emotionality in older adults. Event-Related Potentials were recorded from 30 healthy older Taiwan Mandarin natives (aged 58–82 years, $M=71$) as they read emotionally or neutrally framed sentences that ended coherently with emotion or neutral words. The results revealed a larger late posterior positivity to emotion words, regardless of sentence context, indicating lexically induced emotional appraisal responses. Emotional context effects were also found. Irrespective of word-level emotionality, words following emotional context, compared to neutral context, elicited enhanced anterior P200s and generated more positive responses over posterior sites during and beyond the N400 time window. These results indicate that, with sufficient time for incrementing emotionality, older adults were able to build up emotion anticipation, which, in turn, influences early visual attention and semantic processing when reading the subsequent word. Finally, neutral words elicited an Anterior Positivity (AP) when ending an emotional context rather than a neutral context, whereas similar results for emotion words ending a neutral context were not found. Prior research, without systematic emotionality manipulation, did not find the AP effect in older adults to words disconfirming a contextually constrained lexical prediction. In light of this literature, the

AP effect here suggests that predictive processing during reading may become more available for older adults when emotionally engaged.

FUNDING: MOST 111-2410-H-002 -232 -MY3.

POSTER SESSION II-113 | LATE-BREAKING AN EXAMINATION OF EEG-ECG COUPLING UNDER STRESSFUL AND NON-STRESSFUL CONDITIONS

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Descriptors: EEG-ECG coupling, EEG alpha and beta power, Stress response

Neural-cardiac coupling during stress has been studied using EEG and ECG, but little is known about the fluctuations of these couplings under different conditions. This analysis investigated EEG-ECG interactions in 9 participants (20.8 ± 1.5 years, 1 male) across six tasks: meditation, cold pressor, eyes-closed, eyes-open, Trier social stress test (TSST), and Stroop test. Relative α (8–13 Hz) and β (14–30 Hz) power were derived using a Hilbert transform, and 3 heart rate variability (HRV) spectral features were obtained from the ECG: Low Frequency (LF), High Frequency (HF), and LF/HF ratio. LASSO analysis distilled characteristic EEG-ECG coupling for each condition. While α and β power predicted sympathetic and parasympathetic responses, significant heterogeneity was observed across conditions and cortical locations. Elevated α power indicated increased sympathetic response (LF) and decreased parasympathetic response (HF) during stress and non-stress conditions. However, α power exhibited mixed predictive power for LF during the non-stress condition of eyes closed. Higher β power predicted a shift towards sympathetic activity (LF/HF) during TSST and eyes-closed, but not in other conditions. Each condition demonstrated characteristic neural-cardiac coupling, but neither α nor β power revealed unique distinguishing features. Future research should explore additional EEG-ECG coupling features, such as spectral and non-linear characteristics, as well as other EEG power spectrum frequency bands.

FUNDING: This project has been funded by the Jump ARCHES endowment through the Health Care Engineering Systems Center.

POSTER SESSION II-114 | LATE-BREAKING PHYSIOLOGICAL AND IMMUNOLOGICAL RESPONSES TO THE TRIER SOCIAL STRESS TEST

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Mid Sweden University

Descriptors: Stress, Leukocytes, Arousal

Background: White blood cells or leukocytes, which have a variety of immunological functions, have been shown to migrate in and out of the blood stream in response to different types of stressors (Davis et al., 2008). Hence, leukocyte profiling can be used to measure stress related immune activation. In the present study we employed a psychosocial stress task to assess whether emotional arousal cause leukocyte migration. **Methods:** We used the Trier Social Stress Test (TSST) to induce psychosocial stress. Emotional arousal was assessed with ECG, self-report measures, and blood sampling. **Results:** We found an increase in heart rate from baseline throughout the TSST ($p < .001$) and increased blood cortisol levels directly and 30 minutes after the TSST compared to baseline ($p < .001$). We found an increase in total Leukocyte count after the stress task ($p < .001$) with a return to baseline at 30, 60 and 90 minutes after ($p < .001$). **Conclusion:** The results of our study indicate that psychosocial stress triggers a physiological response manifesting as increased heart rate, cortisol levels, and leukocyte count. Our findings suggest that emotional arousal might be a key factor in inducing an immune response under stressful conditions. It is important to note that the leukocyte count returned to baseline levels within 30 minutes following the stress task, suggesting a transient and adaptive response of the immune system to social stress. Our findings support the idea that the body's physiological and immune responses to stress are interconnected and influenced by emotional states.

FUNDING: Swedish Research Council (2018-01322) and the Bank of Sweden Tercentenary Foundation (P20-0125).

POSTER SESSION II-115 | LATE-BREAKING ELECTROPHYSIOLOGICAL CORRELATES OF CRITICAL THINKING: INSIGHTS FROM RESTING STATE AND EVENT-RELATED OSCILLATIONS

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Descriptors: Critical Thinking, Gamma Oscillations, Alpha Oscillations

Critical thinking is a cognitive process encompassing problem-solving, decision-making, and probability estimation. Cognitive neuroscientists have yet to explore the neurobiological underpinnings of critical thinking. Synchronous gamma oscillations are associated with conscious awareness and insightful thinking, which is linked to critical thinking. This study investigates resting state and event-related neural oscillations, comparing two groups differing in their tendency to engage in critical thinking. We recruited 30 healthy participants (17 female, 13 male) aged 18-25 years. Participants were grouped based on their scores on the California Critical Thinking Disposition Instrument (CCTDI): high/moderate scores ($N=10$) vs. low scores ($N=20$). Electroencephalography (EEG) recordings were obtained during resting state and visual and auditory oddball tasks. We first compared participants' resting-state activity using power spectrum analysis derived from a Fast Fourier transform. As predicted, resting-state gamma-band activation was higher in frontal regions for participants with higher CCTDI scores ($t(28) = -2.183$, $p < .05$). Additionally, we explored differences in event-related oscillatory responses between the two participant groups and revealed that participants with higher CCTDI scores had better discrimination in the oddball task, as evidenced by alpha oscillations in parieto-occipital regions ($F(6,23) = 3.291$, $p < .05$). These findings shed light on the gross regional level oscillatory mechanisms underlying critical thinking.

POSTER SESSION II-116 | LATE-BREAKING FUNCTIONAL AND STRUCTURAL DEVELOPMENT OF AUDITORY CORTEX FROM 2 MONTHS TO 2 YEARS OLD

Kylie Mol¹, Yuhan Chen¹, Heather Green¹, Jeffrey Berman^{1,2}, Marybeth McNamee¹, Emily Kushner^{1,2}, Mina Kim¹, Song Liu¹, Timothy Roberts^{1,2}, J. Christopher Edgar^{1,2}

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Descriptors: infant, auditory, MEG

More myelinated auditory radiation thalamocortical pathways are associated with shorter latency evoked responses in school-age children and adolescents, with the myelination of thalamocortical axons likely contributing to the facilitation of rapid propagation of acoustic

information. Little is known regarding this auditory system function-structure association in infants. The present study tested the hypothesis that maturation of auditory radiation fractional anisotropy (FA; measured using diffusion-weighted magnetic resonance imaging) is associated with the latency of the infant auditory response (P2m measured using magnetoencephalography) in a cross-sectional ($N = 39$, 15 females) as well as longitudinal ($N = 12$, 5 females) cohort of typically developing infants and toddlers (2 to 29 months). In the cross-sectional sample, non-linear maturation of both P2m latency and auditory radiation FA were observed. After removing the variance associated with age in both P2m latency and auditory radiation FA, earlier P2m latencies were associated with higher auditory radiation FA, with FA accounting for 23% of the variance in P2m latency in the left hemisphere ($p < 0.01$) and 10% in the right hemisphere ($p = 0.05$) above and beyond that associated with age-co-mediated effects alone. In the longitudinal sample, P2m latency and auditory radiation FA associations could be observed at the level of a single child.

FUNDING: This work was supported by the National Institute of Child Health and Human Development (NICHD) (R01HD093776 to Dr. J. Christopher Edgar; P50HD105354 to Drs. Roberts and Edgar); the National Institute of Mental Health (NIMH) (R01MH107506 to Dr. J. Christopher Edgar; K01MH108822 to Dr. Yuhua Chen); the Eagles Autism Foundation (Pilot Grant to Dr. Yuhua Chen); and the Nancy Lurie Marks Family Foundation to Dr. Heather L. Green (principal investigator Roseann Schaff).

POSTER SESSION II-117 | LATE-BREAKING IS EEG REALLY BETTER LEFT ALONE FOR DEVELOPMENTAL DATASETS?

Will Decker, Julie Schneider
Louisiana State University

Descriptors: ERP, Preprocessing, Developmental

Event-related potentials (ERP) are common evaluations of EEG data as they evoke robust neural responses with simple experimental designs. However, within ERP data exists unavoidable noise that can moderately or significantly occlude the true EEG signal. There are many signal processing operations to reduce such noise in the data, yet, there remains little consensus as to which preprocessing standards are most effective. In an effort to standardize EEG preprocessing and promote reproducibility, Delorme (2023) evaluated the effectiveness of each preprocessing method. This evaluation indicated that “EEG data is better left alone”—or better left

to automated pipelines. However, it remains unknown whether the same findings apply to developmental EEG data. Therefore, a distinct evaluation of the optimal preprocessing operations must be made given the numerous differences in EEG data quality that exist among younger populations. We directly address this issue by asking what preprocessing methods yield the greatest significance and leave the smallest amount of noise for developmental EEG data. Using open-source developmental datasets, we tested the EEG preprocessing parameters implemented by Delorme (2023), evaluating their optimization using both the t_{max} statistical test and the standard measurement error (SME). We found that a conservative bandpass filter, line noise removal and moderate artifact removal were optimal for analyzing developmental EEG. Our findings suggest the need for different preprocessing parameters and standardization when analyzing developmental EEG data.

FUNDING: This research was funded by an Undergraduate Research Grant from the Discover Undergraduate Research Program at Louisiana State University.

POSTER SESSION II-118 | LATE-BREAKING NEURAL MECHANISMS UNDERLYING DIFFERENT ACTION SEQUENCES OF GOAL- DIRECTED GRASPING: AN ERP STUDY

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Bielefeld University

Descriptors: grasping, action processing, P3

Most actions are planned in anticipation of desired goals, which is shown as the end-state comfort effect. However, neural mechanisms underlying different sequences of goal-directed grasping are still unknown. By using a priming paradigm, 16 young adults were presented with different sequences of a bar-transport task and asked to judge the color on the top of the bar. Primes were either comfortable (overhand grip; OH) or uncomfortable (underhand grip; UH) grips, and targets were either comfortable (thumb up; TU) or uncomfortable (thumb down; TD) postures of this grasping action. Prime-target pairs reflected different action sequences (OH-TU, OH-TD, UH-TU, UH-TD) and formed either a physically possible or a physically impossible movement. Behaviorally, we found that participants were faster for the OH-TU sequence than for the OH-TD sequence ($p < .05$; Cohen's $d = 0.16$). Additionally, reactions to the sequence UH-TU were faster compared to the UH-TD ($p < .05$; Cohen's $d = 0.15$). Neurophysiologically, we found that targets elicited a fronto-central distributed P300 component. The mean amplitude of the P300 was significantly smaller in the UH-TU than in the UH-TD

sequences ($p < .05$; Cohen's $d = 0.35$), and the effect was only found for the physically possible actions. As shown by behavioral and ERP measures, our findings are in line with the end-state comfort effect. The results suggests that the incongruity in representing an action sequence (spatio-temporal order/physical possibility) generates expectancy violations.

**POSTER SESSION II-119 | LATE-BREAKING
ACETAMINOPHEN AND THE SENSITIVE
PERIOD OF BRAIN SEXUAL DIFFERENTIATION:
INTERACTIONS WITH THE SEX STEROID
MILIEU IN NEONATAL LONG-EVANS RATS**

Anna Warner, Christopher Harshaw
University of New Orleans

Descriptors: Social reward, Sex Steroid Hormones, Acetaminophen

Epidemiological evidence has revealed associations between Early-life acetaminophen (ELA; APAP) and increased risk of Autism Spectrum Disorder (ASD). Rodent models mostly corroborate human findings, with animals showing altered social and reproductive behavior. APAP is known to interact with neural systems for social reward and sex steroids necessary for brain sexual differentiation and sex-typical morphology. Here, we examined the effects of ELA during the neonatal sensitive period of brain sexual differentiation (SPBSD) on social reward behaviors in Long Evans rats. ELA was examined in the context of either masculinized or feminized early-life hormonal milieus achieved via injections of 17β -Estradiol (E_2) or Letrozole (LTZ), respectively. From postnatal day 1 (P1) to P11, pups received subcutaneous injections of either E_2 (.05 μ g), LTZ (1 mg/kg), or corn oil vehicle (50 μ l). On P5, P8, and P11, pups were also administered APAP (51.97 mg/kg) or saline vehicle. Play, social conditioned place preference (sCPP), and mate preference (MP) were assayed. We found significant interactions between sex, APAP, and E_2 . Sex-specific effects of APAP include females showing less time pouncing and less sCPP than APAP-treated males. However, E_2 +APAP-treated females showed increased sCPP, approaching the range of APAP-treated males. During MP testing, the masculinizing effects of E_2 were less pronounced among E_2 +APAP-treated females. Our data indicate that APAP interacts with sex steroid hormonal milieus to influence development of sex-typical behaviors of potential relevance to ASD.

FUNDING: Partly funded by Louisiana Board of Regents grants LEQSF(2019-20)-RD-A-28 and LEQSF(2022-25)-RD-A-29.

**POSTER SESSION II-120 | LATE-BREAKING
EFFECTS OF ANTIDEPRESSANT TREATMENT
EXPECTATIONS, THE DOPAMINE D2
ANTAGONIST SULPIRIDE AND EXTRAVERSION
ON MOOD AND HEART RATE**

Li-Ching Chuang, Nick Augustat, Erik Mueller
University of Marburg

Descriptors: extraversion, placebo, dopamine

Antidepressant placebos alter affect and reduce depressive symptoms in clinical and sub-clinical populations. Measuring affective states via both subjective judgments and physiological markers may allow a better understanding of the mechanisms of antidepressant placebo response, which is crucial for maximizing intervention effectiveness. According to the placebo-reward hypothesis, placebo effects presumably act on positive treatment expectations and reward-related alterations within the dopamine system. To examine the role of dopamine in antidepressant placebo responses, we administered either inert pills or dopamine D2 receptor antagonist sulpiride (400 mg) to $N=199$ healthy participants and manipulated treatment expectations by labeling the pills as either inactive or antidepressant, regardless of the actual substance taken (2×2 design). Thereafter, participants underwent an experimental depressed mood induction while mood ratings and heart period were assessed. Furthermore, we assessed trait anhedonia and extraversion as two depression- and dopamine-related personality variables which may moderate antidepressant placebo responses. Results revealed a positive correlation between extraversion (or low anhedonia) with positive affect ratings in the inert substance group which was not observed under sulpiride. Moreover, expectation effects on heart rate were modulated by both sulpiride and trait extraversion. Taken together, the present findings provide tentative evidence that antidepressant placebo responses involve dopamine and dopamine-related personality traits.

FUNDING: This work was funded by the Deutsche Forschungsgemeinschaft Grant/Award Numbers [422744262] – TRR289 („Treatment Expectations“) and [290878970] – RTG 2271 (“Breaking Expectations”).

**POSTER SESSION II-121 | LATE-BREAKING
THE BALANCE N1 IS LARGER IN ANXIOUS
CHILDREN AND ASSOCIATED WITH THE
ERROR-RELATED NEGATIVITY**

Aiden Payne, Alex Meyer, Greg Hajcak
Florida State University

Descriptors: anxiety, ERN, balance N1

The error-related negativity (ERN) is a neural correlate of error monitoring that is enhanced with anxiety. The balance N1 is evoked by sudden disturbance to standing balance and resembles the ERN in scalp topography and moderating factors. We hypothesize that the balance N1 shares neural mechanisms with the ERN and will therefore be enhanced with anxiety. We assessed N=23 anxious children (age 9-12, with Generalized Anxiety, Social Anxiety, and/or Obsessive-Compulsive Disorder) and N=46 nonanxious children. The ERN was measured at frontocentral electrodes as the mean 0-100ms after errors in a cartoon go no-go task. The balance N1 was measured as the mean 50-150ms after sudden release of a cable supporting 5% of body weight in a forward leaning posture. One-tailed t-tests assess group differences in the balance N1. Pearson's product-moment correlations measure associations between the balance N1 and the ERN or SCARED-parent report of child anxiety severity, combining children across groups. All tests are repeated across Fz, FCz, and Cz electrodes. The balance N1 is larger in children with anxiety disorders at central electrodes (Fz $p=0.122$, FCz $p=0.038$, Cz $p=0.005$). Further, the balance N1 was associated in amplitude with the ERN (Fz $r=0.317$ $p=0.009$, FCz $r=0.341$ $p=0.005$, Cz $r=0.331$ $p=0.007$) and with parent-reported severity of child anxiety at Cz (Fz $r=-0.215$ $p=0.077$, FCz $r=-0.224$ $p=0.064$, Cz $r=-0.245$ $p=0.044$). These results show that the balance N1 is larger in children with anxiety disorders and support the hypothesized relationship between the balance N1 and the ERN.

FUNDING: This work was supported by the National Institute of Mental Health (1F32MH129076).

**POSTER SESSION II-122 | LATE-BREAKING
DOPAMINE AND ESTRADIOL MODULATE
THE ASSOCIATION BETWEEN WORRY AND
WORKING-MEMORY LINKED THETA-GAMMA
COUPLING IN A FEMALE SAMPLE**

Courtney Louis, Jason Moser
Michigan State University

Descriptors: worry, theta-gamma coupling, estradiol

Preclinical models propose that anxiety interacts with dopamine (DA) and estradiol to influence lateral prefrontal cortex function, a region critical for working memory. However, no study has examined their interactive effects in humans. We addressed this by investigating DA and estradiol's effects on the relationship between worry and oscillatory neural activity (i.e., theta-gamma coupling; TGC) involved in working

memory in a female sample (N=135). Participants completed a verbal working memory task (N-back) up to four times in person. Saliva samples on the day of N-back completion were used to assay for estradiol and extract COMT gene polymorphisms. TGC was computed on correct lure trials of the N-back task in the 0-500 millisecond time window post-stimulus presentation. We found that for those with high chronic worry, within-person increases in worry were associated with reduced TGC. In contrast, for those with low average worry, within-person increases in worry were associated with increased TGC. Further, acute increases in worry were associated with enhanced TGC for Val carriers (those with less tonic DA), whereas there was no association for Met carriers. The positive association between worry and TGC was enhanced for Val carriers during high estradiol states. Our findings highlight that worry plays a pivotal role in influencing whether individuals approach or avoid increased mental demands. The results also suggest that for those who may be more susceptible to distraction (i.e., those with less basal DA), estrogen supports increased mental stabilization.

FUNDING: This research is supported by the National Institute of Mental Health - 1R01MH108511-01; "Cognitive Control in Anxiety: The Role of Ovarian Hormones" (PI: J. Moser) and 1F31MH125604-01; "Anxiety and Working Memory Function in Women: Exploring the Role of Dopamine and Ovarian Hormones" (PI: C. Louis).

**POSTER SESSION II-123 | LATE-BREAKING
REWARD-BASED EEG BIOMARKERS IN
PREDICTING TREATMENT OUTCOME IN
MAJOR DEPRESSIVE DISORDER: A CANADIAN
BIOMARKER INTEGRATION NETWORK FOR
DEPRESSION STUDY (CAN-BIND-1)**

Marie-Anne Dussault Gomez¹, Prabhjot Dhami^{1,2,3}, Stephen Arnott⁴, Jane Foster^{5,6}, Benicio Frey^{5,7}, Stefanie Hassel⁸, Raymond Lam⁹, Roumen Milev^{10,11}, Daniel Mueller^{2,3}, Sagar Parikh¹², Sakina Rizvi^{3,13}, Claudio Soares¹⁰, Rudolf Uher¹⁴, Susan Rotzinger^{3,15,16}, Sidney Kennedy³, Faranak Farzan^{1,2,3}

¹Simon Fraser University, ²Centre for Addiction and Mental Health, ³University of Toronto, ⁴Rotman Research Institute at Baycrest Centre, ⁵McMaster University, ⁶University of Texas Southwestern Medical Center, ⁷St Joseph's Healthcare Hamilton, ⁸University of Calgary, ⁹University of British Columbia, ¹⁰Queen's University, ¹¹Providence Care Hospital, ¹²University of Michigan, ¹³St. Michael's Hospital, ¹⁴Dalhousie University, ¹⁵Unity Health Toronto, ¹⁶University Health Network

Descriptors: Electroencephalography, Major Depressive Disorder, Reward Processing

Given the current trial-and-error treatment strategy for Major Depressive Disorder (MDD), identifying biological markers of antidepressant treatment response is critical to reduce time-to-remission. The neural correlates of reward function, which are reported as altered in MDD, are of interest as candidate biomarkers. However, it remains unclear whether electrophysiological correlates of reward processing hold value in predicting response to pharmacological treatment. Using data from the first Canadian Biomarker Integration Network for Depression study (CAN-BIND-1), we investigated whether electroencephalography (EEG) measures during a reward-based task are associated with clinical response to 8-week escitalopram monotherapy in MDD. Participants ($n=68$) with MDD completed a Monetary Incentive Delay task as EEG was recorded at baseline. Event related potential (ERP) components assessed included the N200, cue-P300, contingent negative variation, and feedback-P300. The Montgomery-Åsberg Depression Rating Scale (MADRS) was used to measure MDD symptom severity at baseline and week 8. A smaller baseline N200 amplitude was associated with significantly greater reduction in overall MADRS score. Furthermore, treatment responders had a significantly smaller baseline N200 amplitude than non-responders. Reward-based ERP components, specifically the N200, may hold value as predictors of clinical response to pharmacological treatment in MDD.

FUNDING: CAN-BIND is an Integrated Discovery Program supported by the Ontario Brain Institute (OBI). OBI is funded in part by the Ontario government and is an independent non-profit corporation. Funding was also provided by the National Science and Engineering Council of Canada (NSERC), the Canadian Institutes of Health Research (CIHR), Bristol-Myers Squibb, Lundbeck, Pfizer, and Servier.

POSTER SESSION II-124 | LATE-BREAKING THE AGE DIFFERENCES IN BRAIN ACTIVITY DURING SENSORY CONFLICT IN VIRTUAL REALITY

Valentina Melnikova, Artem Kovalev
Lomonosov Moscow State University

Descriptors: Sensory conflict, Virtual reality

The study of the age differences in brain mechanisms of the sensory conflict in virtual reality is an actual problem for modern neuroscience. The hypothesis of this work was that α and β rhythms parameters in the central and posterior brain regions would be different in different ages. 3 age groups of 12 people each took

part in the experiment (18 men and 18 women): up to 18 years, from 19 to 34 years, from 35 to 47 years. Visual stimulation was a virtual optokinetic drum, the inner surface of which is painted with alternating black and white vertical stripes. The CAVE virtual reality system to present the stimulation and EEG BrainBit 2.7 with dry electrodes were used. The experiment consisted of 6 one-minute trials in which the speed (30, 45 and 60 deg/s) and the direction of rotation of the drum (right and left) changed. Each trial was preceded by Simulator Sickness Questionnaire (SSQ) to determine the subjective severity of sensory conflict symptoms. Significant differences were found in the power of the α at a rotation speed of 60 deg/s in the posterior lobe between groups 1 and 3, and the α power in the first group was significantly higher and in the power of the β in the central region between groups 1 and 3 groups. However, third group showed the lowest values of the subjective severity of uncomfortable symptoms by SSQ scores. It can be concluded that during sensory conflict in virtual reality, there were differences in brain activity that may be associated with the intensity of perception and processing of visual stimulus occupying a large part of the visual field

FUNDING: This work was supported by Russian Science Foundation, project 19-18-00474.

POSTER SESSION II-125 | LATE-BREAKING ASSOCIATION BETWEEN FUNDAMENTAL SOCIAL NEEDS AND INFLAMMATION BIOMARKERS IN THE MIDUS STUDY

Emma Dillon, Hailey Fazio, Leia Harper
Reed College

Descriptors: Inflammation, Social Needs, Midlife

Throughout evolutionary history, survival and well-being has been tied to the strength of social bonds. The temporal-need threat model (TNT) illuminates the impact of threats to four fundamental social needs: belonging, self-esteem, control, and meaningful existence. Threats to these needs activate stress responses that can have detrimental effects on health. The current study investigated the relationship between these needs and inflammation using open source data from the MIDUS study. TNT needs were measured using subscales from the Social and Psychological Well-being scales. Inflammation biomarkers collected via blood sample included interleukin-6 (IL-6), e-selectin, and intercellular adhesion molecule-1 (ICAM-1). We ran 12 simple regressions and bonferroni corrected to account for the error rate to give us a new significance level of 0.004. Higher self-esteem predicted lower IL-6 ($\beta = -0.099$, $p = 0.002$) and ICAM-1 ($\beta = -0.114$, $p = 0.003$). Higher

meaningfulness predicted lower e-selectin ($\beta = -0.112$, $p = 0.002$). Higher control predicted lower IL-6 ($\beta = -0.115$, $p < 0.001$). This shows evidence for the impact of fundamental needs as outlined in the TNT on inflammation, adding to the growing body of research that physical health and psychological stress are tied together. These results suggest that improving feelings of social inclusion can decrease inflammation biomarkers that are associated with chronic and autoimmune inflammatory conditions such as arthritis, heart disease, and lupus. This research may assist in treatment and prevention of these conditions.

POSTER SESSION II-126 | LATE-BREAKING SUBDERMAL NEEDLE ELECTRODES ARE CONSISTENT WITH EPIDURAL ELECTRODES IN MEASURING LONG-LATENCY AUDITORY EVOKED POTENTIALS IN RATS

Logan Brewer¹, Riley Ricci^{1,2}, Jesse Davis¹,
Jeffrey Sable^{1,2}, Frank Andrasik¹, Helen Sable¹

¹University of Memphis, ²Christian Brothers University

Event-related potentials (ERPs) are the summation of postsynaptic activity, time-locked to a stimulus, recorded using electroencephalography (EEG). They also provide a phenotypic measure that is analogous between humans and animal models, making them well suited for studying mental processes and improving the validity of psychiatric animal models. Most ERP research in rodents has utilized invasive, epidural electrodes. Although they have benefits, these procedures have a relatively high risk of infection, injury, or loss of the animal. The purpose of this study was to validate a less invasive method for recording ERPs. Twenty adult, male Wistar rats were implanted with subdermal needle electrodes while anesthetized. Once awake, they were presented with a sequence of 5-tone trains with either 1- or 5-s inter-train intervals (ITIs) at a frequency of either 8 kHz (i.e., high) or 500 Hz (i.e., low). Approximately 1-2 weeks after these recordings, the rats underwent a craniotomy to implant three skull screw electrodes and were presented with the same auditory paradigm. In all experimental conditions, the amplitude of the P1-N1 complex was largest to the first tone in the train—particularly after the 5-s ITI—and diminished to subsequent tones, and all peak amplitudes were larger to the high than to the low tones. In addition, the peak amplitudes were larger across the board for the screw EEG recordings. Our findings demonstrate the applicability of a semi-invasive approach for recording ERPs in awake rats that is in line with the 3Rs of animal research.

Poster Session III

POSTER SESSION III-001 | INDIVIDUAL DIFFERENCES IN AGE-RELATED CHANGES OF NEURAL FEEDBACK PROCESSING

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Natasha Maurits²

¹University of Groningen, ²University Medical Center
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Descriptors: Healthy Aging, Decision Making, EEG

Age-related changes in feedback processing were suggested to contribute to performance issues in older adults, but not all older adults show age-related decline in feedback processing. We investigated neural mechanisms underlying individual differences in feedback processing by measuring the electroencephalogram (EEG) in younger and older adults while they performed a probabilistic feedback-based learning task. In general, we observed lower learning rates and more frequent choice switching in older adults. Performance level – when determined on the basis of individual learning curves – was found to influence EEG markers of feedback processing. Feedback valence (gain or loss), reflected in amplitude of the feedback-related negativity, had a smaller effect in the older, high performers compared to the other groups. P3 component amplitude, reflecting model updating, was larger in response to gains than to losses in both high and low performing older adults, but was not modulated by feedback valence in younger adults. Regardless of age, the P3 varied differently between performance groups during learning: P3 amplitudes predicted choice switching in low performers only, whereas in high performers only, amplitudes became larger with learning progression, suggesting different mechanisms underlying performance and age differences. Taken together, these findings suggest individual differences need to be taken into account when studying the neural mechanisms of age-related changes in feedback processing.

POSTER SESSION III-002 | EVENT-INDUCED MODULATION OF APERIODIC BACKGROUND EEG: ATTENTION-DEPENDENT AND AGE- RELATED SHIFTS IN E:I BALANCE, AND THEIR CONSEQUENCES FOR BEHAVIOR

Patrycja Kałamała^{1,2}, Máté Gyurkovics^{1,3}, Daniel Bowie¹,
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Descriptors: aperiodic EEG, excitation:inhibition (E:I) balance, aging

The broadband shape of the EEG spectrum, summarized using a $1/f^\alpha$ function, is thought to reflect the Excitation:Inhibition (E:I) balance in cortical regions. This balance is an important feature of neural circuits and could inform aging studies, as older adults show a relative inhibitory deficit. Thus far, no studies have leveraged the event-related temporal dynamics of $1/f^\alpha$ activity to understand the phases of information processing, especially in the context of aging. Here, for the first time, we examined variations of this activity during the foreperiod of a cued flanker task in younger (YA) and older adults (OA), with picture cues varying in task relevance, relative novelty, and valence. We report a biphasic change in the spectral exponent (negative slopes in log-log space) after cue presentation, independent of ERPs, with an initial period of increased negativity (indicating cortical inhibition, similar in YA and OA) followed by decreased negativity (indicating cortical excitation, especially in OA). The decrease in the exponent negativity was associated with lower performance and greater congruency costs in the flanker task. Finally, more novel cues reduced the shift towards excitation in OA, partly restoring their E:I balance and diminishing congruency costs. These findings demonstrate that the aperiodic EEG varies dynamically in a manner that is predictive of subsequent behavior. They also expand our understanding of how neural communication shapes cognition and have implications for neuroscientific models of cognitive processing and age-related cognitive decline.

FUNDING: NIA grant RF1AG062666 to G. Gratton and M. Fabiani.

POSTER SESSION III-003 | THE ASSOCIATION BETWEEN APOE4, HYPERTENSION, AND FIXEL-BASED WHITE MATTER MICRO-STRUCTURE IN OLDER ADULTS AT RISK FOR ALZHEIMER'S DISEASE

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Descriptors: Hypertension, APOE4, White matter

White matter alterations can contribute to dementia in older adults. Investigating the relationship between dementia risk factors and white matter microstructure can provide insights into early detection and prevention of neurodegenerative diseases. This study examined the relationship between two dementia risk factors (i.e., APOE4 genotype and hypertension) and white matter microstructure in 153 healthy older adults (age=67.8±5.0; 42 male) at high risk for Alzheimer's disease (i.e., individuals with at least one close family member with AD) using fixel-based analysis (FBA), a recently developed diffusion MRI analysis framework to examine fiber-specific changes at the within-voxel level. We found that APOE ε4 carriers exhibited lower fiber cross-section in the right anterior corpus callosum and arcuate fasciculus and lower fiber density in the right anterior corpus callosum and superior longitudinal fasciculus ($p<0.01$ uncorrected) comparing to non-carriers. Additionally, individuals with high blood pressure (i.e., >129/79 mmHg) had lower fiber bundle cross-section in the right arcuate fasciculus and lower density in the bilateral superior longitudinal fasciculi ($p<0.01$ uncorrected) than those without. However, neither APOE profile nor high blood pressure were associated with changes in neuropsychological test performance over a four-year period ($F=0.12$, $p=0.72$; $F=0.08$, $p=0.78$). This study observed fiber-specific white matter microstructural alterations related to genetic and cardiovascular risk factors, while no link between cognitive decline and these risk factors.

POSTER SESSION III-004 | AGE-RELATED VARIABILITY IN WORKING MEMORY FUNCTION DURING A REACTION TIME TASK

Beth Asnakew^{1,2}, Kathy Low^{1,2}, Gabriele Gratton^{1,2}, Monica Fabiani^{1,2}

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Descriptors: working memory, event-related brain potential, P300

While some older adults have well-preserved executive control abilities, working memory capacity (WMC) generally declines with age. Fluid intelligence, which is often used as a measure of cognitive flexibility, has been shown to be reliant on WMC and also appears to be negatively correlated with age. Previous event-related potential (ERP) work demonstrated consistent age-related changes in the P300 component. More recent research suggests that a pronounced parietal P300 amplitude may index updating working memory (WM) templates in response to changes in stimulus

sequence. These effects are larger for individuals with low WMC. To investigate the mediating effects that WMC and cognitive flexibility may have on the relationship between aging and P300 sequential effects, we collected a sample of younger and older adults who were further subdivided into groups of high and low complex WM-span and fluid intelligence scores. ERPs were recorded during a 50/50 choice reaction time (CRT) task. Results indicated greater sequential effects in older individuals, as well as those with lower fluid intelligence. These results suggest that P300 sequential effects may be used to study age-related changes in cognition. FUNDING: Funding provided by NIA Grant RF1AG062666.

POSTER SESSION III-005 | ARTERIAL REACTIVITY DURING HYPERCAPNIA AND AT REST

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Descriptors: Arterial health, Cardiorespiratory fitness, Optical imaging

Cerebral arterial health and arterial reactivity are necessary to maintain brain and cognitive health as we age. Diffuse optical tomography can be used to study the cerebral arterial pulse (pulse-DOT) and parametrize arterial stiffness and reactivity. A CO₂ hypercapnia challenge can induce vasoconstriction and vasodilation of arteries to assess cerebrovascular reactivity (CVR). Arterial health can also be assessed at rest, using resting state heart rate variability (rsHRV), an indicator of autonomic nervous system health. These analyses compared optical pulse measures of rsHRV and CVR in older adults by relating CVR during hypercapnia and rest to two measures: cardiorespiratory fitness derived from a composite estimate of metabolic equivalents (eCRF), and a gold-standard graded exercise test of fitness (VO₂max). Arterial reactivity during hypercapnia and at rest showed little overlap and were not significantly correlated. They also had different associations with cardiorespiratory fitness: rsHRV arterial reactivity was associated with VO₂max, while CO₂ arterial reactivity was associated with eCRF. Overall, these findings suggest that optical pulse variability during hypercapnia and rest are impacted by different aspects of cardiovascular health, such as pulmonary and cardiovascular fitness. These measures of arterial reactivity have potential implications for assessing fitness and health in aging populations. FUNDING: NIA R01AG059878.

POSTER SESSION III-006 | EVALUATION OF A NOVEL EEG DEVICE AND ALGORITHM FOR COGNITIVE STATE MONITORING

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Descriptors: EEG, Focus, Evaluation

Consumer-grade noninvasive neurotechnology to facilitate brain-computer interfacing is a burgeoning market and is a growing contestant to traditional research-grade systems. Research-grade systems produce high signal quality and reliable data using wet electrodes but require trained technicians to administer and leaves behind a mess when removed. Consumer-grade products that involve semi-wet or dry electrodes, tend to be faster and more convenient to don outside of the lab and tend to be less messy but struggle with signal quality issues. The current effort focused on evaluating a consumer-grade, over-the-ear electroencephalography (EEG) device with the potential to bridge the gap between research-grade and consumer-grade systems in assessing attentional states. The Enten™ from Neurable® embeds a 20-channel dry electrode system in a headphone form factor. Over two days, individuals were evaluated on performance during two cognitive tasks while donning the Enten and a forehead-based EEG from Neuroelectrics. Individuals completed multiple blocks of both the Multi-Attribute Task Battery - II (MATB-II) and a modified Stroop Task under a distracted and a non-distracted condition. Raw EEG data from the Enten were processed to generate a “focus score (FS)” using Neurable’s proprietary algorithm. The ability of the FS to accurately capture distraction events was evaluated and the correspondence of the FS to performance outcomes was analyzed. Implications and considerations for consumer-grade neurotechnology to be leveraged in more naturalistic research settings are discussed. FUNDING: Air Force Research Laboratory.

POSTER SESSION III-007 | SEMANTIC AND EMOTIONAL CONTENT IN ATTENTIONAL SOURCES ALLOCATION

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Descriptors: attentional capture, selective attention, biased competition

Frequency-tagged Steady-State Visual Evoked Potential (SSVEP) amplitude increases when attending a stimulus. Aside, the enhanced SSVEP response to salient emotional stimuli has been considered as an electrophysiological marker of attentional resources allocation during attentional capture. Nonetheless, the role of the semantics and the low level feature properties in the emotional content, and its implications during attentional shifting in the human visual cortex, remains unclear. Therefore, we investigated the shifting of attentional resources across time under competitive context, where background presented scrambled and intact versions of neutral and emotional images, and a foreground task, competed for attentional resources. Methods: (N=37) Frequency-tagged SSVEP to (1) Rapid Serial Visual Presentation streams (RSVP-SSVEP) of meaningless followed by meaningful IAPS pictures at 4Hz, and (2) superimposed Random Dot Kinematogram (RDK-SSVEP) task at 15Hz. Results: Greater RSVP-SSVEP amplitudes for intact scenes compared to their scrambled versions, while decreased RDK-SSVEP amplitudes during intact images background presentation. Further, significant differences on SSVEP responses regarding emotional category for both, RSVP-SSVEP and RDK-SSVEP signals. Discussion: Our results suggest that priority processing of emotionally relevant stimuli does not depend (solely) on low-level feature properties, but on semantics. Further, the fast increment of the RSVP-SSVEP followed by the decrement of RDK-SSVEP, points to a two stages processing during attentional resources allocation.

FUNDING: Deutsche Forschungsgemeinschaft [MU972/32-1].

POSTER SESSION III-008 | THE IMPACT OF THE AFFECTIVE CONTEXT ON THE HABITUATION PROCESS: ATTENTIONAL CAPTURE AND NEURAL ACTIVITY OF EMOTIONAL DISTRACTORS

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Descriptors: emotion, habituation, neural activity

The behavioral interference of peripheral emotional distractors decreases with repetitions of the same exemplars and immediately recovers when repeated stimuli are replaced by new exemplars. The present study aimed to investigate whether contextual factors might also play a role in modulating the habituation process. Previous studies investigated the emotional habituation in a constant context, where only repeated distractors were continuously presented across the

habituation phase. Here we investigated whether the introduction of a variable context, consisting of novel pictures among repeated ones, prompted a recovery of the habituated response (dishabituation), and more specifically whether the dishabituation varies as a function of the valence of novel stimuli. Behavioral results collected on 45 participants showed that the introduction of novel distractors among repeated pictures prompted a dishabituation response only for repeated unpleasant pictures, but not for repeated neutral and pleasant pictures. Moreover, when novel pictures depicted pleasant contents (erotica), the dishabituation to unpleasant distractors was attenuated. Both the LPP and the alpha-ERD were highly modulated by distractor emotional contents, and repetition only slightly attenuated the LPP, but not the alpha-ERD, which, in turn, was strongly enhanced when novel pictures were introduced after the habituation phase. Taken together, these findings suggest that the habituation of emotional response does not only rely on stimulus repetition but also on top-down contextual factors.

POSTER SESSION III-009 | FFP2 MASK WEARERS REQUIRE MORE NEURAL RESOURCES FOR DIRECTED ATTENTION TESTS: MAGNETOENCEPHALOGRAPHIC EVIDENCE

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Descriptors: COVID-19, Face masks, Attention

The widespread use of face masks, particularly during the COVID-19 pandemic, has raised concerns about their potential effects on cognition, especially in demanding environments such as schools and hospitals. While previous behavioral studies have indicated no detrimental impact of masks on short-term attention, the neural mechanisms underlying this observation remain unclear. We used magnetoencephalography (MEG) to investigate the effects of wearing FFP2 masks on behavioral and neural correlates of attentional performance in 57 healthy young adults (18-20 years). On separate days, participants wore an FFP2 or a sham mask at least two hours before the appointment. During the MEG session, participants completed a directed attention test and three additional attentional tests conducted after the MEG measurement. A real mask significantly increased heart rate and respiration, probably stabilizing blood oxygenation (no difference across conditions). No adverse effects on attentional performance were found in behavioral

tests. However, participants in the real mask condition showed increased neural activation in the right hemispheric visual sensory and parietal areas in response to task stimuli. Thus, the unaffected attentional performance depended on enhanced recruitment of neural attentional resources, potentially leading to exhaustion with longer-lasting demands. This study highlights the potential consequences of wearing FFP2 masks, particularly in demanding environments. Future studies should test if assumed long-term exhaustion might lead to performance degradation.

FUNDING: This work was supported by the German Research Foundation (JU 445/9-1).

POSTER SESSION III-010 | ADHD SYMPTOMS, BUT NOT SENSORY ENTRAINMENT, PREDICT BETTER BEAT-KEEPING PERFORMANCE

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Virginia Tech

Descriptors: Attention, Entrainment, Rhythm

Efficient processing of rhythmic stimuli involves sensory entrainment, i.e. synchronization of oscillations with the stimulus rhythm. People with Attention Deficit Hyperactivity Disorder (ADHD) may show deficits in sensory entrainment, which may in turn impact their ability to keep a beat. However, ADHD can involve periods of poor focus or hyperfocus, depending on the task. The present study tested whether participants' sensory entrainment (amplitude and intertrial phase coherence of steady-state evoked potentials) during a beat-keeping task predicted accuracy and precision of beat-keeping, especially during gaps in stimulation. Participants ($N=47$) were asked to report the extent and type (e.g., instrumental, vocal) of music experience and their ADHD symptom severity, and then were instructed to tap along with a 1.25-Hz rhythm, sometimes aided by visual or auditory stimuli (exogenous beat-keeping) and other times during periods with no stimulation (endogenous beat-keeping), while EEG was recorded. We then tested whether beat-keeping performance during stimulation gaps depended on entrainment, ADHD symptoms, or prior music training. Entrainment amplitude was higher during stimuli than during gaps, illustrating that exogenous entrainment was more efficient than endogenous entrainment. During gaps, neither entrainment nor music training impacted beat-keeping performance, but ADHD symptoms predicted better accuracy and precision. Results suggest that participants with high ADHD symptoms hyperfocused on the beat-keeping task, regardless of sensory entrainment effects.

POSTER SESSION III-011 | CHILDHOOD ABUSE AND ADULT INFLAMMATION: THE CONTRIBUTORY ROLE OF THE VAGUS

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DeWayne Williams
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Descriptors: child abuse, inflammation, heart rate variability

Survivors of childhood abuse are known to be at risk for health disorders in adulthood, which may be due to higher levels of inflammation observed in this population. The signaling of the vagus nerve as indexed by heart rate variability (HRV) partially regulates inflammation, but no studies have explored the role of vagal dysregulation (i.e. low HRV) to the association between abuse severity and inflammation in adulthood. This study performed a cross-sectional secondary analysis of the MIDUS dataset ($N=1031$) to investigate the potential mediating effects of HRV (as indexed using RMSSD) on the association of child abuse severity with adult inflammation (indexed using c-reactive protein (CRP), interleukin-6 (IL-6) and tumor necrosis factor- α (TNF- α)). Findings revealed higher abuse significantly predicted both lower HRV (unstandardized $B = -.005$, $SE = .002$, $p > .05$) and higher IL-6 (unstandardized $B = .03$, $SE = .01$, $p > .01$), while lower HRV significantly predicted higher IL-6 (unstandardized $B = -.37$, $SE = .17$, $p < .01$). Importantly, results showed a significant indirect effect of childhood abuse on IL-6 via resting HRV (unstandardized $B = .002$, $t=2.95$). No statistically significant effects were found using TNF- α and CRP. Our findings suggest that impairments in vagal signaling following experiences of childhood abuse may partially contribute to higher levels of inflammation observed in this population, thereby implicating the cholinergic anti-inflammatory pathway in the effects of early abuse. Further research assessing these relationships longitudinally is warranted.

FUNDING: This poster is a secondary data analysis of the Midlife in the United States (MIDUS) study, which was supported by grants from the National Institute on Aging [P01-AG020166].

POSTER SESSION III-012 | ELIMINATING DIFFERENTIAL PROCESSING OF THE TINNITUS FREQUENCY BY NONINVASIVE STIMULATION OF THE DORSAL PREFRONTAL CORTEX

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Descriptors: tinnitus, noninvasive stimulation, prefrontal cortex

A network of cortical sources involving dorsal prefrontal, posterior parietal and medial temporal sources is related to the differential processing of sounds of the tinnitus frequency. To examine whether the tinnitus related network can be modulated via transcranial Direct Current Stimulation (tDCS), 3 groups of tinnitus patients were subjected to a protocol of anodal, cathodal or sham stimulation, placing one electrode on the forehead and the extracephalic reference under the chin. Prior to and after the tDCS application, a magnetoencephalographic (MEG) measurement of an auditory event related paradigm was applied. Statistical analysis of the MEG results revealed that tinnitus patients, prior to the application of tDCS, show reduced activity in fronto-temporal regions, and increased activity in posterior parietal regions, as a response to the tinnitus frequency, but not to the control tone. This difference was related to tinnitus loudness and emotional indices. The MEG data showed that only the group receiving anodal tDCS was significantly affected by the intervention in the fronto-temporal and parietal regions that initially differentiated the processing of the two frequencies. After the tDCS stimulation, this group showed no difference in the processing of tinnitus and control frequencies. These results imply that anodal tDCS targeting the dorsal prefrontal cortex may reverse the functionality of the cortical network related to the differential processing of tinnitus and control frequencies in tinnitus patients. FUNDING: Research was supported by the German research council (DFG).

POSTER SESSION III-013 | EFFECTS OF A 5-WEEK HEART RATE BIOFEEDBACK RANDOMIZED INTERVENTION ON THE ASSOCIATION BETWEEN ALZHEIMER'S DISEASE BIOMARKERS AND CORTICAL THICKNESS

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Descriptors: biofeedback, plasma biomarker, cortical thickness

Plasma biomarkers are essential in the diagnosis, prognosis, and staging of Alzheimer's disease (AD). The accumulation of amyloid beta ($A\beta$) due to the imbalance of $A\beta$ production and clearance is known to influence AD pathogenesis. Additionally, low values of AD signature cortical thickness (ADSCt), which is measured by the cortical thickness of bilateral inferior and middle temporal

lobes, entorhinal cortex, and fusiform gyrus, are associated with high severity of AD pathology. In this context, the present study examined the effect of heart rate variability (HRV) biofeedback training on the relationship between the $A\beta$ 42/40 ratio and ADSCt in both younger and older adults. HRV biofeedback training enhanced the amplitude of cardiovascular oscillations and stimulates brain mechanisms that help regulate $A\beta$ levels and ADSCt. Our findings suggest that an increase in the $A\beta$ 42/40 ratio after five weeks of HRV biofeedback training is associated with increased ADSCt, and the increasing heart rate oscillations (Osc+) condition exhibits a stronger relationship between $A\beta$ 42/40 ratio and ADSCt than the decreasing heart rate oscillations (Osc-) condition following the intervention. Modulations of heart rate oscillations via HRV biofeedback contribute to the regulation of plasma $A\beta$ levels and the structural thickness relevant to AD pathology.

FUNDING: This study was supported by NIH R01AG057184 (PI Mather).

POSTER SESSION III-014 | THE INTERVENTION EFFECTS OF HEART RATE VARIABILITY BIOFEEDBACK TRAINING ON AMPLITUDE OF LOW-FREQUENCY FLUCTUATION IN OLDER AND YOUNGER ADULTS

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Descriptors: Heart rate variability, Amplitude of low-frequency fluctuation (ALFF), biofeedback

Heart rate variability (HRV) is a metric that reflects the flexibility and adaptability of the autonomic nervous system. Higher HRV is generally associated with better health and physiological state, indicating a more flexible and adaptable autonomic nervous system. The amplitude of low-frequency fluctuations (ALFF), on the other hand, measures spontaneous low-frequency fluctuations in a specific voxel or brain region during rest. Therefore, engaging in regulatory feedback during heart rate oscillatory activity may potentially influence ALFF in brain regions associated with the autonomic nervous system over time. In our study, we investigated the effects of a 5-week HRV biofeedback intervention in both younger and older adults. Specifically, we examined the impact of daily biofeedback sessions aimed at either increasing heart rate oscillations (Osc+ condition) or decreasing heart rate

oscillations (Osc- condition). Our findings revealed that younger adults in the Osc+ condition showed increased resting-state ALFF throughout the brain, specifically in regions such as the amygdala, orbitofrontal cortex, insula, and brainstem, compared with the Osc- condition. However, no significant changes were observed in older adults, suggesting that younger adults showed more neurovascular plasticity in response to the intervention.

FUNDING: This study was supported by NIH R01AG057184 (PI Mather).

POSTER SESSION III-015 | MODULATION OF NEURAL CORRELATES OF MODEL-BASED PERFORMANCE WITH IMPULSIVITY AND COMPULSIVITY

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Descriptors: Two-step task, FRN, P300

Heightened impulsivity and compulsivity are not only often found in association with both dysfunctional everyday behavior or psychopathology but also linked to alterations in model-based performance and its electrophysiological correlates. 238 participants underwent a two-step task and EEG recording to examine second-stage outcome processing, namely the feedback-related negativity (FRN) and P3, which are associated with reward prediction error (RPE) and subsequent behavioral changes. The effects of valence and magnitude of the RPE were analyzed conjointly via signed prediction error. Single-trial regression revealed a dissociation of the two: the amplitude of the FRN was lower with positive RPE, whereas P3a was higher for both positive and negative RPE. This indicates that the FRN reflects valence effects, whereas the P3a reflects surprise effects. In a second step, self-reported impulsivity and compulsivity were entered into the model to examine how they modulate the relationship between signed RPE and event-related potentials. While higher impulsivity was significantly related to an increased modulation of the FRN in common trials, lower compulsivity scores were associated with enhanced P3a and P3b effects. FRN results in impulsivity might indicate altered response to reinforcement learning with higher impulsivity. P3 effects for compulsivity suggest that lower compulsivity is related to a better internal model of the task structure, where information from higher RPE is constantly integrated to achieve optimal outcome.

FUNDING: Deutsche Forschungsgemeinschaft. Grant Number: CRC 940 Project C6.

POSTER SESSION III-016 | PROCESSING OF IMMEDIATE AND DELAYED FEEDBACK IN PATIENTS WITH CEREBELLAR DEGENERATION

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Descriptors: feedback learning, cerebellum, feedback-related negativity

This study investigated cerebellar involvement in processing of immediate and delayed feedback by testing patients with pure cerebellar degeneration (n=23) and healthy controls (HCs; n=23) with a probabilistic feedback learning task and recording brain activity with EEG. We investigated relationships between possible deficits in behavioral performance and altered feedback-related neural responses (event-related potentials, ERPs) and separately investigated resting state functional connectivity (rsFC; in a subsample of n=40) in cerebello-cerebral networks. Contrary to predictions, learning performance was better for delayed compared to immediate feedback across groups. However, we did not find any group differences. ERP analysis showed valence effects in the feedback-related negativity (FRN; FRN was more pronounced for negative compared to positive feedback) only for immediate feedback, across groups. For HCs, FRN amplitudes were more negative for delayed relative to immediate feedback. For patients, FRN amplitudes did not differ as a function of timing, but patients did show a more pronounced negativity compared to HCs for immediate feedback. Connectivity analyses revealed reduced rsFC in the precuneus and posterior cingulate cortex in patients compared to HCs when using cerebellar clusters covering crus I and II (Buckner et al., 2011) as seeds. Our results show preserved feedback learning but altered neural responses to immediate feedback in patients. How this might link to cerebello-frontal hypoconnectivity in patients needs to be further explored.

FUNDING: German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) - Project number 437661157.

POSTER SESSION III-017 | EVALUATING INHIBITORY CONTROL, ACADEMIC ACHIEVEMENT, AND P3 EVENT-RELATED POTENTIAL DURING AND AFTER ACUTE MODERATE-INTENSITY CYCLING IN CHILDREN

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Eric Drollette

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Descriptors: Inhibitory Control, Acute Exercise, Event-related Potential

The present study examined the effects of an acute bout of moderate-intensity cycling (20-minutes) on inhibitory control, academic achievement, and P3 event-related potential (ERP) in children. Participants ($n=18$; aged 9-12) completed two laboratory sessions of cycling and rest on separate days while wearing an EEG cap (64 Ag/AgCl electrodes). EEG data were recorded while performing the flanker task before, during, and after cycling and rest. Participants also completed academic measures of fluency during-cycling and during-rest. Results revealed no changes in reaction time or accuracy for the flanker task ($p's \geq .49$), and no changes in academic performance ($p's \geq .36$). P3 mean amplitude results revealed larger amplitude for incongruent trials during-cycling ($1.6 \pm 0.5 \mu V$) compared to before- ($0.7 \pm 0.3 \mu V$) and after-cycling ($0.3 \pm 0.3 \mu V$; $p's \leq .04$). Latency results revealed shorter latency for incongruent trials during-cycling (565.8 ± 7.2 ms) compared to after-cycling (595.7 ± 9.4 ms) and during-rest (604.8 ± 12.2 ms; $p's \leq .01$). These data suggest sustained inhibitory control and academic performance regardless of potential dual-task interference of cycling. Further, P3 results suggest that children upregulate attentional resources and stimulus classification during-cycling for more difficult trial types to meet task demands. Together, children may be able to successfully accomplish academic responsibilities while exercising without behavioral or neurocognitive decrements.

POSTER SESSION III-019 | THE EVALUATION OF ERROR TYPES AND TIME ON TASK

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Descriptors: Error monitoring, Error-related negativity, Flanker task

Previous studies showed that the error-related negativity (Ne/ERN), an electrophysiological correlate of error monitoring in choice tasks, differs between error types. This might reflect an error type evaluation that is based on the significance of errors for ongoing behavior. In a flanker

task, the Ne/ERN is particularly large if participants erroneously respond to the flanker, possibly because these flanker errors indicate that selective attention to the target should be increased to avoid further errors. To investigate how time on task affects this error type evaluation, we used a four-choice color flanker task with only incongruent stimuli. We conducted a regression analysis to predict single-trial Ne/ERN amplitudes by error type (flanker error/nonflanker error) and time on task (continuous). Results showed larger Ne/ERN amplitudes for flanker errors than for nonflanker errors and decreasing Ne/ERN amplitudes with increasing time on task. However, no interaction between error type and time on task was revealed. This indicates that error type evaluation is independent of the absolute size of the Ne/ERN suggesting different mechanisms underlying both phenomena.

POSTER SESSION III-020 | INCREASED ADIPOSITY IS RELATED TO INTRAINDIVIDUAL VARIABILITY IN COGNITIVE CONTROL

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Descriptors: Intra-individual Variability, Event-Related Potential, Adiposity

Previous literature has suggested obesity to detrimentally impact cognitive function and health at both behavioral and neuroelectric levels. However, the effects of adiposity on the intra-individual variability (IIV) of cognitive control remains understudied. Thus, this study examined the association between percentage of whole-body fat (%BF) and cognitive outcomes for both measures of central tendency and IIV. Adults ($n=320$; 19-64 yrs) completed the Eriksen Flanker task to assess attentional inhibition. Concurrently, electroencephalograms (EEG) were recorded to extract P3 and N2 event-related potential (ERP) components. In addition to the outcomes of central tendency, dispersion outcomes through standard deviation (SD) were also examined. Results were examined through stepwise hierarchical linear regression with age and sex included as step 1 and %BF included as step 2. %BF was associated with greater reaction time SD (congruent: $\beta=0.153$, $p=0.03$; incongruent: $\beta=0.23$, $p<0.001$), and inversely associated with accuracy (congruent: $\beta=-0.18$, $p=0.02$; incongruent: $\beta=-0.23$, $p<0.001$). Furthermore, %BF was associated with slower P3 peak latencies (congruent: $\beta=0.21$, $p=0.003$; incongruent: $\beta=0.18$, $p=0.01$), and increases in both incongruent N2 ($\beta=0.16$, $p=0.02$)



and P3 ($\beta = 0.16$, $p = 0.03$) latency SD. These findings expand on previous works by suggesting adiposity may exert detrimental cognitive effects beyond measures of central tendency and may also influence dispersion by increasing cognitive variability for both behavioral and neuroelectrical outcomes.

FUNDING: This work was supported by the National Cattlemen's Beef, the Hass Avocado Board, USDA National Institute of Food and Agriculture, and the Division of Nutritional Sciences at the University of Illinois Urbana-Champaign.

POSTER SESSION III-021 | AN ACUTE ACADEMIC STRESSOR IS ASSOCIATED WITH ENHANCED ERROR-RELATED BRAIN ACTIVITY

Alexandra Argiros, Seonwoo Hong, Loran Carpentier, Helena Renault, Corinne Sejourne, Anna Weinberg
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Descriptors: stress, error-related negativity, anxiety

The error-related negativity (ERN) is an event-related potential (ERP) that appears within 100 ms of mistakes on speeded response tasks. An enhanced ERN has consistently been observed in anxious groups and individuals. The magnitude of the ERN is heritable, and it may represent a genetically-mediated risk marker for anxiety disorders. However, environmental influences may also play a significant role. The ERN is sensitive to experimental manipulations that make errors more salient, such as punishment of mistakes. Relatedly, there is evidence that variance in the ERN is associated with real-world chronic stressors that might make errors more costly. The present study sought to understand how an acute naturalistic stressor would be associated with the ERN. To that end, a sample of 27 university students (21 women; 67% White) completed a flanker task at the beginning of the semester and again within five hours of a stressful exam or presentation. There was a significant interaction between response and assessment time predicting the ERN, such that the delta ERN at baseline was smaller ($M = -7.33$, $SD = 4.65$) than the delta ERN following an acute academic stressor ($M = -9.31$, $SD = 5.58$). These results suggest that a stressful context may be associated with at least a temporary increase in neural responses to errors, though future studies should examine the duration of these effects. They may further be useful in explaining a pathway from stress exposure to the development of anxiety, through alterations in the way the brain processes errors.

POSTER SESSION III-022 | WORRY IS ASSOCIATED WITH IMPAIRED PERFORMANCE IN THE ABSENCE OF AN ENLARGED ERN

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Descriptors: Error-Related Negativity (ERN), Worry

Worry is associated with impaired cognitive control (CC) functions. Previous work has shown that worry is associated with an enlarged error-related negativity (ERN), a neural index of CC occurring after the commission of an error, despite having intact behavioral performance. The compensatory error-monitoring hypothesis (CEMH) posits that enlarged ERN in the presence of unimpaired performance reflects greater engagement in compensatory processes to accomplish goal-oriented tasks. As the CEMH has been supported in student samples, the study aim is to investigate if this applies to a community sample ($n=161$; age: $M=34.25$, $SD=5.95$) who completed a flanker task while undergoing EEG. Although worry was not associated with the ERN in this sample ($p=.255$), it was associated with decreased post-error accuracy ($p=.035$) and slower reaction time overall ($p=.022$). On the other hand, a larger ERN was associated with greater post-error accuracy ($p=.013$) and faster RT ($p=.006$).). Thus, in the absence of engaging compensatory control processes through enlarged ERN, those with higher worry demonstrate performance decrements, consistent with the tenets of CEMH.

FUNDING: This work was supported by National Institute of Drug Abuse grant 5R01DA039112 awarded to C. Emily Durbin, Brian M. Hicks, Robert A. Zucker, & Jason S. Moser.

POSTER SESSION III-023 | EXAMINING TASK-RELATED DIFFERENCES IN THE ERROR-RELATED NEGATIVITY (ERN) AS A FUNCTION OF COGNITIVE CONTROL STRATEGY AND TRAIT ANXIETY

Russell Mach, Connie Lamm, Matt Judah
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Descriptors: anxiety, error-processing, ERPs

Anxiety disorders pose a significant challenge to daily living, workplace productivity, and healthcare systems. Extant research supports empirical links between

anxiety and brain-level error monitoring. The ERN – or error-related negativity – is one widely studied correlate of anxious symptomatology. Relatively stable individual differences in the ERN are inferred from electroencephalogram (EEG) recordings time-locked to the commission of mistakes. However, the assumed interchangeability of ERNs elicited under different experimental conditions has not been thoroughly evaluated. Canonical tasks for measuring the ERN may cue specific strategies for cognitive control, which we suggest as one explanation for divergent findings across studies. In a sample of 108 undergraduate students, we examined within and between-subject differences in the ERN to a mixed-task procedure. Experimental blocks alternated pseudo-randomly between several tasks: the AX Continuous Performance task (AX-CPT, Reactive Control), Go/NoGo (Inhibitory Control), and Navon-Flankers (Response Conflict). Partially consistent with our predictions, ERN mean areas for inhibitory control ($t(107) = -4.42, p < .001$) and response conflict trials ($t(107) = -4.70, p < .0001$) were typically larger (i.e., more negative) than those for reactive control. Unexpectedly, the ERN was a non-significant predictor of Trait anxiety scores (STAI-T), after controlling for participant age and gender (all $ps > 0.05$). Future research should consider how ERN task parameters may obscure trait-level differences in error sensitivity.

POSTER SESSION III-024 | RIGHT INFERIOR FRONTAL GYRUS CONNECTIVITY DURING INHIBITORY CONTROL: EVIDENCE OF GREATER NEURAL COMPENSATION IN OLDER WOMEN WITH ALEXITHYMIA

Erik O'Reilly, Elizabeth Paitel, Mary Polking, Christian Otteman, Kristy Nielson
Marquette University

Descriptors: alexithymia, aging, frontal lobe

Engagement of the right inferior frontal gyrus (rIFG) is essential for successful inhibition (i.e., executive functioning, EF), such as in stop-signal tasks (SST). EF declines in older age and is poorer in those with higher alexithymia (difficulty identifying feelings, DIF), which also worsens with age. Thus, alexithymia might exacerbate age-related cognitive decline. Yet, the relationship of alexithymia and age to rIFG structure and function is not well studied. We used MRI (3T) and electroencephalography (EEG) source estimation in cognitively intact older women ($n=35, M_{age}=78$) to investigate rIFG volume and rIFG connectivity with right superior frontal gyrus (rSFG; N200 window), which is essential for successful withdrawal of responding

(i.e., stopping) in SST. SST performance (stop accuracy, stop-signal reaction time) was significantly associated with rIFG volume (intracranial volume-corrected, age covaried), and DIF added significant variance to the regression model ($p=.002, R^2_{adj}=.38, R^2_{DIF}=.15$). Moreover, rIFG-rSFG connectivity during successful stops was significantly related to overall stop accuracy rate ($p=.01$), and this relationship was moderated by DIF ($F(3,30)=5.6, p=.004, p_{interaction}=.04$). Specifically, those with high DIF needed significantly greater connectivity to achieve the same level of performance as those with lower DIF. Thus, DIF was associated with poorer EF, greater rIFG atrophy, and greater rIFG compensatory connectivity, suggesting alexithymia in older women is a risk factor for cognitive decline.

FUNDING: Private contribution from Thomas J. Salentine (KN) and NSF grant #1854158 (KN).

POSTER SESSION III-025 | REPLICATION OF THE COLOR FLANKER TASK WITH EMOTIONAL WORDS: A DUAL ANXIETY APPROACH

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Descriptors: Dual Anxiety, Event-related potentials (ERPs), Emotion Cognition Interactions

Studies investigating the effect of negative emotion on cognitive control have often found increased interference effects (e.g., Engels et al., 2007). However, the color flanker task developed by Kanske and Kotz (2010) has consistently shown decreased interference effects on negative word trials compared to neutral word trials (2011; 2012). This study seeks to address this difference in the literature by examining the effects of anxious arousal vs. anxious apprehension during the color flanker task using 64-channel EEG. Preliminary analyses ($n=51$) revealed no differences in interference effects between negative and neutral trials on reaction time. Anxious arousal was found to have a significant positive correlation with reaction time on neutral incongruent trials only. Event-related potentials indicate a significant P100 and P300/LPP complex effect. Anxious arousal has been shown to be associated with speeded processing and reactions to threatening stimuli, while anxious apprehension has been shown to be associated with slowed processing and delayed reactions to threatening stimuli (Heller et al., 1997). These disparate effects could account for the differences in the literature regarding the influence of negative stimuli on cognitive control.

POSTER SESSION III-027 | VISCERAL ADIPOSE TISSUE MEDIATES THE ASSOCIATIONS BETWEEN MODERATE-TO-VIGOROUS PHYSICAL ACTIVITY AND BEHAVIORAL AND NEUROELECTRIC INDICES OF ATTENTIONAL CONTROL

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Descriptors: attentional control, P3, accelerometry

This study investigated the relationship between accelerometer-measured moderate-to-vigorous physical activity (MVPA; min/d), sedentary time (ST; min/d), performance on the flanker task, and the P3b-ERP component in 148 adults (87 [59%] females, $M_{age} = 33.9 \pm 6.78$ years, $BMI = 30.5 \pm 6.21 \text{ kg} \cdot \text{m}^{-2}$, 85% with overweight or obesity). The relationships between MVPA, ST, and neurocognitive outcomes were evaluated using mediated effect models and percent total body fat mass (PFAT), visceral adipose tissue (VAT), and subcutaneous adipose tissue (SAT) as mediators. All models were adjusted for wear time, sex, height, IQ, and ST (MVPA models) and MVPA (ST models). Smaller volume of VAT fully mediated the positive relationship between greater engagement in daily MVPA and lower accuracy ($\beta = -0.05 \pm 0.02$, 95% BC bootstrap CI [95% CI for short]: -0.11, -0.01) and RT interference scores ($\beta = -0.05 \pm 0.02$, 95% CI: -0.10, -0.01). Smaller VAT volume also fully mediated the relationship between greater engagement in MVPA and faster stimulus evaluation on incongruent flanker trials as indicated by shorter P3b fractional area latency ($\beta = -0.05 \pm 0.03$, 95% CI: -0.11, -0.00) across centro-parietal sites (C1, Cz, C2, CP1, CPz, CP2). In contrast, ST was not related to flanker performance or neuroelectric indices of attentional control. Neither SAT nor PFAT mediated any of the measured associations. Our results suggest reductions in VAT as a potential target mechanism for improving attentional control through increases in daily MVPA in adults with overweight and obesity.

POSTER SESSION III-028 | COGNITIVE CONVERGENCE: SHARED SALIENCE IN REWARD RESPONSE AND CONFLICT DURING DECISION-MAKING AND EXECUTIVE CONTROL

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Descriptors: Cognitive control, salience networks, external validity

A critical assumption of cognitive neuroscience for understanding individual differences such as psychopathology is the trait-like engagement of neural mechanisms, including their generalization across functions. A way to test the minimum threshold of the validity of this assumption is to examine generalization across tasks where the engagement of shared neural mechanisms can be observed. We examined the salience network, made of the insula and anterior cingulate, as a proof-of-principle of this cognitive convergence assumption. We examined 52 healthy controls during reward-related feedback and conflict monitoring on two tasks during 3T fMRI acquisition. Stimuli and feedback on the two tasks were designed to be comparable. The decision-making task was a three-armed restless bandit. Reward probabilities changed independently across stimuli, so participants shifted between exploitation and exploration. Salience network activity was greater during the exploration phase not only in response to the reward, but also when participants selected the stimulus. The cognitive control task was a variant of the expectancy AX task in which A-X pairs were prepotent, and other pairs were rare. Post-conflict slowing was measured by RT's on AX trials following correct AX trials vs. exception trials. Participants showed expected post-conflict slowing, which corresponds to salience network activity patterns. There was little evidence that these propensities to activate the salience network were trait-like, though, setting up a significant challenge to the assumption of cognitive convergence.

FUNDING: USA NIH P50MH119569.

POSTER SESSION III-029 | ERROR-RELATED (ERN) AND REWARD-RELATED (REWP) EVENT-RELATED POTENTIALS: COMPARISON BETWEEN A DRY ELECTRODE AND A GEL-BASED EEG SYSTEM

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Descriptors: EEG Method, RewP, ERN

Event-related potentials (ERPs) have practical utility in clinical psychology as neural markers of individual differences that can predict changes in symptoms over time and as a function of treatment. Implementation in clinical settings, however, would benefit from eliminating conductive gel. Dry-electrode mobile EEG systems exist; however, there is little research comparing ERPs recorded

from dry- and gel-based electrode EEG systems. In the current study, participants completed the flankers task and doors task in counter-balanced order to elicit the error-related negativity (ERN) and reward positivity (RewP), respectively. Across both tasks, the gel-based EEG system produced more positive ERPs in terms of magnitude; however, ERPs recorded from both EEG systems had good internal consistency. In addition, the ERPs from both systems showed good convergent and divergent validity, indicating that both systems are capturing similar variance in error- and reward-related brain activity. Overall, the dry EEG system recorded ERPs with good data quality that may be used in individual differences research implemented in clinical settings and related environments.

POSTER SESSION III-030 | HEART RATE VARIABILITY AND COGNITIVE FUNCTION IN ADULTS IN THE CZECH STUDY HEALTHY AGEING IN INDUSTRIAL ENVIRONMENT (4HAIE)

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Descriptors: heart rate variability, cognitive function, parasympathetic activity

Autonomic dysfunction is common in dementia subtypes and mild cognitive impairment, both of which are frequent diagnoses of older age. Several studies demonstrated the link between decreased autonomic modulation and worse cognitive performance long before the old age, but the evidence is far from conclusive. We aimed to assess the relationship between cognitive function and autonomic modulation, indexed by heart rate variability, in a cohort of adults aged 18 to 65yrs. We used data from the Czech study Healthy Aging in Industrial Environment (4HAIE). The analytical sample included 712 participants (309 women) with a mean age of 37.7(SD±11.3). The global cognitive score was calculated as a sum of standardized test scores from 5 tests on memory and executive function. The distribution of the score was not normal, therefore participants were categorized into those with poor cognitive performance and rest (binary variable of lowest 20% vs. rest). The main HRV variable of our interest was root mean square of successive differences between normal heartbeats (RMSSD) stratified into quartiles. After adjusting for age, sex, education and fitness level, we observed that compared with those who had RMSSD in the second quartile (Q2), those with the lowest RMSSD (Q1) had marginally higher odds of poor cognitive performance (OR:1.53;95%CI 0.97-2.42;p=0.07). In our cohort of adults aged 18-65years we observed limited evidence of an association between

cognitive performance and RMSSD, a marker of autonomic dysfunction.

FUNDING: This research was co-funded by European union and Ministry of Education, Youth and Sports of the Czech Republic, grant number CZ.02.1.01/0.0/0.0/16_019/0000798 Program 4 Healthy Aging in Industrial Environment.

POSTER SESSION III-031 | PSYCHOLOGICAL RISK, SOCIAL SUPPORT, AND EXPECTANT MOTHERS' NEURAL RESPONDING TO INFANT EMOTIONAL FACIAL EXPRESSIONS

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Descriptors: infant emotional expression, event-related potentials, prenatal risks

Depression, anxiety, and lack of social support are related to dampened ERP amplitudes to infant emotional expressions (Rutherford et al., 2015; Rutherford et al., 2017; Nyman et al., 2020). However, small samples assessed postnatally raise questions about replicability (e.g., N=37-78) and whether links predate motherhood. This study comprised 130 expectant mothers and examined the effects of depression, anxiety, and social support on expectant mothers' neural responses to infant emotional cues. Women completed an infant emotion categorization task while being electrophysiologically monitored and completed comprehensive assessments of depressive symptoms (BDI-II, PHQ, EPDS), anxiety symptoms (BAI, GAD-7), and social support (Prenatal Social Support Instrument). Initial analyses focused on the P3; further analyses will include the N170. Depressive and anxiety symptoms were not significantly correlated with P3 amplitude to distress or happy (v. neutral) expressions regardless of assessment. Greater social network was associated with a heightened P3 to distress (v. neutral; $r = .24, p < .05$) and happy (v. neutral; $r = .23, p < .05$) expressions. Findings suggest that social support, but not depression and anxiety, is implicated in women's P3 to infant emotional cues prenatally. Postnatal, but not prenatal links between depression/anxiety and women's P3 to infant expressions may be explained by changes in symptomatology over the transition to motherhood. Further research is needed to evaluate the replicability and timing of associations.

FUNDING: Research supported by the National Science Foundation (#2017920).



POSTER SESSION III-032 | UPDATE ON THE TELEHEALTH EEG ASSESSMENT IN ANGELMAN SYNDROME: DETECTION OF INCREASED DELTA POWER

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Purdue University

Descriptors: Telehealth Assessment, Angelman Syndrome, Delta Power

Electroencephalography (EEG) is a tool that records brain activity in real time and has been utilized to identify patterns of brain activity in Angelman syndrome (AS). Current literature suggests that increased delta may be a potential biomarker for AS, given it is observed in 84% of patients. However, accessing EEG assessments via laboratories and clinics may be challenging for many families due to the widespread geographic location of families with AS, resulting in exclusion from research efforts. To address this barrier, our team developed a remote, home-based EEG assessment that may be administered to families with no technician onsite. The goal of the present project is to examine whether increased delta power would be detected in children with AS using our telehealth EEG assessment. For the pilot, we collected data from 7 families affected by AS including the affected child (age range: 2-15), their unaffected sibling, and caregivers. Each family member was assessed three times over the span of one week, yielding a total of 84 EEG assessments. Previous analyses revealed great caregiver satisfaction with the protocol, excellent internal consistency within each session, and good test-retest reliability across sessions. Recent analyses suggest that our protocol successfully observed increased delta power among children with AS and found delta power was inversely related to chronological age among children with AS, consistent with previous research. Overall, findings suggest the remote, home-based EEG assessment may be a good alternative to in-lab EEG assessments.

FUNDING: This project was funded with support from the Indiana Clinical and Translational Sciences Institute which is funded in part by Award Number UL1TR002529 from the National Institutes of Health, National Center for Advancing Translational Sciences, Clinical and Translational Sciences Award. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

POSTER SESSION III-033 | UNPREDICTABLE THREAT INCREASES EARLY EVENT-RELATED POTENTIAL AMPLITUDES, CARDIAC ACCELERATION, AND CORTICO-CARDIAC COUPLING DURING AN ODDBALL PARADIGM

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Descriptors: Unpredictable threat, Cortico-cardiac coupling, Unexpected stimuli

In the face of unpredictable threat, rapid processing of external events and behavioral mobilization through early psychophysiological responses are crucial for survival. While there is evidence that unpredictable threat enhances early processing in general, it may be evolutionary adaptive to particularly increase sensitivity for unexpected or infrequent events as they may signal danger. N=76 participants performed an auditory oddball paradigm and received unpredictable shocks in THREAT but not in SAFE contexts while frequent (STANDARD) and infrequent (ODDBALL) tones were presented. We assessed event-related potentials (ERP), evoked heart period (HP), and time-lagged within-subject correlations of single-trial EEG and HP (cardio-EEG covariance tracing, CECT). N1 and P2 ERP amplitudes and cardiac acceleration were generally enhanced under THREAT. Meanwhile, P3 for ODDBALL stimuli was attenuated under THREAT. CECTs revealed that cardiac acceleration was predicted by central midline EEG from 140 to 240ms (P150H) and 300 to 400ms (N300H) after tone presentation. Of relevance, early cortico-cardiac coupling (P150H) was enhanced for unexpected stimuli during THREAT, while later coupling (N300H) was reduced. The results suggest that contextual, unpredictable threat enhances early cortical and subsequent cardiac responses to auditory events as well as early brain-to-heart communication in response to unexpected stimuli. Conversely, at later processing stages, benign unexpected stimuli receive reduced resource allocation during unpredictable threat.

FUNDING: This work was supported by the Deutsche Forschungsgemeinschaft (grant number DFG MU 3535/6-1).

POSTER SESSION III-034 | ELECTROPHYSIOLOGICAL MEASURES OF EMOTIONAL REACTIVITY AND EMOTION REGULATION AND ASSOCIATIONS WITH SELF-REPORTED EMOTION REGULATION CAPACITY IN EVERYDAY LIFE

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Descriptors: emotional reactivity, emotion regulation, LPP

Introduction: The late positive potential (LPP) provides electrophysiological measures for emotional reactivity and emotion regulation. There is some evidence for an association between LPP-based measures of emotional reactivity and habitual emotion regulation in everyday life. However, conclusive evidence for an association between LPP-based measures of emotion regulation and habitual emotion regulation is lacking. In this study, we investigated the independent associations of LPP-based measures of emotional reactivity and emotion regulation with self-reported habitual emotion regulation. *Method:* We recorded ERPs to neutral, threatening, and pleasant pictures from the International Affective Picture System while participants were instructed to maintain, reduce, or enhance emotional responding during passive viewing, reappraisal or savoring conditions. We assessed habitual emotion regulation via the Behavioral Emotion Regulation Questionnaire and the Cognitive Emotion Regulation Questionnaire. *Results:* Data of 30 participants will be presented showing linear associations between degree of LPP modulation by down- and up-regulation conditions (i.e., reappraisal and savoring) and self-reports of corresponding habitual emotion regulation strategies in daily life. *Outlook:* This study aims at clarifying the relationship between electrophysiological correlates of emotional reactivity and emotion regulation and self-reports of emotion regulation strategies, which is of crucial relevance in the study of emotion (dys-)regulation in clinical populations.

FUNDING: This study is supported by the German Research Foundation (Forschungsgruppe 5187; project number 442075332).

POSTER SESSION III-035 | PATHOLOGICAL PERSONALITY DIMENSIONS AND NEUROBIOLOGICAL EMOTIONAL REACTIVITY

Sarah Barkley, Jacob Feldman, Adina Levy, Alex Grieshaber, Brady Nelson
Stony Brook University

Descriptors: Late positive potential, Emotional reactivity, Psychopathology

The Hierarchical Taxonomy of Psychopathology (HiTOP) offers a promising framework to identify neurobiological mechanisms of psychopathology. Neurobiological emotional reactivity has been implicated in many forms of psychopathology. The late positive potential (LPP) is an event-related potential component that indexes neural emotional information processing and has been associated with many disorders. However, it is unclear how the LPP maps onto HiTOP-inspired psychopathology dimensions. This study included a clinical sample of 249 18-35-year-olds (M age=23.06, SD age=3.83; 86% female) who completed an emotional picture viewing task while electroencephalography was recorded. Participants completed the self-report Comprehensive Assessment of Traits relevant to Personality Disorders to assess pathological personality dimensions. Results indicated that higher negatively emotionality was associated with a larger LPP, while higher detachment was associated with a smaller LPP. Antagonism was associated with a larger LPP at parietal compared to occipital electrodes. Disinhibition was associated with a larger LPP to high arousal, unpleasant images at occipital electrodes. Additional analyses suggested that several results were largely driven by lower-order traits. These findings suggest that pathological personality domains and traits demonstrate unique associations with the neural processing of emotional information. This study contributes to the development of a neuroscience-informed dimensional system that better addresses comorbidity and heterogeneity of clinical phenomenology.

FUNDING: Stony Brook University.

POSTER SESSION III-036 | A REFINED DARK-ENHANCED STARTLE TASK

Freya Whittaker, Angelica DeFalco, Mia Tognoli, Emma Gilmore, Daniel Bradford
Oregon State University

Descriptors: Dark-enhanced startle, Stress, Methodology

Developed in the 1990s as a translational, human analogue of rodent Light-Enhanced Startle paradigms, the human Dark-Enhanced Startle (DES) task is now widely employed by researchers investigating basic stress mechanisms important in psychopathology and pharmacology research. DES is an attractive alternative to tasks often restricted in sensitive populations (e.g., children) such as threat of shock. Nevertheless, just as DES has advantages, unique challenges to its robustness and validity have been raised, namely concerns about

how attentional differences between total darkness and normal lighting conditions may influence task results. Here, we present methodological details and data from a refined and expanded DES paradigm with several improvements aimed at addressing shortcomings and expanding its applicability beyond previous implementations. Key improvements include the addition of a glow-in-the-dark fixation cross that allows standardization of directed attention between conditions, the employment of startle probe P3 suppression to account for any residual condition differences in emotionally motivated attention, and the inclusion of a dim light condition that facilitates testing of new research questions with more nuanced assessment of graded stress levels. We show evidence from the updated DES task that, when carefully controlling for attention, startle is robustly potentiated in darkness, and that dim light also potentiates startle above bright light. We discuss advantages of using this refined DES task to address various questions in psychophysiology research.

POSTER SESSION III-037 | AMYGDALA AND CORTICAL GAMMA-BAND RESPONSES TO EMOTIONAL FACES DEPEND ON THE ATTENDED TO VALENCE

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Descriptors: Amygdala, iEEG, Gamma Oscillations

The amygdala might drive an attentional bias for emotional faces. Still, how its response to emotion interacts with top-down attention is not fully understood. It is also unclear how amygdala activity compares to emotion processing in scalp EEG. We studied the interaction of emotion and attention during face processing in gamma-band activity (GBA) in the amygdala and on the scalp. Amygdala signals were recorded via intracranial EEG (iEEG) in 10 patients with epilepsy. Scalp data were collected from 19 healthy students. Randomized blocks of angry, neutral, and happy faces were presented, and either negative, neutral, or positive expressions were denoted as the target. Both groups detected happy faces fastest and most accurately. During attention to negative faces, low GBA (< 90 Hz) increased for angry faces in both groups, albeit earlier on the scalp (60 ms) than in the amygdala (130 ms). At 570 ms, amygdala high GBA (> 90 Hz) was increased for angry and neutral compared to

happy faces. When neutral faces served as targets, high GBA higher for emotional than neutral faces around 160 ms. Attention to positive faces did not result in an expression differentiation in GBA. Present data reveal top-down influences that coordinate widespread GBA synchronization to narrow stimulus processing to attended to threats. By contrast, attention-independent emotion detection in amygdala GBA may only occur during a neutral focus. These results are in line with a multi-pathway model of emotion processing, and they reveal how attention can tune timing and amplitude of emotional GBA responses.

FUNDING: This work was partly funded by grants from the German Research Foundation: Deutsche Forschungsgemeinschaft, Grant/Award Numbers: BI1254/8-1, KI1286/6-1. We thank the G.A. Lienert Stiftung for generously funding the international travel that facilitated the data analysis.

POSTER SESSION III-038 | LACK OF STARTLE BLINK POTENTIATION TO UNPLEASANT PICTURES IS LINKED TO PROBLEMATIC USE OF SOCIAL MEDIA

Richard Morris III, Tania Moretta, Egle Orlando, Giulia Buodo

University of Padova

Descriptors: Problematic use of social media, Startle blink, Cue-reactivity

In the present study, we investigated the relationship between the level of problematic use of social media (PUSM) and the startle response to social media-related and affective cues among Italian young adults. The magnitude of the startle eyeblink reflex elicited during the viewing of pleasant, unpleasant, neutral, and Facebook-related pictures was recorded in 31 healthy young adults. Startle eyeblink responses were measured at 300, 1500, and 3500 ms after picture onset to assess the attentional/affective modulation and its temporal course. While reliable startle potentiation to unpleasant pictures was found relative to neutral pictures in individuals with lower levels of PUSM, higher levels of PUSM were associated with startle inhibition during the viewing of unpleasant pictures. This finding may suggest defective defensive motivation and/or enhanced attentional engagement to unpleasant content. In line with previous findings, the underlying mechanisms may be represented by defective emotion regulation processes that prioritize the processing of unpleasant cues, thus capturing more motivational/attentional resources.

POSTER SESSION III-039 | EVIDENCE FOR A COMMON NEURAL MECHANISM INVOLVED IN COGNITIVE CONTROL AND IMPLICIT EMOTION REGULATION: AN EEG EFFECTIVE CONNECTIVITY STUDY

Agnieszka Adamczyk^{1,2}, Mirosław Wyczesany¹
¹Jagiellonian University, ²Radboud University

Descriptors: EEG effective connectivity, theta oscillations, emotion regulation

Self-control (SC) is a core aspect of adaptive human behavior. It allows the attainment of personal goals by regulating unwanted thoughts, emotions, and behavior. Previous research highlighted the crucial role of cognitive control (CC) for explicitly pursued SC and *explicit* emotion regulation (ER) strategies (such as cognitive reappraisal or attentional distraction). The present study investigated whether similar neural mechanisms would be involved in an *implicit* SC task that acted as a covert ER strategy. Thirty-six participants unscrambled sentences of neutral (NREG) or neutral and self-control-related (REG) content prior to passively viewing negative and neutral pictures. Implicit induction of SC (REG condition) reduced the amplitude of the Late Positive Potential to negative pictures, indicating successful ER. In line with predictions, implicit SC enhanced connectivity within CC brain networks. For the fronto-parietal network, increased theta connectivity from the dorso-lateral prefrontal cortex to the intraparietal cortex was observed. For the cingulo-opercular network, increased theta connectivity from dorsal anterior cingulate cortex (dACC) to the left anterior insula/frontal operculum (aI/fO) and from the right aI/fO to the dACC was observed. These effects were accompanied by a *decrease* in pre-stimulus alpha power in the right primary visual cortex. Together, our results show that self-control enhances CC that is necessary for setting, maintaining, and monitoring the achievement of self-control behavior, as well as regulation of attentional and emotional processes. FUNDING: This research was supported from a grant from the National Science Centre in PL (2019/35/B/HS6/03687).

POSTER SESSION III-040 | ALEXITHYMIA PREDICTS INCREASED P300 IN CYBERBALL SOCIAL EXCLUSION PARADIGM

James Brown, Danielle Jones, Colin Bowyer,
 Choe E. Johnson, Elizabeth Hammock, Christopher Patrick
 Florida State University

Descriptors: Affect, Personality, Individual Differences

Alexithymia is the inability to detect physiological feelings and modulate emotion. Recent works show significant relationships between self-reports of alexithymia, positive-, and negative urgency (i.e., tendency to become impulsive when in positive or negative emotional states). This study used an ERP version of the Cyberball task, a ball tossing task between an experimental participant and two ostensible players that is used to induce both positive and negative emotional states. Given extensive evidence of the relationship between reduced P300 amplitude and trait impulsivity, we examined the P300 response to ball-passes in negative emotional state trials where the participant was excluded from play (84% of trials) and positive emotional state trials where other players passed the ball to the participant (16% of trials). Consistent with prior research, results show that individuals high in alexithymia showed a reduced P300 response to negative emotional state trials, suggesting enhanced impulsivity while in an induced negative emotional state (i.e., enhanced negative urgency). However, results for positive trials showed a positive relationship between the P300 and alexithymia. Furthermore, we conducted regression analyses using trait disinhibition as a covariate and discovered alexithymia independently predicted increased P300 amplitude on these trials. These results suggest that increased positive urgency within alexithymia may not impact initial processing of stimuli while in a positive affective state but may reflect deficits in other evaluative processing components.

FUNDING: NIH (MH114994), NIH (T32 MH093311), NIH (R25 NS117356), and the Florida Education Fund.

POSTER SESSION III-041 | GETTING IN TOUCH: AESTHETIC PROCESSING OF MATERIAL SURFACES

Thomas Jacobsen, Barbara Marschallek, Andreas Löw
 Helmut Schmidt University / University of the Federal Armed Forces Hamburg

Descriptors: Aesthetics, fNIRS, Haptics

The haptic exploration and aesthetic processing of all kinds of materials' surfaces are part of everyday life. In the present study, functional near-infrared spectroscopy (fNIRS) was used to investigate the brain correlates of active fingertip exploration of material surfaces and subsequent aesthetic judgments of their pleasantness (feels good or bad?). In absence of other sensory modalities,

individuals ($n=21$) performed lateral movements on a total of 48 textile and wood surfaces varying in terms of their roughness. Behavioral results confirmed the influence of the stimuli's roughness on aesthetic judgments, with smoother textures being rated as feeling better than rough textures. At the neural level, fNIRS activation results revealed an overall increased engagement of the contralateral sensorimotor areas as well as left prefrontal areas. Moreover, the perceived pleasantness modulated specific activations of left prefrontal areas with increasing pleasantness showing greater activations of these regions. Interestingly, this positive relationship between the individual aesthetic judgments and brain activity was most pronounced for smooth woods. These results demonstrate that positively valenced touch by actively exploring material surfaces is linked to left prefrontal activity and extend previous findings of affective touch underlying passive movements on hairy skin. We suggest that fNIRS can be a valuable tool to provide new insights in the field of experimental aesthetics.

POSTER SESSION III-043 | ADVANCED AGE IS ASSOCIATED WITH POORER RECOVERY FROM NEGATIVE PROVOCATION

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University of Wisconsin, Madison

Descriptors: corrugator, emotion regulation, aging

Aging has been associated with both gains and losses in self-reported emotional and psychological well-being. Laboratory findings are also mixed whether aging is linked with improved or impaired emotional regulation. Limited age ranges, differing assessment approaches, and differences in emotional regulation paradigms may explain the mixed findings. To better understand how emotional response trajectories change with age, we examined the temporal dynamics of emotional responding with facial electromyography (EMG) including reactivity to and recovery from emotional stimuli in the Midlife in the U.S. (MIDUS) sample. The response time course to negative, neutral, and positive images were measured with EMG of the *corrugator supercilii* muscle, which exhibits linear changes with affective valence. Clean corrugator data were obtained in $n=211$ participants (56% female, mean age=65.11 years, age range=48-95 years). Although no age differences were found in the initial reactivity to negative images, poorer recovery indicated by significantly higher corrugator EMG levels after image offset were exhibited by participants older than age 75

when compared to those younger than age 60 or to those between age 60-75 years. The poorer recovery exhibited in the oldest participants may be associated with declines in health and/or cognition. How such patterns are linked with self-reported aspects of well-being are useful questions for future research, along with consideration of possible moderators to better understand the poorer negative emotional recovery with advanced age.

FUNDING: Publically available data from the MIDUS Neuroscience Project were used for this research. The MIDUS Neuroscience Project has been funded by the following: National Institute on Aging (P01-AG020166, U19- AG051426, U01 AG077928) Waisman Intellectual and Developmental Disabilities Research Center: U54-HD090256.

POSTER SESSION III-044 | EMPHASIZING TASTE & CONVENIENCE IN INSTAGRAM RECIPE VIDEOS: YOUNG ADULTS' PSYCHOLOGICAL PROCESSING, INTENTIONS, AND RECALL

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Descriptors: Food Media, Emotional Processing, Cognitive Processing

Recipe videos are highly popular on social media like Instagram. Such videos depict common food marketing cues, emphasizing *taste* and *convenience*, that may influence audiences (e.g., to try the recipe). Food is an automatic biological spur triggering appetitive motivational systems, which *taste* cues succeed in too. The role of *convenience* cues, though, is unclear. Unlike *taste* cues, these are less immediate and more linked to rational processing. Young adults (18-25) who use Instagram often and develop likely lasting food habits, are prone to both cues and consider both in food decisions. Via a within-subjects repeated-measures experiment we investigated how Instagram dessert recipe videos emphasizing either *taste*, *convenience*, or both cues affect young adults' cognitive (heart rate) and emotional processing (valence, fEMG; arousal, EDA), their self-report intentions to engage, save, purchase, and prepare, and recipe memory retrieval (recall). Self-report RM-ANOVAs reveal *taste* and *convenience* cues jointly elicit highest recipe intentions ($M=3-4.2$, $F=18.9-37.6$, $p<.001$). Alone, *taste* is a stronger cue than *convenience*, inciting higher intentions than when

absent ($M=2.8-3.7$, $F=175.6-274.9$, $p<.001$). Physiology RM-ANOVAs show contrary cue processing, hinting at some expectance incongruence backed by recall data: absence of *taste* and/or *convenience* cues seems to confuse participants, eliciting greater cognitive and positive emotional processing (lower corrugator, higher zygomaticus/orbicularis). These results are relevant to extend food marketing towards health promotion.

FUNDING: This work was supported by VLAIO (Flanders Innovation & Entrepreneurship) and Flanders' FOOD as it is part of the InFLOOD study (Influence of Food Media on Food Consumption Patterns in Flanders; Grant number: HBC.2018.0397). The findings and conclusions were independently arrived at by the authors and do not represent an official opinion or policy of the funding agency in any way.

POSTER SESSION III-045 | FATIGUE REFLECTS AN AFFECTIVE RESPONSE TO DYSHOMEOSTASIS AND IS PART OF AN ALLOSTATIC STRATEGY

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Johns Hopkins University

Descriptors: Fatigue, Decision Making, Biofeedback

Fatigue is a pervasive symptom that remains poorly understood. Two frameworks conceptualize fatigue but lack direct empirical support. The somatosensory attenuation framework posits that fatigue reflects higher effort perception due to altered sensing of neuromuscular information, while the metacognitive framework of dyshomeostasis posits that fatigue reflects an affective response to dyshomeostasis. We examined which framework better explains fatigue by having participants perform a fatiguing task that required maintaining a specified level of effort or muscle activity in two different sessions. We found that while perceived effort did not increase, fatigue increased similarly in both sessions, supporting the metacognitive framework of dyshomeostasis. This framework posits that fatigue is part of a regulatory process aiming to maintain homeostasis, namely 'allostasis'. If correct, we hypothesized that both sessions would decrease participants' willingness to exert. Since optimal allostasis should occur when interoceptive information (regarding dyshomeostasis) is integrated with sensorimotor information (regarding the compensatory increase in neuromuscular activity), we also hypothesized that the effort session would increase subjective effort cost

(i.e., reduced willingness to exert) to a greater extent. We found that participants' subjective effort cost increased in both sessions, but it increased the most during the effort one. Altogether, these results suggest that fatigue reflects an affective response to dyshomeostasis and is part of an allostatic strategy.

POSTER SESSION III-046 | A PERSON-CENTERED APPROACH TO CHARACTERIZING AUTONOMIC PROFILES IN MIDDLE CHILDHOOD

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Descriptors: autonomic profiles, latent profile analysis, middle childhood

Introduction: Prior work suggests that autonomic profiles more reliably differentiate displays of emotion than singular measures of autonomic reactivity. We leveraged latent profile analysis (LPA) to characterize person-centered profiles of autonomic reactivity across emotional contexts and their association with behavioral displays of two emotions: high-intensity pleasure and stranger fear. **Method:** 328 children (164 pairs of twins) aged 6-10 provided data. RSA and PEP data were collected at baseline and during two laboratory tasks designed to elicit high-intensity pleasure and stranger fear. Six variables were submitted to LPA: baseline RSA, baseline PEP, and RSA and PEP reactivity scores to the two emotion tasks, computed as the unstandardized residual score partialling out variance associated with baseline. **Results:** Best-fitting LPA yielded four autonomic profiles: reciprocal SNS at baseline ($n=18$; 5.5%), SNS inhibition to challenge ($n=28$; 8.5%), moderate ANS reactivity ($n=129$; 39.3%), and PNS activation to challenge ($n=153$; 46.6%). Children with the reciprocal SNS at baseline profile displayed significantly lower high-intensity pleasure than children with the moderate ANS reactivity profile. Children with the SNS inhibition to challenge profile displayed significantly higher stranger fear than children with the PNS activation to challenge profile. **Discussion:** Findings suggest that person-centered approaches incorporating baseline ANS function and reactivity across contexts reveal novel autonomic profiles that are differentially related to behavioral displays of emotion.

POSTER SESSION III-047 | EVENT RELATED DESYNCHRONIZATION IN EMOTIONAL SCENE PERCEPTION

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Descriptors: Emotion, EEG, Alpha desynchrony

Decreases in alpha band oscillations typically accompany any sort of cue processing, and the degree of alpha reduction has been shown to be enhanced during emotional, relative to neutral scene perception. Here we explore changes in alpha (8-12 Hz) and beta (12-30 Hz) power as 50 participants viewed 135 emotional and neutral scenes, balanced by luminance and complexity. The scene contents include erotica, sports victory, pleasant animals, neutral people, neutral nudists, neutral animals, threatening people, threatening animals, and mutilations. EEG data were recorded from 64 channels at 512 Hz, preprocessed and converted into alpha and beta power from each participant and trial over 5 occipital sensors averaged from 500 to 1000 ms after scene onset, deviated from a pre-scene baseline of 1000 to 500 ms prior to scene onset. These alpha and beta power estimates were then averaged over participants and scene content categories. We were specifically interested in the relationships between alpha / beta power and emotion-modulated onset event related potentials including the early posterior negativity (EPN; lateral occipital sensors between 150-300 ms) and the late positive potential (LPP; centroparietal sensors between 400-900 ms), as well as scene ratings of valence and arousal. The degree of desynchrony was consistent across alpha and beta bands, but did not correlate with emotional modulation of the EPN, the LPP, or emotion ratings. Scenes of animal threat evoked particularly strong decreases in alpha and beta power, an effect that did not appear in the ERP data.

POSTER SESSION III-048 | EMOTION RECOGNITION USING TIME-FREQUENCY FEATURES FROM PORTABLE EEG AND MACHINE LEARNING METHODS

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Descriptors: portable EEG, machine learning, emotion classification

Emotions have been widely researched using neurophysiological methods such as EEG(electroencephalography).

However, laboratory contexts do not always reproduce an individual's everyday experiences. Therefore, in this study, we explored using neural signals from mobile EEG in combination with machine learning techniques to assess emotions and different EEG features. We recorded EEG signals from 40 participants (analyzed 15 so far) using MUSE2 EEG when participants looked at images that induced positive, neutral and negative emotions. Then they rated their emotions on a 1 to 9 continuous scale. For within-subjects emotion recognition, time-frequency features contributed to a high accuracy of identifying positive and negative emotions in linear SVM (Support Vector Machine), a machine learning model. However, our results suggested one potential limitation that time-frequency features did not yield high performance for differentiating neutral emotions from positive and negative emotions using the same model. Existing studies on emotion recognition via portable EEG mostly used strong emotion inducing stimuli such as long-duration video clips but involve little information on how well EEG signals can reflect small and transient changes in emotions. This study examined the extent to which low density EEG's 600 millisecond long signals can reflect emotional experience to simple picture stimuli, shedding light on the possibilities and challenges of applying EEG signals on real world applications such as remote mental health assessment. FUNDING: Received Sprout Grant from Brandeis University to run paid participants in the summer.

POSTER SESSION III-049 | PSYCHOLOGICAL DISTRESS AMONG YOUNG PEOPLE: THE MODERATING ROLE OF HEART RATE VARIABILITY IN THE RELATIONSHIP WITH MALADAPTIVE METACOGNITIONS

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University of Padua

Descriptors: Psychological distress, Heart rate variability, Metacognitions

Psychological distress among youth is emerging as a problem of considerable clinical relevance. Both maladaptive metacognitions and low resting HRV have been linked independently to several psychological problems. In the present study, we investigated the role of maladaptive metacognitions (i.e., cognitive confidence, positive beliefs about rumination, negative beliefs about uncontrollability and danger, need to control thoughts) in relation to psychological distress in a sample of young adults, as well as the potential moderating effect of resting HRV. Self-reported metacognitions and psychological distress were assessed in 43 participants. The electrocardiogram was recorded for 5 minutes during rest and HRV was computed as the root mean square of the

successive differences in the interbeat intervals (rMSSD). The results showed that some maladaptive metacognitions, i.e., positive and negative belief about worry, were positively associated with psychological distress. Furthermore, slope analysis showed that reduced maladaptive cognitive self-consciousness was associated with lower stress levels in participants with higher resting HRV. This evidence supports the idea that high resting HRV may be a protective factor against the development of psychological distress among youth. We should therefore consider resting HRV as a potential target for planning preventive interventions applicable in different contexts in which young people may be subject to psychological distress, such as school and work.

POSTER SESSION III-050 | SMOKING PROGRESSION AND NICOTINE-ENHANCED REWARD SENSITIVITY ARE PREDICTED BY RESTING-STATE FUNCTIONAL CONNECTIVITY IN SALIENCE AND EXECUTIVE CONTROL NETWORKS

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Descriptors: Reward, Nicotine, Biomarkers

The neural underpinnings underlying individual differences in nicotine-enhanced reward sensitivity (NERS) and smoking progression are poorly understood. Thus, we investigated whether brain resting-state functional connectivity (rsFC) predicts NERS and smoking progression in YLS. We hypothesized that areas with high densities of nicotinic receptors (insula, anterior cingulate cortex [ACC], hippocampus, thalamus), and areas involved in reward-seeking (nucleus accumbens [NAcc], prefrontal cortex [PFC]) would predict NERS and smoking progression, and that depression would moderate these effects. rsFC was assessed using functional magnetic resonance imaging in 68 14-hour nicotine-deprived YLS (age 18-24, $M = 1.89$ cigarettes/day) who had completed the probabilistic reward task after smoking a placebo on one day and a regular cigarette on another day. Decreased rsFC within the salience network (ACC and insula) predicted increased smoking progression. Greater NERS was associated with greater rsFC between the right anterior PFC and right NAcc, and the insula and ACC, but with reduced rsFC between the ACC and left inferior prefrontal gyrus. In those higher, relative to those lower in depressive traits, greater NERS was predicted by weaker rsFC of the 1) right dlPFC with the thalamus, left orbitofrontal cortex, left amygdala,

and left hippocampus, 2) left dlPFC with insular cortex, but stronger rsFC of the insula with left NAcc. These findings provide the first evidence that differences in rsFCs involving the salience network are associated with NERS and smoking progression in YLS.

FUNDING: Research reported in this publication was supported by R01 DA036032 from the National Institute of Drug Abuse (to David G. Gilbert). Diego A. Pizzagalli was partially supported by R01 MH101521 and R37 MH068376 from the National Institute of Mental Health. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. Alexis E. Whitton was supported by a National Health and Medical Research Council Investigator Grant (GNT2017521).

POSTER SESSION III-051 | THE REWARD POSITIVITY MODERATES THE RELATIONSHIP BETWEEN DAILY SOCIAL MEDIA USE AND POSITIVE AFFECT DURING ADOLESCENCE

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Descriptors: Reward Positivity, Social Media, Ecological Momentary Assessment

Adolescent social media use has demonstrated mixed associations with affect. Given behavioral evidence supporting the role of reinforcement learning in social media use, individual differences in reward responsiveness may underlie this complex relationship. Thus, the present study tested a neural marker of reward system activation, the reward positivity (RewP), as a moderator of this relationship using multilevel modeling. A sample of 179 adolescent girls ($M_{\text{age}} = 17.9$, $SD_{\text{age}} = 1.9$) completed the doors reward task and then reported on their social media use (Snapchat, Instagram) and positive affect (PA) for two weeks. The RewP moderated the relationship between Snapchat use and average PA. For those with a smaller RewP, greater average PA predicted more frequent Snapchat use. Conversely, for those with a larger RewP, average PA predicted less frequent Snapchat use. The RewP also moderated the relationship between Instagram use and day-to-day changes in PA. Participants with a smaller RewP used Instagram more on days with higher PA than was typical for them, but participants with a larger RewP did not demonstrate this relationship. In sum, the RewP moderates the relationship between adolescent average PA and Snapchat use, as well as adolescent day-to-day fluctuations in PA and Instagram use. Broadly, these results support reward responsiveness as a

moderator of the relationship between social media use and affect, and underscore the importance of examining this relationship both within and between individuals as well as across social media platforms.

FUNDING: R01 MH097767 (PI: Nelson).

POSTER SESSION III-052 | THE (LACK OF) INFLUENCE OF HAIR TYPE AND TEXTURE ON EEG AND ERP DATA QUALITY

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³The University of North Carolina

Descriptors: Diversity and Representation, Psychophysiological Methods, Data Quality

Psychophysiological research suffers from a lack of diversity in its study samples. EEG research, in particular, is heavily biased toward White samples due to some long-held and untested assumptions regarding how racial differences in hair texture, volume, and style impact electrode placement and signal quality. We examined and tested those assumptions using laboratory-based EEG data collected from 213 young adults (51 African American or Black, 15 bi- or multi-racial, and 147 White or Caucasian) with a range of hair textures/types (self-classified using a standard 8-category scale) and volumes (quantified as total volume of gel applied during electrode placement, ml). EEG recordings from a resting baseline and a cognitive task were evaluated with respect to: electrode impedance, using DC offset as a proxy; data quality, using the Signal-to-Noise ratio and the standardized measurement error; and ERP amplitude, using the P1 and P300 waves. Results from a series of multilevel models indicated, as expected, that differences in hair textures/types were related to differences in the DC offset of the raw recordings. However, after being prepped through a standard fully automated EEG data processing pipeline, there were negligible (i.e., far below standard threshold) or no differences in data quality and ERP amplitude. Contrary to commonly held perceptions, our empirical data demonstrate that EEG data quality does not differ across hair textures/types, and that viable EEG-based results can be obtained from diverse samples, allowing us to move towards greater inclusivity.

FUNDING: Funding for this project was provided by the National Institute of Health (UH3 OD023332).

POSTER SESSION III-053 | ESTIMATING WITHIN- AND BETWEEN-PERSON VARIABILITY IN THE REWARD POSITIVITY

Lidia Panier, Juhyun Park, Lidie Silva, Eric Hehman,
Anna Weinberg
McGill University

Descriptors: RewP, trial-by-trial, longitudinal

The Reward Positivity (RewP) has been conceptualized as a trait-like neural response reflecting individual differences in reward sensitivity, with good-to-excellent internal consistency and test-retest reliability in adults. However, reliability estimates are typically derived from averages across one task administration or across two time points, designs limited in their ability to assess within-person change. We elicited the RewP through the Doors task, from 472 undergraduates at a baseline visit, 128 of whom also completed up to two follow-up visits. At baseline, between-person factors accounted for 30.8% of the total variance in the conditional response to gain trials and 25.6% for loss trials. This suggests that individual differences accounted for substantial variance within a session; however, it also indicates that a sizable proportion of the total variance was due to variability within individuals across trials. When examining sources of variability across three sessions, between-person variance accounted for 68.6% of the total variance in the conditional response to gain trials and 69.4% for loss trials. These findings suggest that, despite considerable trial-by-trial variability in the RewP within individuals, the averaged RewP is relatively stable across time and may have trait-like properties. Future studies should seek to understand systematic and random sources of within-person variability in trial-level data (e.g., noise, time on task), and should continue to examine continuity across session in samples that are larger and more densely sampled.

POSTER SESSION III-054 | DO PARENTS EXHIBIT SIMILAR COGNITIVE AND EMOTIONAL PROCESSING OUTCOMES AS CHILDREN DURING COVIEWING?

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³University of Tennessee, Knoxville

Descriptors: Educational Media Content, Cognitive Processing, Physiological Synchrony

Eighty-nine percent of parents watch television programs with their children some or all the time. Recent

research shows that the mere presence of a parent affects children's cognitive and emotional processing of the televised content. The current study attempts to replicate these effects and investigate how coviewing might affect parent's cognitive and emotional reactions. This study had two main predictions. First, parent-child coviewing leads to greater cognitive resource allocation over time, indexed by cardiac deceleration. Second, this coviewing also leads to greater arousal over time, indexed by skin conductance level. Parent-child dyads ($N=27$; child age: $m=8.07$ years, $sd=1.09$) viewed episodes of *Dinosaur Train* (11 min) and *Daniel Tiger's Neighborhood* (10:57 min) in a coviewing or separate condition. Stimuli are CGI educational television shows that teach scientific thinking skills and social-emotional strategies, respectively. Multi-level models were used to examine the heart rate and skin conductance changes for parents and children in each condition. Results were mixed. Coviewing led to greater cardiac acceleration for parents compared to viewing alone ($\beta = -25.71$, $p=0.04$), but did not significantly affect children's heart rate ($p=0.167$). This significant acceleration contrasts with previously reported coviewing effects on cognitive processing. There was not a significant effect of coviewing on SCL for parents ($p=0.296$) or children ($p=0.996$). In sum, results provide evidence that coviewing effects are not universal across parents and children.

POSTER SESSION III-055 | EXAMINING ASSOCIATIONS BETWEEN INFANT BEHAVIORAL INHIBITION, PARASYMPATHETIC CARDIAC REACTIVITY, AND REGULATORY BEHAVIORS WITH FATHERS

Alyssa Swift, Diane Lickenbrock, Logan Rios
Western Kentucky University

Descriptors: Respiratory Sinus Arrhythmia, Infant Temperament, Fathers

Organized behaviors emerge in infancy to support regulation (Planalp & Braungart-Rieker, 2015). Infants high in behavioral inhibition, characterized by strong reactivity to novelty (Henderson et al., 2015), are at risk for dysregulation. Parasympathetic cardiac activity (respiratory sinus arrhythmia, RSA) supports regulatory capacity (Suurland et al., 2018). Infant physiological regulation differs with mothers and fathers. However, little work has explored dynamic measures of infant

regulation with fathers (Richter & Lickenbrock, 2021). The current study examined associations between infant behavioral inhibition, RSA reactivity, and regulatory behaviors with fathers. Father-infant data at 4- and 8-months from a larger longitudinal study were used. Dyads participated in a face-to-face task (Tronick et al., 1978) during which infant RSA suppression was derived (Stifter et al., 2010) and regulatory behaviors were rated at 8-months (Ekas et al., 2013). Infant behavioral inhibition was calculated by averaging mother and father reports at 4-months (IBQ-R, Gartstein & Rothbart, 2003). Results ($n=57$) revealed a Behavioral Inhibition X RSA Suppression interaction predicted distraction ($\beta=.28$, $p=.05$). As behavioral inhibition increased, distraction decreased for infants low in RSA suppression. In sum, behaviorally inhibited infants may be at risk for using less effective regulatory strategies (e.g., distraction). Additionally, infants lower in RSA suppression may exhibit effective external regulatory behaviors when not highly inhibited.

FUNDING: This research was supported by a NIGMS grant (8P0GM103436, P20GM103436, 8P20GM103436, 8P20GM103436-22), OCSE QTAG grant, and a WKU RCAP Level 1 grant awarded to D. Lickenbrock. Additional funding was provided by a WKU FUSE grant awarded to Alyssa Swift.

POSTER SESSION III-056 | NEUROELECTRIC INDICES OF PRE-MOTOR PLANNING ARE SELECTIVELY RELATED TO BALANCE IN CHILDREN

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Descriptors: motor function, children

Background: Physical fitness in children has been associated with many event-related potentials, such as the P3 component. The lateralized readiness potential (LRP), an assessment of motor planning and action, however, has received little attention regarding health behaviors and brain function in children. This study assessed the relationship between LRP and components of motor coordination. **Methods:** 35 children (7-13 yrs) completed a cross-sectional study, in which motor function was assessed across three domains (balance, manual dexterity, and aiming and catching) using Pearsons® Movement Assessment Battery for Children 2nd edition (MABC-2). To elicit and analyze the stimulus- (LRP-S) and

response-locked (LRP-R) LRP, participants completed a modified flanker task. Stepwise regressions were conducted to test the association between LRP and MABC-2 components. *Results:* LRP-S mean amplitude difference ($b=0.401$, $P=0.04$) and reaction time interference ($b=0.545$, $P=0.00$) were positively associated with balance after including age, sex, body mass index, and physical activity in step 1. LRP-S did not predict manual dexterity or aiming and catching, and LRP-R did not predict any MABC-2 domains. *Conclusion:* This study showed that neural resources related to pre-motor planning and behavioral cognitive performance were selectively related to balance and no other metrics of motor coordination (i.e., manual dexterity, aiming and catching). These findings provide further knowledge surrounding the link between neural mechanisms underlying motor function and coordination skills in children.

FUNDING: This work was funded by the Illinois Association for Health, Physical Education, Recreation, and Dance (IAHPERD), and the Egg Nutrition Center.

POSTER SESSION III-057 | THE RELATIONSHIP BETWEEN EMOTION DYSREGULATION AND ERROR MONITORING IN ADOLESCENTS WITH ADHD

McKenzie Figuracion¹, Michael Kozlowski², Katelyn Macknyk¹, Madelyn Heise¹, Sarah Pieper¹, Brittany Alperin², Hannah Morton², Joel Nigg², Sarah Karalunas¹

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Descriptors: ERN, ADHD, Temperament

Attention-deficit/hyperactivity disorder (ADHD) is emblematic of the limitations of existing diagnostic categories. One potential solution is to interrogate psychological mechanisms at the behavioral and physiological level together to try and identify meaningful subgroups and clarify individual variation within ADHD. Here, we illustrate this using a combination of behaviorally-rated temperament measures from the Early Adolescent Temperament Questionnaire; cognitive performance on three conditions of an emotional go/no-go task (neutral, negative, and positive); and electroencephalogram (EEG)-measured error processing, including the error-related negativity (ERN) and positivity (Pe). In a large ($n=362$) sample of adolescents with ADHD, latent profile analysis identified two temperament subgroups: 1) emotionally regulated and 2) emotionally dysregulated (with high negative affect). Cognitive and EEG assessment in a subset of 272 adolescents (ADHD=151) found that at the diagnostic level, ADHD adolescents produced blunted Pe amplitude but no

difference for ERN compared to typically developing controls. This is qualified by ERN blunting in emotional conditions but only for the dysregulated ADHD group. Across participants, Pe was enhanced in positive context. Overall, neural response patterns identified important differences in how trait and state emotion interact to affect cognitive processing. Results highlight important temperament variation within ADHD that helps clarify its relationship to the ERN, one of the most prominent putative neural biomarkers for psychopathology.

FUNDING: National Institute of Health (R01 MH120109; PI Karalunas) National Institute of Health (K23 MH108656; PI Karalunas) National Institute of Health (R37 MH059105; PI Nigg).

POSTER SESSION III-058 | ACUTE EFFECTS OF A SINGLE BOUT OF EXERCISE ON FUNCTIONAL BRAIN NETWORKS IN CHILDREN

Trevor Cline, Emma Tinney, Morfini Francesca, Lauren Raine, Laurel Gabard-Durnam, Susan Whitfield-Gabrieli, Arthur Kramer, Charles Hillman

Northeastern University

Descriptors: Neuroscience, Exercise, Childhood

A single bout of aerobic exercise can provide acute benefits to cognition and emotion. Yet, little is known about how acute exercise affects the underlying functional connectivity of childhood cognitive brain networks, and no prior research has utilized a data-driven, machine learning approach. Using multivariate pattern analysis, we investigated the effects of acute exercise on changes in functional brain connectivity in children. On separate days, participants ($N=21$, 9-13 yr.) completed 20-mins of exercise (walking) and 20-min of seated control in a within-participants, counterbalanced design, with pre- and post-fMRI scans. Results identified three clusters in the left lateral prefrontal cortex (lPFC), a key region of the frontoparietal network (FPN), which showed dissimilar connectivity changes (post>pre) after exercise compared to control ($k \geq 50$; voxel $p < 0.001$; cluster FDR corrected $p < 0.05$). Post hoc seed-to-voxel analyses revealed that activity in these left lPFC clusters became more correlated with bilateral lPFC activity (left $\beta=1.25$, right $\beta=1.24$), left caudate activity ($\beta=0.96$), and more anti-correlated with precuneus activity, a key region of the default mode network (DMN; $\beta=-1.30$). The findings suggest that acute exercise supports FPN integration with subcortical regions involved in movement and cognition, more coordination within the FPN, and better segregation of FPN and DMN. Such patterns, associated

with healthier cognitive and emotional control, may underlie the transient mental benefits observed following acute exercise in children.

FUNDING: Internal Funding from Northeastern University.

POSTER SESSION III-059 | EXPLORING MECHANISMS OF FEAR GENERALIZATION: THE CASES OF THREAT UNCERTAINTY AND CONTEXT

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Descriptors: Emotion/affect, Attention, Learning/conditioning

Fear generalization is heightened in anxiety-related disorders, but inconsistent findings indicate the need for more research into influencing mechanisms. In two studies, we explored whether threat uncertainty and a threatening context would cause wider generalized responses. Both studies employed a differential threat conditioning paradigm with generalization test using two female faces as conditioned stimuli (CSs) and a 90 dB scream as the unconditioned stimulus. Four morphs were created as generalized stimuli resembling the CSs in 20% increments. Participants' responses were recorded with subjective ratings, skin conductance and steady-state visual evoked potentials. In Study 1, threat uncertainty was manipulated in three groups with different reinforcement schedules for one of the CSs (CS+). Results showed that despite successful acquisition, uncertainty did not affect generalization, but higher individual intolerance of uncertainty was associated with wider generalized responses in US-expectancy. In Study 2, context consisted of geometrical shapes presented on the screen corners for two minutes. In the middle of the screen either CS+ or CS- were presented and CS+ was reinforced only in CTX+. During acquisition, responses were generally heightened in CTX+, while affective ratings were not sensitive to the contextual information. During test, the generalization gradient was not influenced by contextual information. Overall, both studies suggest that threat uncertainty and context impact fear learning, while fear generalization does not seem to be influenced.

POSTER SESSION III-060 | LOVED FAMILIAR FACES AS A MEAN TO IMPROVE INHIBITORY LEARNING IN AN INSTRUCTIONAL LEARNING PROTOCOL: ARE THERE ANY BENEFICIAL EFFECTS?

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Descriptors: Loved-familiar faces, Threat of shock, Peripheral physiology

Recent approaches to increasing the efficacy of exposure-based treatments for anxiety disorders have shown that the use of pictures of supportive individuals enhances extinction learning and prevents the return of fear in classical conditioning protocols. However, it remains unknown whether these effects can be extended to social learning procedures. The aim of the present study was to determine whether pictures of the romantic partner show the same capability in an instructional learning protocol. To date, fifteen participants underwent a threat-of-shock procedure with two separate sessions. During the first day, two neutral unknown faces served as threat cues, whereas a third face indicated safety. The task comprised 78 trials distributed across four blocks (habituation, instantiation, extinction, and test). During extinction, one of the threat cues was presented together with the picture of the romantic partner, whereas the second threat cue was accompanied by the picture of a stranger. 24 hours later, participants viewed again all three stimuli used in the previous session. Skin conductance, corrugator EMG, heart rate, and startle responses were collected. Preliminary analyses showed that during the extinction block, threat cues paired with the picture of the partner were associated with heart rate deceleration, increases in skin conductance, and corrugator inhibition, compared to safety cues. A similar pattern was observed during the second session. The implications of these data for the role of highly relevant stimuli at improving inhibitory learning are discussed.

FUNDING: This research has been funded by the Spanish Ministry of Science and Innovation through a grant awarded to Pedro Guerra Muñoz (ref. PID2020.119549GB-I00).

POSTER SESSION III-061 | IMPACT OF EMOTIONAL FACE PROCESSING ON INHIBITORY CONTROL TRAINING IN TRAUMA-EXPOSED ADULTS

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Auburn University

Descriptors: Inhibitory Control Training, Event-related potential, LPP, N2

Abnormal neural response to emotional faces (NREF), measured using the late positive potential (LPP), has been correlated with posttraumatic stress disorder (PTSD) symptoms. Moreover, a deficit in inhibitory control (IC), measured by N2, an event-related potential sensitive to IC, might be associated with PTSD symptoms. Thus, training trauma-exposed individuals to recruit IC while processing threat stimuli may be beneficial. Additionally, NREF may moderate the impact of IC training. 67 trauma-exposed adults viewed 72 faces depicting fearful, happy, and neutral faces. Emotional face modulation of the LPP was measured by subtracting the LPP to neutral from fear and happy faces. Participants were then randomized to one of two IC training conditions. In the threat condition (ICT+T), 85% of a flanker task's incongruent and congruent stimuli were superimposed over fear and happy faces, respectively. In the happy condition (ICT+H), pairings were reversed. A 50% congruency-emotion pairing ratio test block with novel emotional faces was then used to measure generalization. The training condition*emotion*congruency*LPP interaction was significant both for fear ($p=.02$, $\eta^2=.08$) and happy ($p=.03$, $\eta^2=.08$) LPPs. Enhanced fear LPP predicted greater generalization in the ICT+T, $p=.02$, $\eta^2=.16$, but not ICT+H, $p=.33$, $\eta^2=.03$, condition, whereas enhanced happy LPP predicted greater generalization in the ICT+H, $p=.03$, $\eta^2=.15$, but not ICT+T, $p=.24$, $\eta^2=.04$, condition. NREF used during emotion+IC training may impact successful generalization in trauma-exposed adults.

POSTER SESSION III-063 | DOES TRANSCUTANEUS AURICULAR VAGUS NERVE STIMULATION ACCELERATE EXTINCTION LEARNING? A CONCEPTUAL REPLICATION STUDY

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Descriptors: vagus nerve stimulation, fear extinction

Transcutaneous auricular vagus nerve stimulation (taVNS) has been tested as a strategy to accelerate fear extinction learning based on the hypothesis that taVNS increases central noradrenergic activity. Evidence for such effect is mixed, perhaps because of a low statistical power and the use of suboptimal taVNS parameters in the early human studies on the topic. The present study therefore sought to replicate the initial positive finding of Burger et al. (2016) who found that taVNS in humans ($N=35$) accelerates fear extinction learning. In the present study, participants ($N=80$) first underwent a fear acquisition phase (12 trials), in which one of both conditioned stimuli (CSs, gabor patches presented for 8 sec) was reinforced in 75% of the trials with an unconditioned stimulus (US, a 1s electrocutaneous stimulus on the wrist). During the subsequent fear extinction phase, both CSs were presented 12 times each without US while participants received either taVNS (cymba concha of the left ear), or sham stimulation. taVNS or sham stimulation was administered continuously at the maximum level below the pain threshold. US expectancy ratings, fear-potentiated startle responses, and skin conductance responses were measured. Findings indicate that, contrary to the findings of Burger et al. (2016), taVNS did not accelerate fear extinction. Implications of the results and future directions for research on taVNS and extinction learning will be discussed.

POSTER SESSION III-064 | CAN PUPIL SIZE DURING ENCODING ACCOUNT FOR VARIANCE IN EPISODIC MEMORY ENCODING?

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Descriptors: memory precision, reward anticipation, pupil
Moment-to-moment fluctuations in neuromodulatory subcortical arousal systems (e.g., dopamine and noradrenaline systems) can show large effects on learning and memory. Dopaminergic projections to the hippocampus play an important role in the formation of long-term memories. Evidence for this comes from studies showing that when neutral items are predictive of a later reward, they are remembered better than neutral items that do not have any reward association. This reward anticipation manipulation is thought to induce dopaminergic responses in the midbrain, which result in stronger encoding. In the current study, we examined whether trial-to-trial variability in reward-related arousal might correspond to variability in long-term memory encoding precision. We tested this using a precision memory task in combination with a monetary incentive delay task. Half of the neutral items were linked to later reward, while the other half

had no reward association. Following a short distractor task, participants were tested on a continuous measure of item location (i.e., memory precision). We found that pupil size (an index of arousal) was larger following rewarding items, compared to neutral items, but we found no association between pupil size during encoding (i.e., pre-trial baseline pupil size or reward-induced pupil size) and memory precision performance on the trial-level.

FUNDING: NWO VICI grant (VI.C.181.032) awarded to S.N.

POSTER SESSION III-065 | 7-TESLA EVIDENCE FOR COLUMNAR AND ROSTRAL-CAUDAL ORGANIZATION OF THE HUMAN PERIAQUEDUCTAL GREY RESPONSE IN THE ABSENCE OF THREAT: A WORKING MEMORY STUDY

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Descriptors: periaqueductal grey, neuroimaging, threat

The PAG is a small midbrain structure surrounding the cerebral aqueduct that has been extensively studied for its role in the “fight-or-flight” response. Stimulation of the PAG in non-humans elicits a diverse range of physiological responses and motor behaviors, which are attributed to specific PAG columns (e.g., stimulation of ventrolateral PAG (vlPAG) elicits “freezing” behaviors). These observations have been interpreted as evidence for the PAG as a “fear circuit”, coordinating survival-based responses. However, PAG anatomical connectivity places it at a critical integration point in brain-body communication, suggesting a more general regulatory role beyond survival-related behavior. We used ultra-high resolution (7-Tesla) fMRI to image the PAG in humans (N=87) and examine BOLD signal intensity in its functional subregions during a working memory task. The N-back task was used to estimate PAG activity outside of life-threatening circumstances. In-scanner physiology (interbeat interval, respiration) was also recorded. Consistent with non-human animal work, we observed task-elicited, columnarly organized BOLD signal changes in the PAG. Notably, BOLD response increases in vlPAG were observed during both mild and moderate cognitive demand. This suggests that

a natural manipulation of cognitive demand evokes distinct columnar activation that was previously attributed to “freezing” behavior. These findings provide evidence for the hypothesis that the PAG is a key structure for regulating complex autonomic responses and brain-body communication, even in the absence of threat.

FUNDING: This work was supported by the National Institutes of Health (National Cancer Institute Grant U01 CA193632, National Institute of Biomedical Imaging and Bioengineering Grants K01EB019474 and P41EB015896, and National Institute on Drug Abuse Grant T32 DA017637-14). This work also used instrumentation supported by the NIH’s National Center for Research Resources Shared Instrumentation Grant Program (Grant S10 RR023401).

POSTER SESSION III-066 | ICONIC CO-SPEECH GESTURES ENHANCE ASSOCIATIVE MEMORY FORMATION, BUT ONLY WHEN THE LISTENER EXPECTS THEM TO BE MEANINGFUL

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Descriptors: Gesture, Memory, Event-Related Potentials (ERPs)

Co-speech gestures can enhance memory for accompanying words, but their effects on memory for non-gestured associates are unclear. In three experiments, we provide ERP and behavioral evidence for a moderating role of expectations regarding gesture ambiguity. In Exp 1, participants watched videos of an actor reciting sentences that ended in unrelated verb-noun pairs (e.g., ‘...driving apple’). The verb in each pair (“driving”) was accompanied by either a matching iconic gesture, a simple beat gesture, or no gesture. Relative to other trial types, iconic gestures enhanced memory for both the verbs and the associated nouns. In Exp 2, ERPs were recorded during study, and beat gestures were replaced with semantically ambiguous “nonsense” gestures. Here the memory benefits of iconic gestures were limited to the verbs and no longer extended to the nouns. ERPs elicited by the nouns suggested that the ambiguous gestures may have caused a global shift in attention toward the gestures and accompanying verbs and away from the paired nouns. Indeed, when the same set of iconic- and non-gestured word pairs were studied without the nonsense-gestured pairs (Exp 3), the associative memory benefits found in Exp 1 were restored. Moreover, under these circumstances, nouns preceded by iconic-gestured verbs elicited larger

N700 amplitudes relative to those preceded by non-gestured verbs, suggesting enhanced associative imagery. Overall, this work suggests that iconic gestures enhance associative memory primarily when the listener expects them to be consistently meaningful and unambiguous.

POSTER SESSION III-067 | WHY DO ANTI-DISTRACTED DRIVING MESSAGES FLOP? INVESTIGATING THE ROLE OF COACTIVATION AND COUNTERARGUING IN CELL PHONE USE AND DRIVING BEHAVIOR MESSAGING

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Descriptors: Defensive processing, Counterarguing, Motivation

Despite national attention, every year people die from cell phone use while driving. This study argued that the defensive processing of anti-cell phone use while driving messages results in the rejection of potential risks related to the behavior. Further, the varying portrayals of threat in these messages elicit a cascade of psychological responses that lead to counterarguing resulting in the dismissal of the message's arguments. The limited capacity model for motivated mediated message processing was utilized to explore the impact of these messages on defensive processing via psychophysiological arousal, fEMG, and heart rate. Level of threat was investigated to see how it influenced individuals' defensive processing and how various levels of threat content elicited appetitive and aversive system activations. We hypothesized that level of threat would impact heart rate and arousal and messages high in threat would show the highest counterarguing. A MLM was used to test the hypotheses predicting changes in psychophysiological measures and a multi-level repeated measures ANOVA was used to test the counterarguing predictions. Results showed high threat content led to higher aversive activation ($\beta = -0.44$, $p < 0.02$), low threat content led to higher appetitive activation ($\beta = -1.26$, $p < 0.001$), psychological arousal was not impacted by threat level ($\beta = 0.55$, $p < 0.22$), and no evidence of counterarguing was found $F(1, 355.64) = 2.42$, $p < .121$). Overall, evidence of defensive processing was present but not of counterarguing, a result not previously shown in anti-risky behavior work.

POSTER SESSION III-068 | DYSPHORIA EFFECTS ON EFFORT-RELATED CARDIOVASCULAR RESPONSES AND THE SHIELDING POWER OF PERSONAL CHOICE

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Descriptors: Dysphoria, Cardiac pre-ejection period, Personal choice

Individuals with dispositionally depressed mood perceive mental tasks as more demanding and show higher effort-related cardiovascular responses when performing easy and moderately difficult cognitive tasks (Brinkmann & Gendolla, 2008). Importantly, recent research suggests that providing individuals with personal control over a task to perform can mitigate the effect of experimentally induced affective influences on effort-related cardiovascular responses (Gendolla et al., 2021). In the present study, we investigated whether the shielding effect of personal choice even extends to the impact of dispositional mood differences on effort-related cardiac pre-ejection period (PEP) by recruiting students with low ("non-dysphoric") vs. high ("dysphoric") scores on a self-report depression scale. We expected personal task choice vs. external task assignment to moderate the effect of dysphoria on cardiac PEP. To test this hypothesis, we asked dysphoric and non-dysphoric participants ($N = 119$) to engage in an easy cognitive task either by personal choice or external assignment. The cardiac PEP reactivity during task performance confirmed our predicted pattern. In the assigned task condition, we could conceptually replicate previous findings by showing that dysphoria leads to increased cardiac PEP reactivity. Critically, we found that these dysphoria effects did not occur among participants who had the opportunity to choose the task themselves. Therefore, our study suggests that the previously observed shielding effect of personal choice also applies to dispositional negative affect. FUNDING: Swiss National Science Foundation (SNSF).

POSTER SESSION III-069 | DIMINISHED REWP AMPLITUDE PREDICTS GREATER RISK FOR DRINKING INITIATION IN MID-ADOLESCENT FEMALES

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Descriptors: RewP, Alcohol, Adolescence

Initiation of alcohol use at younger ages is prognostic of later drinking problems. Reward system dysfunction is theorized to contribute to early initiation and escalation of drinking, but existing evidence supports both hypo-sensitivity and hypersensitivity as risk factors; research employing direct neural indices of reward processing is needed for clarification. The reward positivity (RewP) is a well-established neurophysiological index of hedonic “liking,” an important aspect of reward processing. Adult research has yielded conflicting findings, with different studies reporting reduced, enhanced, or null associations of RewP with engagement in or risk for harmful alcohol use. No study has yet examined relations between RewP and multiple indices of drinking in youth. Here, we examined how RewP measured in a gain/loss feedback task related to self-reported drinking initiation and past-month drinking, when accounting for age along with depression and externalizing symptoms, in 250 mid-adolescent females. Analyses showed that (1) compared to not-yet drinkers, adolescents who endorsed drinking initiation responded less strongly to monetary gain (RewP) but not loss feedback (FN), and (2) past-month drinking was unrelated to either RewP or FN magnitude. These findings provide evidence for reduced hedonic “liking” as a concomitant of early drinking initiation in adolescent females and warrant further research with mixed-sex adolescent samples exhibiting greater drinking variability.

POSTER SESSION III-070 | THE INFLUENCE OF SELF-REPORTED SOCIAL ENGAGEMENT ON MISMATCH NEGATIVITY AMPLITUDE

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Descriptors: schizophrenia, mismatch negativity, self-reported social engagement

Since the 90's, a reduced mismatch negativity (MMN) amplitude in patients with schizophrenia has been consistently reported. Because research has often reported that schizophrenia is linked to a particular sociodemographic profile (i.e., poorer cognitive functioning, fewer years of education, social isolation, etc.), it is of interest to understand to what extent the reduction in MMN is associated with schizophrenia per se or whether the effect is being modulated by these confounding variables. This study aimed to understand whether different cognitive and social variables were associated with MMN amplitudes in a non-clinical sample ($n=30$), to avoid thus the influence of any clinical confounding variable. Due to the frequency of

studies reporting a difference in years of education between the schizophrenia and the non-clinical sample in MMN literature, a special focus was put in this variable. Participants were exposed to an *oddball paradigm* that elicited a MMN with two different deviant types (frequency and duration). Educational level did not influence the MMN amplitude in our healthy sample. However, age and social functioning was negatively associated with the MMN amplitude. Thus, beyond the well reported age effect, individuals that reported to engage less frequently in social interactions were characterized by smaller MMN amplitudes. As social isolation has been described to be associated with schizophrenia, it becomes necessary to understand to what extent this factor might be mediating MMN reductions.

FUNDING: The project that generated these results was financially supported by one grant by The Caixa Foundation (ID 100010434), code LCF/BQ/DR19/11740020.

POSTER SESSION III-071 | INTEROCEPTION TRIGGERS THOUGHTS ABOUT THE SELF

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Descriptors: Spontaneous Thought, Interoception, Subliminal Perception

Our thought states, in the absence of specific constraints, transition from one to another (spontaneous thought). It is known that episodes related to the self tend to emerge during these transitions, but the relationship between it and bodily response has not been directly examined. This study examined the influence of cardiovascular reactivity and interoception—the sensing of an internal bodily state—on the shifting of thought states. Participants ($N=100$, 70 women) completed two tasks: the heartbeat counting task (HCT) and the vigilance task (VT). We assessed participants' interoceptive accuracy by their performance on the HCT. In the VT, participants pressed a key when the target stimuli appeared. During this task, we asked participants to report the content of their thoughts. In half of the VT, we presented subliminal vibration stimuli, to induce alteration in the heart rate (i.e., vibration block). Results showed that participants with higher interoceptive accuracy were more likely to repeat self-referential thought (about past episodes and future plans regarding themselves) during the vibration block than did those with lower interoceptive accuracy. The results suggest that individuals with higher interoceptive accuracy are more influenced by subliminal bodily response, thereby activating the monitoring function regarding the self, which results in continuous self-referential thoughts.

POSTER SESSION III-072 | COMPARING ELECTROPHYSIOLOGICAL CORRELATES OF FEEDBACK PROCESSING ACROSS REWARD TASKS: REWP AND P300 IN TWO PARADIGMS

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Descriptors: reward processing, RewP, P300

Evaluation and learning from feedback is crucial for successful behavior. In reward tasks, two event-related potentials (ERPs) have been studied as neural markers of feedback processing, the Reward Positivity (RewP) and P300. While the RewP encodes initial reward sensitivity, the P300 is believed to reflect value updating. Further, research suggests a relation between both ERPs and learning effects. To investigate reward processing across paradigms, we employed two feedback tasks. In the doors task, participants engaged in a guessing game with trial-wise pseudo-randomly presented monetary rewards or losses. In a consecutive reversal learning task, participants learn based on probabilistic feedback, which of two differently colored doors was rewarded. Trial structure, timing, and feedback stimuli were comparable in both tasks. Based on previous findings, we anticipated increased RewP amplitudes following rewards and ERP correlations across tasks. We explored the potential impact of learning mechanisms on P300 and RewP magnitude and the relation of both ERPs to self-reported pleasure and affective experiences. Preliminary findings suggest an association between ERPs across paradigms and modulatory effects of learning processes on P300 and RewP (i.e., overall increased amplitudes in the learning paradigm). As part of a large-scale data-collection including patients with internalizing disorders, our results have clinical implications for understanding feedback processing in mental disorders, where abnormal feedback processing has shown to predict outcome.

FUNDING: Funded by the German Research Foundation (DFG-Forschungsgruppe 5187).

POSTER SESSION III-073 | WHAT CONNECTION AFFORDS? INCREASED HEART RATE VARIANCE WITH PARASYMPATHETIC CONTROL ON PERCEIVING LOSS CAN FEEL HURTFUL

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Descriptors: Emotion, Perception, Loss of Connection

The study investigated how distinctions in perception might affect emotional responding to a change in an affordance. There is evidence that Europeans tend to perceive salient objects in the foreground, while East Asians tend to perceive holistically. Due to sensitivity to focal objects, European Americans (EA) were hypothesized to respond negatively with increased heart rate (HR) variance on perceiving loss of connection (a social affordance) when playing Cyberball, a ball-tossing videogame. Chinese Americans (CA) were predicted to show no difference from controls. Subjects were informed they would play the game with computer-generated players. ECG, respiration and self-report data were acquired from 51 subjects (38 EA, 13 CA, 25 male, mean age 21.1) in a between-subjects design. 26 subjects (19 EA, 6 CA) received 2 out of 48 balls tossed and the controls received 10. Most in the experimental condition reported a negative emotion (e.g. anger) as their main emotion. Control subjects reported mainly neutral affect. ANOVA analyses reveal that HR variance had an interaction effect (time x condition, $p=0.009$) and RSA had a main effect (condition, $p=0.033$). Both experimental groups had increased heart rate variance over time and increased RSA. Facial coding revealed EA in the experimental condition expressed more negative emotion, while CA in both conditions showed no difference. However, CA in the experimental condition showed correlation across measures: HR variance, RSA and respiration, suggesting automatic regulation to perceiving loss contained its expression.

POSTER SESSION III-074 | OSCILLATORY COUPLING BETWEEN NEURAL AND CARDIAC RHYTHMS

Kaia Sargent¹, Emily Martinez¹, Alexandra Reed², Morgan Bartholomew³, Anika Guha⁴, Caroline Diehl¹, Christine Chang¹, Sarah Salama¹, Julian Thayer⁵, Keith Nuechterlein¹, Gregory A. Miller¹, Cindy Yee¹
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Descriptors: EEG, heart rate variability, oscillatory coupling
Oscillations serve a critical role in organizing biological systems. In the brain, oscillatory coupling is a fundamental mechanism of information exchange; however, the possibility that neural oscillations interact with slower physiological rhythms (e.g., heart rate, respiration) is largely unexplored and may have important implications for psychological and physical health. Oscillations in heart rate,

an aspect of heart rate variability (HRV), show remarkably robust associations with psychological health. Mather and Thayer (2018) argue that cross-frequency coupling between high-frequency HRV (HF-HRV) and neural oscillations may be a physiological mechanism that partially accounts for these findings. We tested this hypothesis by measuring phase-amplitude coupling between HF-HRV oscillations and EEG oscillations at rest. Evidence of robust coupling was detected in all EEG frequency bands examined (delta, theta, alpha, beta, and gamma; all p -values $< .0002$, effect sizes ranging from 1.18 in the gamma band to 2.67 in the alpha band). Furthermore, Granger causality analyses indicated that heart-to-brain effects were significantly stronger than brain-to-heart effects in all frequency bands except gamma. These findings suggest that cardiac rhythms play a causal role in modulating neural oscillations, which may contribute to strong relationships between HRV and psychological wellbeing and suggest novel, physiologically grounded avenues for improving mental health.

FUNDING: This work was supported by the National Institute of Mental Health (R01 MH110544 and R01 MH110544-S1) and the UCLA Division of Graduate Education.

POSTER SESSION III-075 | USING TRANSCRANIAL FOCUSED ULTRASOUND TO ALTER DEFAULT MODE NETWORK (DMN) FUNCTIONAL CONNECTIVITY AND SUBJECTIVE EXPERIENCE

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Descriptors: transcranial focused ultrasound, mindfulness, functional connectivity

Aberrant default mode network (DMN) connectivity characterizes a number of mental disorders and altered states of consciousness, thus providing an attractive target for neuromodulation. Transcranial focused ultrasound (tFUS) is an emerging neuromodulation technique that can non-invasively target subcortical regions of the brain. We hypothesized that tFUS could be used to temporarily alter DMN connectivity in a way that would alter subjective experience. Thirty subjects participated in a trial in which they received either sham or veritable tFUS targeting the posterior cingulate cortex (PCC), a major hub of the DMN. Functional MRI scans were taken at baseline, and then again 5 and 25 minutes following application of tFUS. Results show that application of tFUS to the PCC reduces functional connectivity along midline hubs of the

DMN (PCC and mPFC) in the time after administration. Phenomenological surveys (Toronto Mindfulness Scale, Visual Analog Mood Scale, Amsterdam Resting State Questionnaire, and the Visual Analog Self Scale) were also administered before and after tFUS. Participants who received active tFUS showed multiple significant effects, including alterations in their sense of time and self, an increase in mindfulness, and a reduction in global vigor. Put together, it appears that the neuromodulatory effects of tFUS can be used to alter the qualities of a subject's state of consciousness.

FUNDING: Portions of this study were funded by X (formerly Google X), the Moonshot Factory.

POSTER SESSION III-076 | ASSOCIATION BETWEEN ELECTROPHYSIOLOGICAL SIGNALS AND PERSONALITY TRAITS: AN EEG STUDY

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Descriptors: EEG, personality, biomarker

Personality refers to individual's enduring characteristics in attitude, behavior, and perspectives that could distinguish an individual from others. Prior behavioral and neuroimaging research has suggested that personality traits represent various types of personality and relate to cognitive functions and brain networks. In this study, we investigate whether a variety of personality traits could be decoded by electrophysiological signals using resting-state electroencephalography (EEG). Sixty-four healthy young participants were recruited to undergo resting-state EEG recording and reported their personality traits with the self-report NEO Five-Factor Inventory (NEO-FFI), which is designed to categorize individuals into five personality dimensions, including neuroticism, extraversion, openness, agreeableness and conscientiousness. Participants were divided into high and low groups based on their NEO-FFI scores for each personality dimension. Microstate EEG analyses were applied with distinct microstate parameters (duration) extracted by topographical patterns. The results showed distinct microstate parameters across four microstates between high and low groups, with differential duration of the fourth microstate for Neuroticism, duration of the third/fourth microstate for Extraversion, and duration of the first/fourth microstate for Conscientiousness. Our findings provide preliminary

results suggesting the psychophysiological representation of human personality traits.

FUNDING: This work was supported by Taiwan's Ministry of Science and Technology (105-2420-H-009-001-MY2; 107-2410-H-009-028-MY3; MOST 110-2410-H-A49-059), and supported by the Center for Intelligent Drug Systems and Smart Bio-devices (IDS2B) from The Featured Areas Research Center Program within the framework of the Higher Education Sprout Project by the Ministry of Education (MOE) in Taiwan.

POSTER SESSION III-078 | BIOLOGICAL SEX AND HORMONAL CONTRACEPTIVE RELATIONSHIPS WITH DRUG CUE REACTIVITY IN CANNABIS USE DISORDER

Mallory Cannon, Brandon Schermitzler, Thomas Preston, Kaveh Afshar, Richard Macatee
Auburn University

Descriptors: Hormonal contraceptives, Cannabis, Sex differences

Cannabis use disorder (CUD) is associated with significant disability and increasing prevalence rates. CUD prevalence and chronicity is higher in males, but females display accelerated progression to CUD after first use, worse pharmacotherapy outcomes, and worse withdrawal symptoms. Drug-cue reactivity is a robust measure of future drug use, particularly in males, but the overall literature on sex differences is mixed. A previous study in cannabis users has suggested that sex differences in cannabis-cue reactivity may depend on ovarian hormone milieu, which varies by hormonal contraceptive (HC) use and menstrual cycle phase. The current study expands on this research by assessing how HC use and menstrual cycle phase may impact cannabis cue reactivity sex differences. 152 young adults were exposed to neutral and cannabis-related images during electroencephalogram (EEG) recording and then assessed for cannabis craving. The late positive potential (LPP), an event-related potential sensitive to motivational salience, was used to assess neural drug cue reactivity. Compared to females using HC ($n=52$), males ($n=74$), $F(1,242)=10.74$, $p<.001$, and naturally-cycling females ($n=26$), $F(1,146)=4.41$, $p=.037$, had greater LPP amplitudes to cannabis vs. neutral cues. LPP modulation by cannabis cues did not significantly differ in males vs. naturally-cycling females, $F(1,192)=0.22$, $p=.64$. There were no significant LPP/craving differences across menstrual cycle phases. These findings suggest cannabis cue-reactivity in biological females may depend on HC use.

FUNDING: This work was supported by the Auburn University Intramural Grant Program (#190569).

POSTER SESSION III-079 | AN EXAMINATION OF THE RELATIONSHIP BETWEEN THE LPP TO FEARFUL FACES AND THETA/BETA RATIO IN TRAUMA-EXPOSED ADULTS

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Descriptors: Posttraumatic Stress Disorder, Late Positive Potential, Theta/Beta Ratio

The late positive potential (LPP) is an established event-related potential (ERP) that tracks attention to motivationally salient stimuli, including socioemotional threats. Similarly, high resting Theta/Beta ratio (TBR) is theorized to be associated with reduced ability to disengage attention from threatening stimuli during goal-directed activity. Thus, enhanced threat modulation of the LPP should be associated with high resting TBR, but this has never been tested. As part of a larger study, 60 trauma-exposed adults with elevated post-traumatic stress symptoms completed resting EEG recordings before and after an inhibitory control training task as well as after writing about their worst traumatic event. Prior to the first resting recording, participants passively viewed fearful, happy, and neutral faces. To quantify TBR at each resting recording, a fast Fourier transform was used to estimate spectral power density (μV^2) for frontal electrodes in the Theta (4-7 Hz) and Beta (13-30 Hz) frequency bands. T/B ratios were then log-normalized. To quantify the LPP, mean amplitudes from 400-3000ms were computed for neutral, happy and fearful faces. The fear-neutral LPP difference score was significantly positively associated with TBRs from all three recordings (main effect $F=7.26$, $p=.009$, $\eta_p^2=.12$), whereas the happy-neutral LPP difference score was non-significant (main effect $F=0.40$, $p=.53$, $\eta_p^2=.007$). These findings support resting TBR's conceptualization as a trait-like neural index of inhibitory control over threat processing.

POSTER SESSION III-080 | LONGITUDINAL ASSOCIATIONS BETWEEN NEUROPHYSIOLOGICAL RESPONSES TO UNPLEASANT IMAGES AND CHANGES IN INTERNALIZING SYMPTOMS FROM MIDDLE CHILDHOOD TO ADOLESCENCE

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Descriptors: Anxiety, Depression, Late-positive potential

The transition to adolescence is characterized by substantial change in the neural processing of emotion and increased rates of internalizing symptoms. Dysregulated responses to negative stimuli are linked to the development of both depression and anxiety. However, research examining reactivity to negative stimuli in depression show mixed results and the equivocal findings may be attributable to the high comorbidity between depression and anxiety. This highlights the need to clarify the developmental pathways among internalizing symptoms and neural responses to negative stimuli. We analyzed longitudinal data from ages 9, 12, and 15 in a large sample of youth ($N=530$). A random-intercepts cross-lagged panel model was applied to examine within-subjects autoregressive and cross-lagged effects between symptoms of depression, anxiety, and neurophysiological responses to unpleasant images indexed by the late-positive potential (LPP). Results revealed stronger homotypic continuity in internalizing symptoms from ages 12 to 15, $\beta_s=.41-.44$, $ps<.001$, than ages 9 to 12, and heterotypic continuity between age 12 anxiety and age 15 depression, $\beta=.21$, $p<.01$. Age 12 symptoms had opposing effects on neural reactivity at age 15, with anxiety symptoms predicting prospective enhancements in LPP responses, $\beta=.28$, $p<.05$, while depressive symptoms prospectively predicted blunted LPP responses, $\beta=-.29$, $p<.05$. The findings suggest early emerging symptoms may uniquely alter developing neural circuitry, which could exacerbate risk for the maintenance of internalizing symptoms.

FUNDING: LD was supported by a NIH/NIMH F31MH127863-02 during this work.

POSTER SESSION III-081 | CONCURRENT AND PROSPECTIVE RELATIONS BETWEEN ABERRANT STRESS-INDUCED FRONTAL ALPHA ASYMMETRY AND CANNABIS USE DISORDER

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Descriptors: Cannabis, Stress, Frontal Alpha Asymmetry

Stress potentiation of drug use motivation is implicated in Cannabis Use Disorder (CUD); however, little is known about its neurobiological mechanisms. Frontal alpha asymmetry (FAA) is used as an index of approach/avoidance motivation and is sensitive to stress. In cannabis users, we aim to show that stress induction leads to greater alpha-band activity in left, relative to right, frontal sites, representative of greater state avoidance motivation, and that problematic cannabis use is related to

alterations in the FAA stress response. Cannabis users completed a CUD diagnostic interview and surveys of problematic use. Participants also completed an EEG resting state task pre- and post-stress induction ($n=102$) or control ($n=52$). Finally, participants in the stress group completed another CUD interview and surveys of problematic use at a 3-month follow-up. Results showed a significant effect of stress, $F(1,253)=4.46$, $p=.036$, driven by a shift from right- to left-hemispheric alpha-band activity from pre- to post-task. Higher CUD symptom counts, $F(1,167)=7.246$, $p=.008$, and Marijuana Problem Scale scores, $F(1,166)=5.579$, $p=.019$, but not number of past-month use sessions, $F(1,163)=.023$, $p=.879$, predicted a blunted FAA stress effect, which predicted greater maintenance of CUD symptoms from baseline to follow-up, $F(1,127)=6.007$, $p=.016$. Disordered cannabis use is predictive of an aberrant neural stress response, such that those with more disordered use experience less deactivation of approach motivation after stress, which may play a role in maintaining chronic disordered use.

FUNDING: This project was partially supported by Auburn University Intramural Grant Program award #190569 (PI Macatee).

POSTER SESSION III-082 | MOTIVATIONAL CONTEXT AND FEEDBACK PROCESSING IN IMPULSIVITY AND COMPULSIVITY

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Descriptors: feedback processing, impulsivity, compulsivity

Neural correlates of feedback processing, like the reward positivity, depend on motivational context and are altered in mental disorders marked by impulsivity and compulsivity, like obsessive-compulsive disorder (OCD) and substance use disorder (SUD). The current study investigated how feedback processing is altered in impulsivity and compulsivity and whether these effects are influenced by motivational context. We recorded feedback processing in the EEG using a monetary incentive Flanker task ($n=221$). The sample was recruited along the dimensions of impulsivity and compulsivity. Single-trial robust regression analyses revealed a significant interaction effect on the differentiation between gain and loss context for the reward positivity: high compulsive/low impulsive individuals showed a larger positivity in the gain context, whereas high compulsive/high impulsive individuals showed no difference between contexts. High compulsive individuals also showed larger differences between gain and loss context for the P3b. Within negative feedback

trials, higher compulsivity was related to a larger positivity in the gain context for the P3a. For the P3b, high compulsive individuals showed smaller differences between gain and loss context. These findings indicate that the impact of motivational context varies according to different configurations of impulsivity and compulsivity. This has potential implications for the understanding of PM in OCD and SUD, and emphasizes the importance of trans-diagnostic research.

FUNDING: This work was funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation), grant number SFB 940.

POSTER SESSION III-083 | THE REWARD POSITIVITY IS UNRELATED TO DEPRESSION SYMPTOMS IN YOUTH

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Grace Anderson, C. Durbin, Jason Moser
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Descriptors: Depression, RewP, Youth

Depression throughout youth has been related to reduced Reward Positivity (RewP) amplitude, a neurophysiological index of reward responsiveness (RR). The RewP has been suggested to be a vulnerability marker of youth depression across development. However, little work has empirically tested the association between RewP and depression longitudinally with a wide age range. The current study aimed to address this by examining the moderating role of age and aging in the association between the RewP amplitude and depression symptoms. We hypothesized that smaller RewP amplitude would relate to depression symptoms in older youth and as they aged. One hundred and sixty-one community youth, ages 3-13 ($M = 9.03$, $SD = 2.42$), were recruited at baseline. Participants completed two in-person lab visits: baseline and 1.5 year follow up. At baseline, RewP amplitude and depression were unrelated ($p = .25$). Further, we found that age did not moderate the effect of RewP amplitude on depression symptoms cross-sectionally ($p = .78$). Longitudinally, RewP amplitude and depression symptoms were also unrelated ($p = .78$). Moreover, we found that age and aging do not moderate the effect of RewP amplitude on depression symptoms, $F(1,69) = 1.68$, $p = .20$, $\eta^2 = .01$. Notably, youth who were older at baseline had significantly more depression symptoms ($p = .04$) and depression symptoms increased as youth aged ($p = .04$). Our findings suggest

that age and aging do not moderate the relation between RewP amplitude and depression in youth cross-sectionally or longitudinally.

FUNDING: This work was supported by National Institute of Drug Abuse grant 5R01DA039112 awarded to C. Emily Durbin, Brian M. Hicks, Robert A. Zucker, & Jason S. Moser.

POSTER SESSION III-084 | PATHOLOGICAL PERSONALITY TRAITS AND THE NEURAL RESPONSE TO REWARD

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Descriptors: event-related potentials, reward, personality pathology

The Hierarchical Taxonomy of Psychopathology framework has the potential to advance knowledge of the neural bases of psychopathology. An aberrant neural response to reward has been implicated in multiple forms of psychopathology. However, it is unclear whether neural response to reward is associated with higher-order, dimensional representations of psychopathology. The present study included a sample of 486 participants ($M_{age} = 21.53$, $SD_{age} = 3.65$; 73.7% female) who completed the doors guessing task while electroencephalography was recorded to examine two event-related potential components: the doors P300, which indexes attentional allocation, evaluative processing, memory, and context updating; and the reward positivity (RewP), which indexes reward sensitivity and reinforcement learning. Participants also completed the self-report Comprehensive Assessment of Traits relevant to Personality Disorder to examine domains and traits. Greater negative emotionality, antagonism, and the trait callousness were associated with a smaller doors P300, while greater psychoticism and the trait unusual beliefs were associated with a larger doors P300. Greater negative emotionality and the trait affective lability were associated with a larger RewP, while greater detachment and the traits non-perseverance and self-harm were associated with a smaller RewP. The present study suggests that higher-order pathological personality domains and traits have distinct profiles in the neural response to reward.

FUNDING: Stony Brook University College of Arts and Sciences.

POSTER SESSION III-085 | INTERNALIZING PSYCHOPATHOLOGY AND INSTABILITY IN DAILY NEGATIVE AFFECT: MODERATING ROLES OF THE SALIENCE NETWORK AND CENTRAL EXECUTIVE NETWORK

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Texas A&M University

Descriptors: affect instability, ecological momentary assessment (EMA), general functional connectivity

Internalizing psychopathology such as anxiety and depression has been associated with higher levels of negative affect instability (AI), suggesting greater sensitivity and/or deficient affect regulation in response to events. The salience network (SN) detects and responds to emotional stimuli, and the central executive network (CEN) exerts top-down control over attention toward salient stimuli. General functional connectivity (GFC) within these networks might further understanding of the mechanisms behind AI, and why some individuals with internalizing psychopathology are more likely to be characterized by negative AI than others. Individuals with mixed internalizing psychopathology ($N = 54$, 38 female) completed self-report measures, underwent fMRI scans, and then completed 10 days of ecological momentary assessment to assess negative AI. We used GFC from 32 minutes of resting state and task fMRI, a latent variable reflecting transdiagnostic internalizing symptoms, and their interaction to predict daily negative AI. In one model, participants with higher internalizing symptoms showed greater negative AI, $\beta = .324$, $p = .015$, but only when SN connectivity was high, $\beta = .303$, $p = .023$. In another model, participants with higher levels of internalizing symptoms also showed higher negative AI, $\beta = .340$, $p = .010$, but only when CEN connectivity was low, $\beta = -.380$, $p = .004$. Therefore, SN and CEN connectivity may play a role in increased negative AI in internalizing psychopathology, and individual differences in negative AI may depend on variability in SN and/or CEN connectivity.

FUNDING: This work was supported by National Institute of Mental Health grant, R01MH125083 (to AM).

POSTER SESSION III-087 | ASSOCIATIONS BETWEEN PHYSICAL AND COGNITIVE HEALTH IN FIRST-EPISODE SCHIZOPHRENIA

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Hannah Perdue, Amber Sarwani, Brandon Alderman
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Descriptors: P300, Lateralized Readiness Potential, Schizophrenia

Impaired cognition is a core feature of schizophrenia, which is also frequently accompanied by impaired physical health. Identifying the extent to which physical health (e.g., physical activity and BMI) and psychomotor deficits are related in first-episode schizophrenia (FES) may highlight ways to improve functional outcomes. We examined differences between FES patients ($n = 14$) and matched healthy controls ($n = 14$) in physical health and ERP measures of cognitive function, as well as associations between physical health and cognition within groups. Stimulus categorization (P3) and response selection (lateralized readiness potential; LRP) processes were assessed during a visual oddball task and P3 and LRP difference waveforms were calculated as the difference between rare/frequent and contralateral/ipsilateral waveforms. Compared with controls, FES patients had higher BMI and lower physical activity levels, and demonstrated slowed reaction time and lower P3 amplitudes ($ps < .05$). Negative associations between BMI and P3 and LRP amplitude ($r > .41$), and positive associations between physical activity with P3 and LRP amplitude ($r > .44$) were found in FES patients. These associations were nonsignificant in controls. These findings suggest relationships between physical health and cognition in FES, which may have implications for improving cognition through exercise and dietary intervention.

POSTER SESSION III-088 | KNOW YOUR DEVICE: A GUIDE TO EVALUATING THE QUALITY OF MOBILE EEG DATA

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Olave Krigolson
The University of Victoria

Descriptors: mobile EEG, data quality, validation

In recent years, the availability of mobile EEG systems for research purposes has increased significantly, despite initial skepticism about their ability to provide high-quality data. Validation work by our laboratory group (and others) has demonstrated that mobile EEG systems can produce sufficient valid data (Boere et al., 2023; Krigolson et al., 2017, 2021). This study evaluates several mobile EEG devices, including MUSE, Brain Bit, Emotiv Epoc, Neurosity Crown, CGX Quick 20, CGX Dev Kit, CGX Patch, and Brain Products X.on, with a focus on their ability to capture raw EEG data and event-related potentials. Our analysis also includes a comparison of signal quality measures, such as signal-to-noise ratio, internal consistency, and standardized

measurement of error. Our aim is not to endorse a specific device but rather to provide guidelines for researchers considering the use of mobile EEG devices and a set of standards for assessing the quality of data they capture. Developing criteria for evaluating the quality of data captured by mobile EEG devices is critical to ensure data reliability and validity. Mobile EEG systems have the potential to advance EEG research by enabling data collection in more naturalistic settings, such as during real-world activities, increasing the ecological validity of the data. Therefore, this evaluation is essential to maintain the credibility of mobile EEG research and promote the use of these devices in the scientific community.

FUNDING: NSERC Discovery Grant.

POSTER SESSION III-090 | RELAXATION ROOMS AFFECT PERCEIVED ANXIETY MORE THAN PSYCHOPHYSIOLOGICAL MEASURES FOLLOWING EXPOSURE TO STRESS

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Descriptors: Trier Social Stress Test, Heart Rate Variability, Electroencephalogram

Organizations have installed relaxation rooms providing immersive multisensory experiences via light, sound, and objects to decrease workplace stress. Few studies have examined how these rooms benefit users beyond self-report measures. Here, 80 healthy participants engaged in a 3-hour experiment during which a Trier Social Stress Test (TSST) was performed following a baseline period. After the TSST, participants were randomly assigned to one of four recovery conditions within a multisensory relaxation room: Control (C), Auditory Only (A), Visual Only (V), or Combined Auditory and Visual (AV). During the baseline period, TSST, and recovery, participants completed the State-Trait Anxiety Inventory-6 (STAI-6) and wore a Polar H10 chest strap and Dreem 3 Headband to measure heart rate (HR), heart rate variability (HRV), and neural activity (electroencephalography, EEG), respectively. During the TSST, anxiety, HR, and beta EEG power increased and high-frequency power and rMSSD HRV decreased, confirming participants reactivity to the stressor ($p < .01$ for all vs. baseline). Only the V and AV conditions led to notable reductions in anxiety (15% and 17%, respectively) vs. the C condition. Theta and gamma band EEG activity also increased in the AV condition compared to the C condition. We observed no differences between conditions during

recovery for HR and HRV. Overall, these findings suggest the visual features of the relaxation room impacted self-reported anxiety, however physiological and neurological effects were less apparent.

FUNDING: This work is supported by Delos Living, LLC. This research has been reviewed by the Mayo Clinic Conflict of Interest Review Board and is being conducted in compliance with Mayo Clinic Conflict of Interest policies. Both the Mayo Clinic Conflict of Interest Review Board and the Institutional Review Board have reviewed the Financial Conflict of Interest for the authors related to this research and they have determined that this Financial Conflict of Interest poses no additional significant risk to the welfare of participants in this research project or to the integrity of the research.

POSTER SESSION III-091 | A TRANSCRANIAL MAGNETIC STIMULATION PROTOCOL OF THE INFERIOR FRONTAL GYRUS TO MANIPULATE ACTIVITY IN THE INTEROCEPTIVE BRAIN NETWORK : A PILOT STUDY ON HEARTBEAT-EVOKED POTENTIALS

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Descriptors: Transcranial Magnetic Stimulation, Interoception, Heartbeat-evoked Potentials

Interoception, the processing and perception of internal bodily signals, plays an important role in symptom perception. As interoception is mediated by the interoceptive brain network (IBN), whereas dysfunctions in the IBN may contribute to symptom generation, a manipulation of activity in the IBN by transcranial magnetic stimulation (TMS) could be a promising approach to normalize potential dysfunctions. Using a network stimulation approach targeting the inferior frontal gyrus (IFG), four participants underwent a TMS protocol to enhance (intermittent theta burst stimulation/iTBS), or to inhibit (continuous/cTBS) IBN activity or a neutral condition (intermediate/imTBS). Heartbeat-evoked potentials (HEPs) from 455-595ms after the cardiac R-wave in a 3x3 cluster around electrode C2, assessed during a heartbeat counting task, served as indicator of IBN activity. HEPs were recorded before and directly after TMS sessions. Average HEP amplitudes descriptively increased after the inhibition (cTBS: +42%; pre: .23; post: .33 μ V) and the neutral (imTBS: +102%; pre: .41; post: -.57 μ V) protocol, but decreased after undergoing the enhancement (iTBS: -60 %; pre: .65; post: .26 μ V) protocol. However, none of these differences were significant due to the small

sample size. Future studies in larger samples sizes have to validate the current findings that iTBS may enhance IBN activity, whereas cTBS has no effect as compared to a neutral condition. In case this validation is successful, the current TMS protocol may be a future approach to normalize IBN activity in somatic symptom disorders.

POSTER SESSION III-092 | ACTIVE SAMPLING OF VISUAL INFORMATION ACROSS THE CARDIAC AND RESPIRATORY CYCLES

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Northeastern University

Descriptors: Active Sampling, Cardiac Cycle, Respiration

There is renewed theoretical and empirical interest in how phases of the cardiac and respiratory cycle influence information processing and associated motor actions (eye movements). In the current study we build on previous research showing eye movements are coordinated with the phases of the cardiac cycle, by asking if they are also coordinated with phases of the respiratory cycle. We recruited 40 introductory psychology students to perform a visual search task while we recorded their eye movements, respiration, and cardiac activity. We used circular statistics to examine whether participants preferentially saccaded or fixated during specific phases of the cardiac or respiratory cycles. Across both, we saw evidence of significant coupling with fixation onsets (cardiac: Rayleigh test $z=6.05$, $p<.01$, respiratory: Rayleigh $z=3.21$, $p<.05$). There was marginally significant coupling of saccade onsets to the respiratory cycle (Rayleigh $z=2.92$ $p<.06$), but inconsistent with prior findings, we found no evidence for coupling of saccade onsets to the cardiac cycle. This work contributes to a growing body of evidence suggesting that visual sampling during motivated performance is coordinated with the cardiac and respiratory cycles.

POSTER SESSION III-093 | MODULATING EMOTIONAL VISUAL STIMULI WITH SALIENT ODOR CUES: A NOVEL APPROACH TO ASSESSING FACE PROCESSING

Chloe Johnson, Colin Bowyer, Danielle Jones, Austin Pauley, James S. Brown, Adam Dewan, Christopher Patrick
Florida State University

Descriptors: Olfaction, Emotion, Psychopathy

The processing and identification of emotional facial expressions is a core component of relating to others

in a social context. For example, individuals high in trait callousness exhibit deficits in identifying and processing emotional facial expressions. The current study sought to build upon prior research concerning emotional face processing by examining the impact of affective priming via olfactory cues on psychophysiological measures of face processing. Importantly, the olfactory system stands as the most emotionally salient of the exteroceptive sensory systems, and prior work has found that affective priming with odor cues significantly impacts participants' ability to accurately identify emotional facial expressions of varying intensity. The current study utilized an ERP-face processing paradigm in which affective odors (pleasant, unpleasant, and blank) preceded emotional faces of varying intensity. ERP responses to odor presentation and emotional face stimuli were collected in a sample of 40 undergraduate students to examine the impact of olfactory priming on emotional face processing. Overall, we found that affective odors were more salient (reflected in enhanced P300 response to odor cues), paralleling findings from prior research. Further, we demonstrated that the salience of subsequent emotional faces was also enhanced following affective odors (reflected in enhanced VPP and increased accuracy). Taken together, these results suggest that affective odors may promote differentiation of emotional faces through enhancement of the salience of emotional face stimuli.

FUNDING: National Institutes of Health (NIH) T32 Training Grant [2T32MH093311-11].

POSTER SESSION III-094 | EXPLORING CONTEXTUAL FACTORS IN VAGAL TANK THEORY

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Cornell University

Descriptors: Heart Rate Variability, Vagal Tank Theory, Self Regulation

High baseline Heart rate variability (HRV) is a putative measure of resilience which predicts adaptive HRV changes during (Reactivity) and after (Recovery) a stressor according to Vagal Tank Theory. However, we do not understand how the availability of *resources* prior to a stressor impacts this relationship. Using an ecological framework, we tested VTT hypotheses while examining receptivity to social presence and contemplative practices as a moderator to Reactivity and Recovery during a subsequent stressor. Using ECG, we modeled HRV as the root-mean square of successive R-R intervals

(RMSSD) across four conditions: baseline, post contemplative practice, directly before a CO₂ breathing tasking, while breathing CO₂, and after CO₂. Reactivity and Recovery were defined as the usual subtraction for phasic HRV literature, while Receptivity was modeled as post contemplative practice HRV minus baseline. Our multiple regression analyses showed that higher baseline predicted greater reactivity, positively interacting with the female gender and the partner condition ($F(9,83)=2.00$, $p=0.04$). Higher baseline predicted lower recovery HRV with no significant interactions ($F(9,85)=2.66$, $R^2=0.22$, $p=0.009$), potentially due to the benefit in the HRV level at the reference level (after contemplative practice). Higher receptivity predicted higher recovery, with women showing the strongest relationship ($F(4,88)=16.3$, $R^2=0.43$, $p<0.001$). Our results suggest that both baseline and receptivity to resources may impact resilience to stress, and that future research should account for gendered effects.

FUNDING: UVA Contemplative Science Center funded the data collection for this study.

POSTER SESSION III-095 | PHYSIOLOGICAL RESPONSES TO DIFFERENTIALLY UNAMBIGUOUS SOCIAL STIMULI IN INDIVIDUALS WITH PEER VICTIMIZATION EXPERIENCES

Klara Blauth, Frank Neuner, Benjamin Iffland
Bielefeld University

Descriptors: Peer victimization, Event-related potentials, Emotional facial expressions

The visual perception and processing of facial expressions are essential to social functioning and have been linked to mental health. Studies suggest that maltreatment experiences in childhood and adolescence may influence these processes, as the frequency of confrontation with certain emotions and the context may alter the relevance of facial expressions for individuals. However, there is a lack of studies examining emotion perception and processing in the context of peer victimization. Therefore, the present study aimed to examine the impact of peer victimization experiences during childhood and adolescence on the behavioral and physiological responses in adult participants when confronted with emotional facial expressions with varying amounts of unambiguous visual information. The RISE (Random Image Structure Evolution) paradigm was used to create image sequences of angry, sad, happy, and neutral facial expressions, which became increasingly recognizable as the sequence progressed. Both ERP and experimental responses were analyzed for each emotion

and each sequence level. Participants with higher levels of peer victimization experiences showed more pronounced P100 amplitudes for emotional facial expressions depending on the image level and the valence of the expressions presented. Accordingly, these participants also showed altered response behavior. The results indicate facilitated processing of certain emotional facial expressions, which could influence the interpretation of social cues.

POSTER SESSION III-096 | HOW DOES COGNITIVE REAPPRAISAL IMPACT SOCIAL INFORMATION PROCESSING IN LONELY INDIVIDUALS? INVESTIGATION WITH EEG EVENT-RELATED POTENTIALS

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Polish Academy of Sciences

Descriptors: loneliness, cognitive reappraisal, social cognition

Specific cognitive processes were observed in lonely individuals compared to non-lonely individuals during the encoding (increased focus on threats) and interpretation (social cognitive bias) of social stimuli. Furthermore, an increased focus on self-preservation is believed to reduce cognitive resources, which prevents lonely individuals from applying emotion regulation techniques, such as cognitive reappraisal, to counter biased information processing. The aim of the study was to examine the relationship between loneliness and the behavioral and physiological mechanisms linked to social threat perception and emotion regulation through cognitive reappraisal. We sampled 150 participants based on the distribution of loneliness scores in the Polish population. They were presented with static pictures from affective picture databases containing either neutral or negative social or non-social content and were asked to either passively watch or reappraise the presented pictures while their EEG and behavioral ratings were recorded. Consistent with previous literature, both the bottom-up effects of picture content (negative > neutral) and the top-down effects of cognitive reappraisal use (reappraise < watch) were found on behavioral ratings and the Late Positive Potential observed during the task. However, we only found a weak interaction between participants' loneliness levels and the social content of the stimuli (rather than task instructions or affective content). Further investigation of the mechanisms linking loneliness and patterns of responding to affective stimuli is needed.

FUNDING: The National Science Centre, Poland, supported this work, Grant No: 2019/35/B/HS6/00517.

POSTER SESSION III-097 | REAL-LIFE LONELINESS, BUT NOT TRAIT LONELINESS, IS RELATED TO LOWER HEART RATE VARIABILITY MEASURED BOTH IN LABORATORY AND ECOLOGICAL SETTINGS

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Descriptors: *loneliness, heart rate variability, ambulatory*
Examining the physiological consequences of loneliness is of crucial importance, given its association with cardiovascular risk. It was shown that heart rate variability (HRV), an index of parasympathetic activity, could be linked to the experience of loneliness, which could help to explain its corrosive effects. However, most of the findings come from laboratory studies examining short-term cardiac activity. Thus, the current study examined the link between both laboratory and real-life loneliness and HRV markers. 169 participants were recruited for a laboratory session and a week-long experience sampling study. In the laboratory, their heart rate was measured with an electrocardiograph. The experience sampling included multiple daily assessments of one's feelings and passive ambulatory monitoring of heart activity. Participants were also asked to complete a questionnaire assessing their level of trait loneliness. We found that trait loneliness was not related to HRV measured in the laboratory or daily life. However, average real-life loneliness was a significant and negative predictor of both types of HRV. Interestingly, questionnaire-measured depressive symptoms and daily negative affect were related to laboratory HRV, but none predicted real-life HRV. The results offer novel insights into the association between the experience of loneliness and decreased parasympathetic activity. Notably, the relationship was not significant for the questionnaire measure, which provides evidence for the importance of assessing the effects of loneliness in ecologically valid settings.

FUNDING: This work was supported by the National Science Centre, Poland (Grant No: 2018/31/B/HS6/02848).

POSTER SESSION III-099 | A SUCCESSFUL UPHILL BATTLE IN MEANING COMPREHENSION: ERPS REVEAL PRESERVED AMBIGUITY RESOLUTION PROCESSES IN HEALTHY OLDER ADULTS

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Descriptors: *anterior positivity, lexical ambiguity, aging*
Apprehension of a homograph activates multiple associated meanings commensurate with their frequency, creating a challenge for selecting the weaker subordinate reading. Prior research showed that young adults selecting the subordinate meaning of a homograph embedded in a minimal semantic context elicit a post-N400 anterior positivity (AP), reflecting additional processing effort. This study aimed to investigate the impact of aging on this aspect of ambiguity comprehension. We measured brain potentials from 40 healthy older native speakers of Taiwan Mandarin (mean age = 69.53, range = 60-83). Participants read biased homographs following a one-word phrasal context that was congruent with only one meaning of the homograph and judged the semantic relatedness between this phrase and a subsequent phrase on 1/3 of the trials. Older adults were 79.6% accurate, indicating relatively successful meaning comprehension. Furthermore, they showed a young-like AP (600-1100 ms) to homographs in the subordinate context than to both homographs in the dominant context and unambiguous words. These results indicate that the ability to reprioritize and integrate the subordinate meaning in the face of competition from the dominant meaning is relatively well preserved with age. These results also implicate that the absence of AP effect in older adults' response to plausible unexpected continuations of constraining sentence contexts in prior research is likely due to a lack of a strong competing context-based prediction, instead of the decline in the ability to integrate the unexpected continuation.

FUNDING: This study is supported by Chiang Ching-kuo Foundation grant RG002-D-21 to Lee and Federmeier.

POSTER SESSION III-100 | SENSORIMOTOR OSCILLATORY ACTIVITY RELATED TO INVOLUNTARY IMAGERY OF MANIPULABLE OBJECTS

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Descriptors: *EEG, Consciousness, Action-related attributes*
In the "Two-Object" variant of the Reflexive Imagery Task (RIT) subjects are presented with two line drawings of everyday objects and instructed to not think of the name of any of the objects (Cho et al., 2018). Involuntary subvocalizations (RIT effects) occur on a substantive proportion of the trials. In this RIT, a trial could consist of HAMMER (the Manipulable category) presented along with CLOUD

(the Non-Manipulable category). We investigated whether an object's semantic action-related attributes may affect the rate of occurrence of the involuntary subvocalization of manipulable object names as opposed to non-manipulable object names. We also investigated whether the encoding of an object's semantic action-related attributes, during a time window immediately preceding (-400 ms) the occurrence of RIT effects, increases EEG event-related desynchronization (ERD) in the Mu (9-13 Hz) and Beta (14-30 Hz) frequency bands over sensorimotor cortex (electrode sites: C3, Cz, C4). Repeated measures ANOVAs ($n=6$) revealed significant main effects of object manipulability on both Mu frequency ERD ($F(1,4) = 53.33, p = .002, \eta^2 = .10$) and Beta frequency ERD ($F(1,4) = 14.35, p = .019, \eta^2 = .15$). Post-hoc t -tests revealed that greater Mu frequency ERD preceded RIT effects to Manipulable objects ($M = -6.67, SE = 8.31$) than to Non-Manipulable objects ($M = 5.97, SE = 7.11; t(4) = 7.30$), and, likewise, that greater Beta frequency ERD preceded RIT effects to Manipulable objects ($M = -4.36, SE = 6.33$) than to Non-Manipulable objects ($M = 9.94, SE = 5.72; t(4) = 3.79$).

POSTER SESSION III-101 | AFFECT IN THE WILD: PSYCHOPHYSIOLOGICAL RESPONSES TO REAL-WORLD CONTEXTS

Sam Dutton¹, Patrick Hill², Zac Imel¹, Monika Lohani¹
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Descriptors: Stress, Affect

Understanding and measuring the affective responses associated with personally relevant stressors outside of a typical laboratory setting requires methodological innovation. Such methods must be sensitive to changes in relevant psychological domains and allow for near-real-time data collection. Physiological methods are a prime candidate for real-world data collection because they are sensitive to changes without disrupting psychological processes. Similarly, Ecological Momentary Assessment (EMA) is another method that can be successfully gathered to provide context-sensitive details regarding naturally occurring daily stressors (e.g., negative self-perceptions and work concerns) to inform changes in physiological measures. In the present study, we investigated the feasibility of assessing naturally occurring and personally relevant experiences by adopting a combination of heart rate and EMA data. Twenty-nine community members (Mean age = 28.17, SD = 8.78; Female = 76.9%) completed a battery of surveys assessing psychological experiences (such as standardized self-report measures

for affect). Using an ambulatory research-grade monitor, heart rate data were continuously collected for eight hours as participants went about their day in their naturalistic environment. Extending lab-based research, we found that heart rate data collected in a more ecological context were associated with self-reported affect measures. This work demonstrates the feasibility of adopting psychophysiological methods to better understand affective processes in real-world contexts.

FUNDING: Seed Grant, University of Utah.

POSTER SESSION III-102 | TASK DIFFERENCES AFFECT ERP CORRELATES OF MENTAL HEALTH STIGMA

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Descriptors: Faces, Stigma, Task

Stigma associated with mental illness disproportionately affects people diagnosed with schizophrenia. Previously we showed that assigning emotional faces a spurious diagnosis of schizophrenia modulated both N170 and P3 amplitudes, when participants passively viewed the faces (Grose-Fifer & Vidals, 2021). Moreover, there was no correlation between ERP measures and dangerousness ratings of the faces, suggesting that ERPs may serve as a measure of implicit bias toward people with schizophrenia. However, others have shown that ERP correlates of implicit bias may be task-dependent. In this follow-up study, we investigated whether explicitly categorizing each face in terms of mental health diagnosis would elicit the same pattern of results we attained previously. A new sample of 40 participants viewed happy and angry faces; each face was preceded by the letter H (healthy) or S (schizophrenia) to indicate their mental health status. Afterward, participants rated their perceptions of dangerousness for each face. Mental health diagnosis produced very little modulation of early ERPs (P1 and N170). However, we found an interaction between mental health diagnosis and facial expression for later ERPs. Happy faces perceived as mentally healthy elicited smaller early posterior negativities (EPNs) than the other conditions. Also, happy faces with the schizophrenia designation elicited smaller LPPs than other conditions. Mental health labels clearly affect how people process emotional faces, however, the exact pattern of results appears to be task-dependent.

FUNDING: PSC CUNY funding to JG-F.

POSTER SESSION III-103 | LATE POSITIVE POTENTIAL PREDICTIVE OF POSITIVE SOCIAL EXPERIENCE AFTER COMPLETING STRUCTURED SOCIAL TASK

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Greg Hajcak
Florida State University

Descriptors: Late Positive Potential (LPP), Relationship Formation, Social Functioning

Quality of relationship formation is a major component of psychosocial functioning. However, the neural mechanisms underlying relationship formation are not yet well understood. The Late Positive Potential (LPP) is a reliable neural measure of emotional salience that can be leveraged to understand the neurophysiology of relationship formation. In the present study, thirty-one college students (Age: $M=19.52$, $SD=1.26$) completed a relationship formation (Aron et al., 1997; $n=14$) or small talk control ($n=17$) social task in gender-matched dyads. The LPP was elicited by images of their partner, a stranger, and a neutral image before and after the social task. Self-reported ratings of participants' social experience were assessed as well. The LPP did not increase in the relationship formation condition compared to the small talk control condition. However, the LPP elicited by people (i.e., collapsed across partner and stranger photos) predicted participants' post-interaction ratings, such that individual's with larger LPP to people reported liking their partner more, being more comfortable with their partner, and enjoying the social task more. In sum, these results suggest that LPP amplitude elicited by pictures of people may predict social capacity and the proclivity for relationship formation.

POSTER SESSION III-104 | WOMEN'S DOMAIN-SPECIFIC AFFILIATION ACROSS THE MENSTRUAL CYCLE

Kaylee Phimmasene, Anastasia Makhanova
University of Arkansas

The menstrual cycle is a naturally occurring, monthly process that most women experience. It has three distinct phases (follicular, ovulatory, and luteal) marked by fluctuations in ovarian hormones such as progesterone and estrogen. While past research has examined how women's social perceptions vary with cycle phase, that research focused on women's general sociality and desire to affiliate with strangers. Sociality (i.e., affiliative behavior) can be further broken down by target to assess affiliative behavior

toward romantic partners, family, close friends, potential new friends, and strangers. We conducted a daily diary study to examine how menstrual cycle effects may differ depending on the target of affiliation. Women ($N=25$) completed a survey every evening for the duration of one menstrual cycle and reported their desire to affiliate with friends, family, romantic partners, and strangers. We assessed cycle phase by having participants wear Ava bracelets, which collect biometric data (i.e., sleep, heart rate variability, and body temperature) that have been found to reliably predict the onset of ovulation. We found that general sociality and desire to meet new friends did not differ across cycle phase. However, romantic sociality increased in the ovulatory phase relative to both follicular and luteal phases. Only familial platonic sociality increased in the luteal phase. Results partially supported our hypothesis and contribute to a more nuanced understanding of changes in women's sociality across the menstrual cycle. This research project was funded by the Honors College Research Grant at the University of Arkansas.

POSTER SESSION III-105 | NAVIGATING THE APPROACH-AVOIDANCE MATRIX: EXPLORING INDIVIDUAL DIFFERENCES IN A NOVEL VIRTUAL REALITY FORAGING TASK

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A key characteristic of adaptive fear is avoidance of genuinely threatening situations or stimuli. However, excessive avoidance of non-threatening stimuli or circumstances can have negative long-term consequences, such as the maintenance of anxiety by preventing the acquisition of safety information. Approach-avoidance (AA) conflicts in predator foraging tasks, yet the effect of inter-individual variation on AA tactics in these situations is still understudied. We present an AA paradigm in a virtual foraging task that is based on a matrix-designed environment that facilitates the tracking and visualization of AA behavior as a function of spatial movement. Participants have to gather an adequate number of food tokens in three simulated environments to attain virtual survival. An AA conflict is induced by proportionally linking the potential reward to the probability of encountering an aversive (electrical) stimulus. To achieve this goal, each individual is required to perform a unique AA behavior in terms of time spent in each context and spatial movement along the field. Here, we present results for virtual spatial trajectories, skin conductance and eye-tracking results in 210 individuals demonstrating the

validity of our task. We discuss our findings in the context of our overarching goal of identifying data-driven subgroups to understand response heterogeneity on the behavioral task performance. We also showcase the potential of using reward and punishment in a gamified design within virtual reality to elicit AA behavior.

POSTER SESSION III-106 | INCLUSIVITY OF BLACK PARTICIPANTS IN RESEARCH EVALUATING SPORT-RELATED CONCUSSIONS USING ELECTROENCEPHALOGRAPHY (EEG): A PERSPECTIVE REVIEW

Lexi Kier, Erin Reifsteck, Jessica McNeil,
DeAnne Brooks, Eric Drollette
University of North Carolina, Greensboro

There is concerning racial disparity- in neuroscience that significantly limit relevance and applicability of scientific results to Black and African American populations. This is particularly evident in electroencephalography (EEG) research since most systems are designed to have limited obstruction of the scalp and Black populations have phenotypic thick coarse hair and protective hairstyles that interfere with this methodology. It is likely that this inherent EEG design excludes Black populations from participating in research. This perspective review sought to evaluate inclusivity of Black populations in published research that evaluated sport-related concussions using EEG. Recent advances in EEG technology (e.g., machine learning) have enhanced the ability to detect neurophysiological abnormalities post-concussion. Thus, it is imperative that representation is apparent in research especially if EEG advances as a primary tool for concussion trauma detection and treatment. Inclusivity in prior research was determined by extracting demographic and race information from all research articles ($n=23$) cited in two recent meta-analyses (Corbin-Berrigan et al., 2020; Conley et al., 2018). Unfortunately, results revealed that all research articles failed to report race. As such, the premise that Black populations are underrepresented in sport-related concussion research due to EEG system design remains conjecture. Moving forward, future research should be required to report demographic data to ensure inclusivity of Black populations and applicability of research outcomes.

POSTER SESSION III-107 | LATE-BREAKING AN EXAMINATION OF MINDFULNESS ON MU SUPPRESSION AND PAIN EMPATHY AND ITS RELATION TO TRAIT EMPATHY

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Laura Swain, Jane Stafford, Bridget Cho
University of South Carolina, Aiken

Descriptors: Mindfulness, Sensorimotor Resonance, Mu Suppression

There have been multiple benefits reported from the practice of mindfulness meditation. Recently social functioning, including empathy, has emerged as one such possible benefit. However, the literature is mixed and it is unknown if mindfulness has an effect on the neural mechanism involved in empathy. Therefore, we conducted a large-scale experimental study involving over 100 participants that were either enrolled in a behavioral or EEG experiment to examine pain empathy and mu suppression, respectively. We also measured state and trait mindfulness and trait empathy. Results did not show a change in pain empathy or mu suppression in response to an acute mindfulness manipulation. However, pain empathy responses were able to be predicted significantly better when the component of state mindfulness involving decentering was incorporated into a regression model compared to trait empathy alone. Also, trait empathy was related to trait mindfulness. Collectively, state decentering may be involved in increased pain empathy, while trait mindfulness appears more related to general trait empathy. Further research is warranted to better understand the potential benefit a brief mindfulness meditation may produce in the realm of brain activity and social functioning.

FUNDING: Part of this project was made possible through grant funding obtained through the University of South Carolina Summer Scholars Program awarded to Kaia McMullen.

POSTER SESSION III-108 | LATE-BREAKING DEVELOPMENTAL CHANGES IN GAMMA-TO-BETA OSCILLATIONS DURING THE FIRST 150 MS OF THE NOVELTY ODDBALL

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Colorado State University

Descriptors: P300, time-frequency, development

Past ERP studies using the novelty oddball paradigm have revealed age related changes in P300 amplitude. A recent study by Wienke et al. 2018 using time-frequency (TF) measures showed increases in the theta (~4-7Hz) power related to N2 and P3 of a visual novelty oddball task in 8–28-year-old participants, indicating better attentional control with age. However, attention has been tied to other oscillations besides theta which may begin earlier than P3. This study examines TF measures related to P1/N1 ERP components to evaluate developmental differences in each stimulus condition (i.e., frequent, target, novel tones) of an auditory novelty oddball task. Participants ($N = 61$) were in 4 age groups (8, 13, 18, or 19–25-year-olds). Evoked power at Fz for two regions of interest (ROIs), early gamma (34–64 ms/35–47 Hz) and beta (92–124 ms/17–20 Hz), were measured from TF plots for each age group at each stimulus condition. Repeated measures ANOVAs revealed significant main effects. For early gamma, significant differences were found across the conditions, $F(2,114) = 38.44$, $p = <.001$, and a significant interaction of condition by age groups, $F(6,114) = 3.25$, $p = .005$. For the early beta ROI, significant differences were found across conditions, $F(2,114) = 9.996$, $p = <.001$, and across age groups, $F(3,57) = 5.18$, $p = .003$, but no interaction. These results demonstrate that across the conditions, gamma power increases and beta power decreases in the P1/N1 time frame as age increases, indicating development changes in attention occur early in ERPs for this paradigm, well before P3.

FUNDING: NIH/NCMRR (K01 HD001201) to PLD.

POSTER SESSION III-109 | LATE-BREAKING THE ROLE OF NOREPINEPHRINE IN REACTIVE BALANCE

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Descriptors: Norepinephrine, Vestibular, corticospinal tract
During reactive balance, the central nervous system briefly speeds up neural processing beyond what is typical for voluntary actions. We propose this increased processing speed is accomplished by a phasic increase in norepinephrine (NE) release throughout the brain and spinal cord, whereby NE acts as a neuromodulator to make neurons more responsive to simple inputs. Phasic NE release can be indirectly measured in humans from pupil dilation (PD). We measured PD with a wearable pupillometry device, and lower limb activation with electromyography

(EMG) while participants engaged in a reactive balance task. Participants ($N=19$; mean age=20.3; 7 women) wore a safety harness attached by a cable to an electromagnet, allowing them to plant their feet and lean away from a wall with the cable as support. In half of 80 trials, a loud beep coincided with the electromagnet being shut off, removing support such that participants had to move a foot forward to reestablish balance. In the other half of trials, there was no electromagnet release, and the loud beep cued participants to step forward as fast as they could without a balance perturbation. PDs were larger on perturbation trials than non-perturbation trials, $t(18)=3.0$, $p<.01$. This effect approached significance for the EMG data, $t(18)=2.0$, $p=.06$. Interestingly, on perturbation trials, large-PD trials exhibited greater EMG activity than small-PD trials, $t(18)=3.2$, $p<.01$. This effect approached significance for no-perturbation trials, $t(18)=1.9$, $p=.07$. These results provide preliminary evidence linking NE to reactive balance control.

FUNDING: This work was funded by a Utah State University Catalyst Grant, which is an internal grant meant to facilitate development of new projects.

POSTER SESSION III-110 | LATE-BREAKING NEUROELECTRIC AND BEHAVIORAL OUTCOMES OF VERBAL AND SPATIAL WORKING MEMORY IN RELATION TO PHYSICAL FITNESS

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Descriptors: Working memory, Physical fitness

Physical fitness has been positively related to working memory, however, whether such associations vary as the function of the type of and the temporal stages involved in working memory remains to be determined. This study recruited 94 adults (46 males) aged 18 to 35 years and each participant completed electroencephalogram (EEG) recording while performing verbal (VWM) and spatial working memory (SWM) tasks as well as had their muscle strength, aerobic fitness, and body composition measured. After controlling for age, sex, and self-reported physical activity, physical fitness components were associated with cognitive outcomes during SWM but not VMM. Specifically, higher levels of aerobic fitness were linked to increased accuracy in the high demanding condition during SWM ($\beta = .354$, $p = .004$), greater upper body strength was associated with faster response times in both the low ($\beta = -.362$, $p = .009$) and high ($\beta = -.347$, $p = .015$) demanding conditions

during SWM, and lower waist-hip ratio (WHR) was related to higher accuracy in low demanding condition ($\beta = -.262, p = .015$), as well as shorter retrieval-related P3 latency in both high ($\beta = .327, p = .002$) and low ($\beta = .311, p = .003$) demanding conditions during SWM. Findings in this study suggest the importance of physical fitness that is selective to processes requiring varying levels of SWM. Further, the association of WHR with SWM can be extended to neuroelectric measures indicating greater processing efficiency underlying spatial-related information processing.

**POSTER SESSION III-111 | LATE-BREAKING
FLANKER PERFORMANCE TRAJECTORY IS
ASSOCIATED WITH PROBLEM BEHAVIOR
TRAJECTORY: A LARGE LONGITUDINAL STUDY
IN MAINSTREAM ELEMENTARY SCHOOL
CHILDREN**

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Descriptors: Flanker, Children, longitudinal

Conflict and performance monitoring are essential for behavioral adjustment and learning, and their role in childhood psychopathology is well-studied cross-sectionally. Here, we explore the developmental trajectory of response times (RT) on the flanker task in children and its association with the development of teacher-reported problem behavior (anxiety, depression, attention deficit-hyperactivity-, conduct- and oppositional defiant-related scores). Five waves of repeated measures of RT and problem behavior were drawn from a large longitudinal sample of mainstream elementary school children in the Netherlands (1468 children, 51% boys, followed from ages 7 to 12 years). Latent growth curve modeling (LGM) identified a piecewise decrease in RT: the steepest decline was found from 7 to 9 years old. Several gender differences in different age groups were observed. In addition, descriptors on post-error slowing and speed-accuracy trade-offs in different age groups elucidate conflict and performance monitoring in 7- to 12-year-old children. Parallel LGM revealed that RT trajectory is associated with several problem behavioral trajectories. We demonstrate for at least one problem behavior scale a parallel LGM and cross-lagged panel model, showing the longitudinal association between RT and problem behavior. These results provide a unique insight into performance monitoring development and its relation to the development of problem behavior in

children. Also, this poster highlights the opportunities for analyzing task behavior in children longitudinally.

**POSTER SESSION III-112 | LATE-BREAKING
SPIRITED AWAY: ALCOHOL MAY DULL ERROR
MONITORING AND ENCOURAGE RISKY
CHOICES**

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¹Oregon State University, ²Colorado State University,

³University of Wisconsin, Madison

Descriptors: Alcohol, Error-Related Negativity, Gambling task

Alcohol consumption is associated with risky and maladaptive decision-making. The precise neural mechanisms by which alcohol influences these processes remain an important area of research with critical implications for prevention and treatment of alcohol-related harm. Recognizing that alcohol may interfere with neural error monitoring involved with ongoing decision-making, we randomly assigned 120 participants into alcohol (target BAC = .08%), placebo, and no-alcohol groups. We measured participants' ERPs and behavioral choices as they engaged in a task requiring choices between certain and uncertain monetary rewards. Across trials, we manipulated the uncertainty type (unknown vs known probability of receiving each of two uncertain reward options) and uncertain reward variance (high vs low difference between the two uncertain reward options) rendering each trial with an objectively advantageous and disadvantageous choice. As we previously showed with this task, sober individuals tended to avoid uncertain rewards, even when they were the better option, and alcohol decreased this uncertainty avoidance leading to more risky choices. We detected Error Related Negativity (ERN) activity at fronto-central electrodes after disadvantageous choices, across participants, even though they did not receive immediate feedback about their choices. Notably, alcohol consumption significantly dampened this ERN response. These results suggest that alcohol may enhance the propensity for risky choices by interfering with the neural error-monitoring systems involved in decision-making.

FUNDING: This research was funded by a grant from the Oregon Council on Problem Gambling Research Center. Its contents are solely the responsibility of the author(s) and do not necessarily represent the official views of the Oregon Council on Problem Gambling.

**POSTER SESSION III-113 | LATE-BREAKING
PUPILLARY RESPONSES TO SHORTLY
PRESENTED STATIC EXPLICIT AND NON-
EXPLICIT SEXUALLY RELEVANT IMAGES:
EARLY AUTONOMIC COMPONENTS OF SEX AND
SEXUAL ORIENTATION SPECIFIC PERCEPTUAL
PROCESSING?**

Sabine Prantner¹, Alejandro Espino-Payá², M. Carmen Pastor¹, Cristina Giménez-García¹, Rafael Ballester-Arnal¹, Markus Junghöfer²

¹Universitat Jaume I, ²University of Münster

Descriptors: pupillometry, emotional arousal, visual sexual stimuli

Pupil responses during affective picture viewing reflect emotional arousal. Images with sexual content have been shown to produce strong pupil dilations. Previous research has intended to attribute sexual interest to pupil responses, with inconsistent results. Males are commonly more aroused to scenes that are consistent with their reported sexual orientation, while females' sexual orientation seems weakly reflected in their sexual response. This work analyzes early pupillary responses of 54 males and females with strict hetero- or homosexual orientation (HetMal, HetFem, HomMal, HomFem) to static explicit pornographic and non-explicit sexual images of female and male same- and opposite-sex content (FemMal, FemFem, MalMal). Images were matched for luminance and contrast. A passive viewing task (1 sec stimuli, 1-1.2 sec ITI) was performed. Changes in pupil size revealed overall stronger dilation to explicit images in comparison to non-explicit sexual images, and stronger dilation to explicit FemFem sexual images for all groups. Interaction effects of image content and participant groups were found: HomMal showed significantly greater pupil dilation to MalMal explicit sexual images than the other groups. The hypothesis that pupil dilation would be indicative of sexual interest and that a person's sexual orientation might be indicated by greatest pupil dilation to certain stimuli, could not be fully supported. Early automatic components of perceptual processing of sexual images seemingly are indicative of emotional arousal but may not be sexual orientation specific.

**POSTER SESSION III-114 | LATE-BREAKING
SUBTHRESHOLD DEPRESSION IS PREDICTED
BY ELECTROPHYSIOLOGICAL SIGNALS OF
EMOTION-EVOKED MOTIVATION**

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Pitzer College

Descriptors: Emotion, Depression, Time-Frequency Analysis
Depression is a multidimensional affective disorder characterized by disruptions in emotional and motivational processes. Recent neuroimaging investigations of clinically depressed individuals have revealed the hyperactivation of neural mechanisms towards negative environmental stimuli while positive environmental stimuli tended to evoke a hypoactivation of these same systems suggesting measurements of these phenomena may aid in the diagnosis of the disorder. The current study aimed to investigate the relationship between motivation-related EEG signals and an individual's level of subthreshold depression. For this study, 70 college student volunteers without a diagnosis of depression (46 females) were recruited to perform a simple emotional image viewing task where they were asked to view and rate (pleasantness and perceived arousal) a series of positive, neutral, and negative images. Participants were also asked to complete an inventory of subthreshold depression. Our results revealed that an individual's subthreshold depression was successfully predicted by delta band activity evoked while the person viewed negative images, but not when an individual viewed neutral or positive images. These results further support past research suggesting a hyperactivation of emotional neural mechanisms for negative stimuli, as well as position emotion evoked delta band activity as a diagnostic tool for depression.

**POSTER SESSION III-115 | LATE-BREAKING
REDUCTION IN ANGER TOWARD A
FICTITIOUS POLITICAL OPPONENT, WITH
NO CONCOMITANT CHANGE IN HEART
RATE VARIABILITY, AFTER A 4-WEEK
INTERVENTION DESIGNED TO PROMOTE
POLITICAL HUMILITY**

Madelyn Hartrim-Lowe¹, Nathaniel Thom¹, Everett Worthington², Jay Wood¹, Bryan McGraw¹, Kristin Garrett¹

¹Wheaton College, ²Virginia Commonwealth University

Descriptors: Vagal tone, Civility, Stress Response

INTRODUCTION: Political division is rising in the United States, necessitating the development and study of interventions designed to promote civility. The promotion of political humility offers a promising avenue by which individuals can better manage the stress of political engagement. **METHODS:** 81 undergraduate students (20.59 ± 5.01yrs; 70.4% female; 77.5% white; 22.5% minority) were assigned to three groups: control (n=27), placebo positivity curriculum (n=26), and a curriculum designed to enhance political humility (n=28). Curricula were completed in four weeks. Pre- and post-curriculum data

collection consisted of participants engaging with written scenarios expressing opposing partisan views while ECG and self-reported emotional responses (angry, amused, disgusted, sad, anxious, happy, and negative) were obtained and analyzed via mixed-model repeated-measures ANOVA with Group (control, placebo, humility) and Time (pre, post). RESULTS: Results reveal a significant decrease in anger in the political humility group ($p=.03$, partial $\eta^2=.16$), a marginally significant increase in anger in the control group ($p=.06$, partial $\eta^2=.13$), no change in the positivity group ($p=.66$, partial $\eta^2=.008$). The interventions did not alter vagal tone or other emotional responses (all $ps>.25$, highest partial $\eta^2=.04$). CONCLUSION: A 4-week intervention designed to promote political humility successfully reduced anger toward a fictitious political opponent. These findings may promote civility by mitigating political division. Future studies may explore this through face-to-face scenarios.

FUNDING: The Mitigating Effects of Humility and Social Identity on Hostility and Stress Across Political Differences. Fall 2019-Fall 2021. Funded by a Self, Virtue, & Public Life Initiative grant, under the Templeton Religion Trust.

POSTER SESSION III-116 | LATE-BREAKING HOW DOES A SET OF CARDIOVASCULAR VARIABLES EXPLAIN SUBJECTIVE EXPERIENCE OF VALENCE AND AROUSAL DURING EMOTIONAL SCENARIO IMMERSION?

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¹Northeastern University, ²University of New Hampshire

Descriptors: Affective Experience, Cardiovascular Activity, Individual Variation

Affective scientists have debated the extent of variability in the relationship between affective experience and autonomic nervous system (ANS) activity. The fingerprints hypothesis posits that, for example, positive and negative valence have a typical pattern of ANS activity that can be used to identify their instances. In contrast, the populations hypothesis posits that the ANS features of affect vary in a situated way. Prior work has supported the populations hypothesis, showing high variability in the ANS-affect relationship within and across people in real-world settings. We aimed to further investigate whether these findings generalize to a more constrained lab setting. In this study, $N=61$ participants performed an emotional scenario immersion task while we recorded the electrocardiogram and impedance cardiogram to yield six cardiovascular measures (e.g., Cardiac Output). Participants

immersed themselves in rich emotional scenarios from a first-person perspective and rated valence and arousal after each scenario on a 5-point Likert scale. Bayesian mixed effects models tested the amount of variance in affect ratings explained by the six cardiovascular measures collectively. In line with the populations hypothesis, the cardiovascular measures did not explain a significant amount of the variance in either valence ($BF<0.001$, $R^2=0.004$) or arousal ratings ($BF<0.001$, $R^2=0.002$). Our study provides further support for the populations hypothesis and has implications for the search for physiological and affective 'biomarkers' in healthy populations and mood disorder patients.

FUNDING: This data was collected under a grant from the Army Research Institute (W911NF-16-1-0191).

POSTER SESSION III-117 | LATE-BREAKING ALTERATIONS IN EEG FUNCTIONAL CONNECTIVITY IN INDIVIDUALS WITH TENDENCY OF DEVELOPING INTERNET ADDICTION

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¹National Tsing Hua University, ²National Health Research Institutes, ³National Yang Ming Chiao Tung University

Descriptors: Internet Addiction, Resting-State EEG, Functional Connectivity

Internet addiction is defined as the problematic patterns of Internet use that may result from dysfunction of impulsive behaviors and inhibitory functions. Previous neuroimaging research has suggested that Internet addiction may be associated with ineffective connectivity between and within brain networks of frontal regions involved in cognitive control processes. In this study, we examine whether and how individual differences in the tendency to develop Internet addiction modulate electrophysiological signals using resting-state electroencephalography (EEG). Ninety-six healthy young participants were recruited to undergo resting-state EEG recording and their propensity to develop Internet addiction was measured using the Chen Internet Addiction Scale. The Phase Lag Index (PLI) across 8 frequency bands was calculated to assess the strength of functional connectivity for each participant. The EEG results showed significant effects of Internet addiction in the delta band (1-4 Hz) and three gamma bands (30-40 Hz, 40-50 Hz, and 50-60 Hz), indicating higher PLI values in frontal regions in individuals with greater Internet addiction tendencies compared to normal controls. Our results provide preliminary evidence suggesting

that individuals with a tendency to develop Internet addiction are involved in altered psychophysiological signals and disrupted brain mechanisms associated with inhibitory control processes.

**POSTER SESSION III-118 | LATE-BREAKING
EVERYTHING ALL AT ONCE: ENHANCED
SENSITIVITY AND ALTERED INFORMATION
PROCESSING OF INTERNET ADDICTION
INDIVIDUALS IN NUMERICAL STROOP ERP
EXPERIMENT**

Qiduo Lin¹, Bing Li¹, Hoi Yan Mak¹, Chih-Mao Huang²,
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¹City University of Hong Kong, ²National Yang Ming
Chiao Tung University, ³National Health Research
Institutes

*Descriptors: Numerical Stroop, Internet Addiction,
Information Processing*

Internet has reshaped our way of thinking and doing. Internet addiction (IA) is defined as the problematic patterns of Internet use that may result from dysfunction of inhibitory functions and compromised attention regulation. However, in our previous study using numerical Stroop task, we found no worse accuracy and even a tendency of faster reaction times (RT) for the IA compared to normal control participants (NC). To further investigate the underlying neural dynamics contributing to this faster response, we conducted single-trial analysis on ERPs by sorting the trials into 3 RT bins: fast, medium, and slow. In slow trials, only IA displayed enhanced N100 for congruent and incongruent conditions, indicating early perception of the embedded physical size. Also, IA displayed a facilitation effect (Congruent-Neutral) on early and late LPC. However, in fast RT trials, IA showed a similar pattern of facilitation (on N200 and early LPC) and interference (Incongruent-Neutral, on N450 and late LPC) effect to that of NC. These findings demonstrated that IA were capable of alike processing as NC, yet exhibited enhanced sensitivity on physical though goal-irrelevant information at the early stage processing. The heightened attention to the early sensory information can be beneficial to expedite the responses overall. Despite reported cognitive deficits associated with IA, our study reveals alternation in information processing mechanisms, specifically in attention regulation and allocation of cognitive resources due to habitual multitasking and excessive online content consumption.

FUNDING: This work was supported by the Hong Kong Institute for Advanced Study, City University of Hong Kong (Project No. 9360157).

**POSTER SESSION III-119 | LATE-BREAKING
THE DEVELOPMENT OF THE EEG DOMINANT
RHYTHM PEAK FREQUENCY DURING VISUAL
PROCESSING**

Mina Elhamiasl¹, Jessica Sanches Braga Figueira¹, Ryan Barry-Anwar¹, Zoe Pestana², Andreas Keil¹, Lisa Scott¹
¹University of Florida, ²University of California, Davis

Descriptors: Peak Frequency, EEG, Visual Processing

The dominant rhythm (6 to 9 Hz) is an important index of infant visual processing. Although previous work has shown that the dominant rhythm peak frequency increases across the first year of life, the precise developmental trajectory and topographic distribution are not well-understood. In addition, it is not clear if developmental changes in peak frequency are modulated by task or visual attention, or if these increases are a general feature of brain development. In the current study, the development of the peak frequency was investigated during a novel sustained attention task in 6- (n=39), 9- (n=30), and 12-month-old (n=28) infants. During this task, a fixation cross was presented for 5 seconds, followed by 2 computer-generated objects and 2 female faces floated down a computer screen, one by one, for 10 seconds each. The peak frequency between 5 and 9 Hz was estimated using the center of gravity (CoG) method and examined during fixation, face, and object trials. Findings showed that from 6 to 12 months of age, CoG significantly increased in baseline (6.60 to 6.72 Hz), faces (6.61 to 6.74 Hz), and objects (6.60 to 6.72 Hz) conditions. The development of the peak frequency was present in posterior, frontal, and central areas during all three conditions. We also compared CoG with a conventional method by calculating the mode frequency after removing 1/F noise. CoG outperformed the mode in capturing the developmental changes in peak frequency. The findings suggest that CoG of the dominant rhythm may be a robust marker of neural development.

FUNDING: Funding for this research was provided to L. Scott and A. Keil from a National Science Foundation (BCS:1728133).

**POSTER SESSION III-120 | LATE-BREAKING
THE EFFECT OF ACUTE EXERCISE ON
ATTENTIONAL CONTROL AND THETA POWER**

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University of South Carolina, Aiken

Descriptors: Attentional Control, Theta Power, Acute Exercise

Exercise has a profound impact on one's health, and it is becoming increasingly accepted that exercise also benefits cognitive functioning. Yet, the neural mechanism for which cognitive enhancement occurs is less understood. Therefore, the purpose of our study was to experimentally test whether an acute exercise activity was able to increase theta power and behavioral performance during an executive functioning attentional control task. Participants were randomly assigned to either a stationary-bike exercise or a resting control condition. Thereafter, they completed the Erikson flanker task, and most participants completed this while EEG data were being recorded. From the flanker task data, we demonstrated an interaction effect from both accuracy and reaction time measurements. Importantly, the exercise group was more accurate than the control group to incongruent trials. From the EEG data, theta power was overall higher in the exercise group, especially during the congruent trials, compared to controls. Our results add to the limited but growing body of research that suggests acute exercise produces a general increase in theta power, that in turn may play a role in enhancing cognitive performance. These results, combined with previous research, could have widespread implications in multiple settings such as in the investigation of a biomarker of physical fitness, neurorehabilitation, and in education.

FUNDING: This work was supported by a Magellan grant received through the Advanced Support for Innovative Research Excellence at the University of South Carolina and the University of South Carolina Aiken's Summer Scholars Institute.

POSTER SESSION III-121 | LATE-BREAKING FUNCTIONAL CONNECTIVITY PATTERNS FOLLOWING A TRAUMATIC BRAIN INJURY

Goretti Espana Irla, Meishan Ai, Emma Tinney, Timothy Morris

Northeastern University

Descriptors: traumatic brain injury, functional magnetic resonance imaging, functional connectivity

High resolution functional magnetic resonance imaging (fMRI) has revealed sub-clinical neuroplastic changes in mild traumatic brain injury (mTBI), where standard clinical imaging has failed. However, reported findings have been inconsistent with conflicting results and methodology. We aim to test functional differences after mTBI across the human connectome. Two hundred sixty-five adults (87 women), between 18-83 years old with Glasgow Coma Scale 13-15 were included as part of Transforming Research and Clinical Knowledge in TBI (TRACK-TBI) and downloaded from Federal Interagency Traumatic

Brain Injury Research (FITBIR). fMRI was performed within 2 weeks post-injury in mTBI and orthopedic controls ($n=49$). Voxel-to-voxel connectivity revealed differences between groups in connectivity patterns of 5 significant ($p\text{-voxel} < 0.001$, FEW cluster-level $p < 0.05$) clusters ($k > 65$, $F_{\max} = 4.65$), including dorsolateral prefrontal cortex, left postcentral gyrus, bilateral occipital cortex, and right hippocampus. Post hoc characterization of each cluster revealed by MVPA using seed-to-voxel analysis demonstrated hypoconnectivity in TBI across long range cortico-cortical networks (frontal-occipital) and hyperconnectivity of proximal connections between superior and medial frontal-somatosensory and sub-cortico-cortical (hippocampus-frontal/occipital). We report differences in patterns of functional connectivity of regions known to be vulnerable to the mechanisms of injury (dorsolateral prefrontal cortex, hippocampus). Our analyses demonstrate unbiased data-driven connectivity changes after mTBI.

FUNDING: TRACK-TBI is sponsored by the U.S. National Institutes of Health, National Institute of Neurologic Disorders and Stroke (Grant # U01 NS1365885), U.S. Department of Defense; Abbott Laboratories, One Mind.

POSTER SESSION III-122 | LATE-BREAKING ENHANCING INTEROCEPTIVE ABILITIES AND EMOTIONAL PROCESSING: EFFECTS OF HD- TDCS STIMULATION

Olga Pollatos¹, Miriam Kipping¹, Jasmin Schultze¹, Sara Hajian¹, Beate Herbert^{2,3}, Lorena Desdentado^{4,5}, Thomas Kammer¹, Sandra Mai-Lippoldt¹

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Valencia, ⁵Instituto de Salud Carlos III

Descriptors: interoception, neurostimulation, HD-TDCS

Background: Interoception is vital for emotional experience and well-being. The interoceptive network, including the right anterior insula and right primary somatosensory cortex, is crucial for this processing. High-definition transcranial direct current stimulation (HD-tDCS) modulates cortical excitability. Three studies explored the effects of anodal HD-tDCS over these regions to enhance interoceptive abilities and emotional perception. **Methods:** All studies used active HD-tDCS (20 min, 2mA) compared to sham tDCS, two of which included physical pre-activation. Study 1 ($n=52$) compared the effects of anodal HD-tDCS and sham tDCS on interoceptive abilities, targeting the right anterior insula. Study 2 ($n=39$) examined these changes adding pre-tDCS physical activation. Study 3 ($n=36$) targeted the right primary somatosensory

cortex after pre-tDCS physical activation. Results: Study 1 found no significant effects on interoceptive dimensions but reported lower well-being and stronger stimulation sensations under HD-tDCS. Study 2 showed improvements in interoceptive sensibility and confidence with pre-activation, but no differential effects between sham and insula stimulation. Study 3 revealed no significant improvement in interoceptive accuracy, emotion evaluation, and sensibility with active HD-tDCS, except for increased cardiac interoceptive confidence. Discussion: Although consistent enhancement was not observed, our data offer insights into modulating interoceptive and emotional processes with HD-tDCS, indicating avenues for further research.

**POSTER SESSION III-123 | LATE-BREAKING
ALTERED EMOTIONAL STIMULUS PROCESSING
IN DEPRESSION: INSIGHTS FROM THE
INVESTIGATION OF AMPLITUDE AND
LATENCY OF THE LATE POSITIVE POTENTIAL**

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Descriptors: late positive potential, emotional processing, depression

Depression is known to affect the processing of emotional stimuli, also revealing alterations in the amplitude of the Late Positive Potential (LPP), a proxy of central emotional stimuli processing. However, the investigation of LPP latency, linked with the speed of the encoding of emotional information, has been overlooked in previous studies. 28 individuals with depressive symptoms and 30 healthy controls were presented with pictures with positive, neutral, and negative emotional valence while electroencephalographic activity was recorded with a 32-channels cap. Linear mixed models on mean amplitude and fractional peak latency of the LPP were performed adding fixed effects of group, emotional condition, and their interaction. Participant and channel factors were included as random effects. Results revealed a significant reduction in the mean amplitude of the LPP during exposure to positive stimuli ($b = -0.7$, $p < .001$), as well as a shortened latency during exposure to negative stimuli ($b = -26.17$, $p < .001$), particularly among individuals with depressive symptoms. These findings suggest decreased attentional resources allocated to positive stimuli, along with an increased speed of the encoding of negative stimuli, in individuals with depressive symptoms. This study sheds light on the neurophysiological underpinnings

of emotional processing deficits in depression. The present findings have considerable implications for understanding the mechanisms underlying depressive symptoms and may inform the development of targeted interventions.

FUNDING: The study was supported by a grant from MIUR (Dipartimenti di Eccellenza DM 11/05/2017 No 262) to the Department of General Psychology, University of Padua the TRAINED project (multifactorial analysis of heart rate variability and gait features in clinical Evaluation of Depression, PRIN 2017).

**POSTER SESSION III-124 | LATE-BREAKING
SENSITIVITY TO SOCIAL REWARDS
MODERATES THE ASSOCIATION BETWEEN
EXPERIENCES OF DISCRIMINATION AND
SYMPTOMS OF DEPRESSION IN UNIVERSITY
STUDENTS**

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Descriptors: Discrimination, Depression, Social Reward

Discrimination is a social stressor that can be associated with depression. This study ($N=116$) sought to identify the role that neural responses to social feedback might play in determining the strength of the association between experiences of discrimination and symptoms of depression. In this sample, 90% of participants reported membership in at least one equity-seeking group (81% women or gender minorities; 32% sexual minorities; 41% racial minorities). Participants completed the Inventory of Depression and Anxiety Symptoms and Intersectional Discrimination Index—lifetime. Participants also completed the Island Getaway task to elicit neural responses to socially accepting or rejecting feedback, including the rejection-sensitive N1, and the reward positivity (RewP), which is enhanced following positive feedback. Individuals reporting more experiences of discrimination had a larger N1 to rejection and more symptoms of depression. Additionally, the RewP moderated the positive association between discrimination and depression, such that, at low levels of discrimination, a larger RewP was associated with fewer symptoms, but at high levels of discrimination, a larger RewP was associated with more symptoms of depression. The results of this study replicate prior findings of an association between experiences of discrimination and symptoms of depression, but also highlight the effects of experiences of discrimination on how the brain processes social feedback, and finally identifies predictors of differential susceptibility to experiences of discrimination.

POSTER SESSION III-125 | LATE-BREAKING PROBIOTIC AND AUTONOMIC INFLUENCES ON HEALTH PERCEPTION

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Descriptors: Gut Microbiome, Autonomic Nervous System, Health Perception

Recent research has shed light on the connections between the gut microbiome and various aspects of mental and physical health. Improvements in gut health via the regular consumption of live microorganisms in probiotics have been linked to beneficial outcomes like decreased anxiety and inflammation. However, less is known about the neurobiological mechanisms underlying these connections, and the extent that individuals are aware of health changes. The autonomic nervous system (ANS) enables rapid communication between the brain and organ systems of the periphery, including the gut. Current work has demonstrated that ANS function impacts perceptual and emotional processes, as well as immune regulation, indicating involvement in the gut-brain signaling processes influencing shifts in health observed during probiotic administration. The present study extends existing work by examining the role of the ANS in perceptions of health over time among those taking a probiotic compared to a placebo. Participants completed five weekly in-person laboratory sessions during which measures of autonomic activity (including heart-rate variability, pre-ejection period, blood pressure) and mental and physical health (including self-rated health, anxiety, perceived vulnerability to disease) were collected. Findings show that probiotic administration was associated with improvements in self-reported health, and that ANS activity moderated these effects. This work contributes to the literature on health awareness and suggests that interactions between the ANS and gut health may be a avenue for future research.

Descriptors: Prediction, Word stem completion, Event-related potential (ERP)

Studies have shown that word processing is affected not only by the probability of encountering that word but also by the strength (constraint) of the prior context. However, in sentence processing tasks, studying the mechanism of constraint effects is difficult since it unfolds across multiple words. To better target these effects, this study used a word stem completion paradigm. Event-related potentials (ERPs) were recorded while participants silently generated completions for three letter word stems, which varied in entropy (constraint), and were subsequently presented with word completions, which varied in predictability; participants reported whether each presented completion matched their predictions. N400 responses to the completions showed patterns similar to those found in sentence processing studies, with smaller responses to highly predictable words but no effect of entropy on unpredictable words. Splits by participant response showed that “match” response N400s were equally facilitated regardless of *a priori* predictability. Different from sentence processing studies, there was no anterior positivity to improbable words following low entropy (high constraint) stems. ERP responses to the stem revealed multiple effects of entropy, such that word stems with higher entropy showed increased P2 amplitudes and a later, sustained negativity from 600 to 800 ms with a central, posterior distribution. Overall, the present study employed a novel approach to studying word prediction effects, with promise for helping to reveal how contextual strength impacts processing.

FUNDING: Supported by a grant from the National Institutes of Health (R01 AG026308) to K.D.F.

POSTER SESSION III-126 | LATE-BREAKING PROBING PREDICTION-RELATED PROCESSES IN LANGUAGE USING AN EEG WORD STEM COMPLETION PARADIGM

Hui-Sun Chiu, Ryan Hubbard, Kara Federmeier

University of Illinois

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