Social & Affective Neuroscience Society

May 3-5
Brooklyn,
NY

SANS 2018

Social & Affective Neuroscience Society Annual Meeting 2018

May 3-5 | Brooklyn, NY

Schedule Overview

Thursday, May 3

Start End Session

3:00 PM 7:30 PM Registration

3:00 PM 3:15 PM Welcome

3:15 PM 4:30 PM Symposium Session A: Emotion

Andreas Olsson: The social transmission of emotions: From social to neural networks **Sylvia Morelli**: Medial prefrontal cortex encodes idiographic representations of empathy **Benjamin Becker**: Training the emotion regulation circuit using functional connectivity-based real-time fMRI neurofeedback: Feasibility and functional relevance **Mara Mather**: How arousal increases neural gain and and attentional selectivity

4:45 PM 5:45 PM Keynote Address

Joseph LeDoux: Have we misunderstood fear?

5:45 PM 7:00 PM Poster Session A & Welcome Reception

Friday, May 4

Start End Session

8:00 AM 9:00 AM Breakfast

9:00 AM 10:15 AM Symposium B: Learning

Philippe Tobler: Social reinforcement learning **Julia M. Rodriguez-Buritica**: Examining neural correlates of observational reinforcement learning across development **Geert-Jan Will**: Neurocomputational mechanisms of individual differences in self-esteem **Daphna Shohamy**: Using memory to guide decisions

10:15 AM 10:30 AM Coffee Break

10:30 AM 11:30 AM Trainee Blitz

Björn Lindstrom: Transfer of social fear learning to decision making **Federica Meconi**: Empathy draws on autobiographical memories **Hayley M. Dorfman**: Causal inference explains asymmetric learning of positive and negative outcomes **Sivan Kinreich**: Brain-to-brain neural synchrony during social interaction in couples **Daniel Ames:** Predicting the effectiveness of health messaging through fMRI and fNIRS **Rosemarie E. Perry**: Enriched peer relationships prevent social neurobehavioral deficits following early life adversity **Yuan Chang Leong**: Neurocomputational mechanisms underlying motivational biases in decision-making **Marianne Reddan**: A neural basis for embodied emotion

11:30 AM 12:45 PM Symposium C: Social Cognition

Grit Hein: A neuroscience approach to prosocial motivation

Niv Reggev: Stereotype confirmation triggers reward-related neural activity **Julia Sliwa**: Comparing human and monkey neural circuits for processing social scenes **Frank Van Overwalle**: The role of the cerebellum in understanding social action sequences

12:45 PM 2:15 PM Lunch

Session on Grant Funding Process (begins at 1:15 PM)

Tamera Schneider, National Science Foundation

Janine Simmons, National Institute of Mental Health
Lisbeth Nielsen, National Institute on Aging Luci
Roberts, National Institute on Aging

2:15 PM 3:45 PM Symposium D: Communication

Janice Chen: Shared experience, shared memory: Neural dynamics underlying perception and memory during continuous natural events **Benjamin Turner**: What makes brains different? Individual differences factors explain shared activity

patterns during message processing **Beau Sievers**: Conversation and neural influence in social networks

Asif Ghazanfar: The integrative biology of social behavior and its development

3:45 PM 5:00 PM Poster Session B & Coffee Break

5:00 PM 6:15 PM Presidential Symposium

Deanna Barch: Motivational function across the spectrum of psychopathology **Kevin Pelphrey**: Towards a social neuroscience of Autism Spectrum Disorders

6:15 PM 7:30 PM Poster Session C & Reception

Saturday, May 5

Start End Session

8:00 AM 9:00 AM Breakfast

9:00 AM 10:15 AM Symposium E: Decision-Making

Nathaniel Daw: Approximate action evaluation: Habits and beyond **Candace Raio**: A novel approach to quantifying the

subjective cost of self-control **Pin-Hao Chen**: Towards a neurometric-based construct validity of trust **Cendri Hutcherson**: No time to be nice? Motivational computational dynamics underlying altruistic choice

10:15 AM 11:45 AM Poster Session D & Coffee Break

11:45 AM 12:45 PM Early Career & Distinguished Scholar Awards

Leah Somerville: Looking at social and affective neuroscience through a developmental lens **Betsy Murray**: Specializations for decision making in primate prefrontal cortex

12:45 PM 2:30 PM Lunch

2:30 PM 3:45 PM Faculty Blitz

Harma Meffert: The role of the amygdala in the empathy-based stimulus reinforcement learning for disgusted and happy facial expressions **Yoni (Jonathan) Levy**: The emergence of multi-disciplinary approaches supporting intergroup conflict resolution **Brendan Gaesser**: A role for the medial temporal lobe subsystem in guiding prosociality: The effect of episodic processes on willingness to help others **Jennifer A. Silvers**: A neurodevelopmental framework for the acquisition of self-regulation **Peter Mende-Siedlecki:** Perceptual and neural contributions to racial disparities in pain care **Ebony M. Glover**: Sex differences in emotion regulation: Comparing naturally cycling women, women using hormonal contraception, and men

Yoko Nomura: Microbiota of meconium in newborns is associated with maternal pregnancy specific anxiety

Susanne Quadflieg: Biased attitudes against positive cross-race encounters

3:45 PM 4:00 PM Presidential Closing Remarks

Mauricio Delgado, SANS President

The Williamsburg Hotel, Main Floor Plan

2018 Awards

Distinguished Scholar Award

Betsy Murray, National Institute of Mental Health

Early Career Award

Leah Somerville, Harvard University

SANS Poster Awards[1]

Ingrid Huang Richard
Huskey Ai Koizumi
Claire R. Leibowicz
Prateekshit Pandey
Nathan Petro

[1] In recognition of the top 6 most highly rated abstracts that will be presented as posters.

Conference Program

Thursday, May 3, 2018

Opening Remarks

Thursday, May 3, 2018

3:00 – 3:15 PM

Symposium Emotion

Thursday, May 3, 2018

3:15 – 4:30 PM

Andreas Olsson, Karolinska Institutet

Sylvia Morelli, University of Chicago at Illinois

Benjamin Becker, Clinical Hospital of Chengdu Brain Science Institute, Key Laboratory for NeuroInformation, University of Electronic Science and Technology of China

Mara Mather, University of Southern California

ABSTRACTS

THE SOCIAL TRANSMISSION OF EMOTIONS: FROM SOCIAL TO NEURAL NETWORKS *Andreas Olsson – Karolinska Institutet* In rapidly changing environments, humans and other animals often glean information about the value of objects and behaviors through social learning. In humans, for example, observing others' behaviors and their consequences, enables the transmission of a wide range of value-based information, from what stimuli should be avoided or approached to the appropriateness of specific social behaviors. In contrast to learning from direct, personal, experiences, little is known about the mechanisms underlying these forms of social learning. Here, I will discuss studies using behavioral, imaging (fMRI), and pharmacological techniques examining both the sender and receiver during various forms of social emotional learning. The focus will be on threat, avoidance and safety learning. Consistent with research across species, our results show that these forms of social learning draw on processes partially shared with direct

conditioning and extinction learning. Importantly, however, the outcome of social learning is distinguished by its dependence on social information and interaction. The study of the mechanisms underlying social learning is fundamental to our understanding of the spread of both adaptive and non-adaptive emotional information between individuals, as well as in networks and societies.

MEDIAL PREFRONTAL CORTEX ENCODES IDIOGRAPHIC REPRESENTATIONS OF EMPATHY *Sylvia Morelli – University of Chicago at Illinois; Pin-Hao A. Chen – Dartmouth College; Joshua Wondra – University of Illinois at Chicago; Luke J. Chang – Dartmouth College* Empathy is a pervasive and common human experience. As such, past work has focused on identifying a common neural signature for empathy across people. However, individuals vary in how they interpret and represent others' emotional experiences. Thus, it's possible that the subjective nature of empathy manifests in unique – not common – patterns of neural activation for each individual. To test this hypothesis, we scanned individuals (N=40) as they read 40 different stories about others' negative emotional experiences. For each experience, participants rated how much empathy they felt on a visual analog scale. We trained idiographic whole-brain models using ranked ridge regression and 5-fold cross-validation to separately predict empathy ratings for each participant. We found that these individual models reliably predicted empathy ratings (mean r = .21, std= .23, $p < .001$, 10,000 permutations). A univariate t-test revealed that voxels in the MPFC consistently contributed to the prediction across participants ($q < 0.05$ fdr-corrected) highlighting its important role in empathy computations. Interestingly, however, we did not observe any evidence of a consistent spatial similarity of the pattern in MPFC across participants (mean pairwise r = .03, ns), suggesting that each person may have a unique representation of empathy. These findings raise the possibility that empathy is an idiosyncratic appraisal, with each individual evaluating others' negative experiences in a slightly different way. Future work should further explore what factors (e.g., personal experiences, perceiver characteristics, appraisals) lead to more similar patterns of activation within the MPFC during empathy.

TRAINING THE EMOTION REGULATION CIRCUIT USING FUNCTIONAL CONNECTIVITY-BASED REAL-TIME FMRI NEUROFEEDBACK: FEASIBILITY AND FUNCTIONAL RELEVANCE *Benjamin Becker, Zhiying Zhao, Shuxia Yao, Feng Zhou, Keshuang Li - Clinical Hospital of Chengdu Brain Science Institute, Key Laboratory for NeuroInformation, University of Electronic Science and Technology of China; Michael Luhrs, Rainer Goebel - Maastricht University; Keith Kendrick - Clinical Hospital of Chengdu Brain Science Institute, Key Laboratory for NeuroInformation, University of Electronic Science and Technology of China* Successful emotion regulation relies on an interplay between the amygdala and prefrontal regulatory regions. Deficient emotion regulation and attenuated amygdala- prefrontal functional connectivity represent a core characteristic across neuropsychiatric disorders. Recent technological advances allow the real-time analysis of fMRI data, a technique that has been employed to develop real-time fMRI-informed neurofeedback (rtfMRI-NF) trainings that enable subjects to gain volitional control over regional brain activity. Based on a neurocircuitry model of emotion regulation the present study evaluated an innovative connectivity-based rtfMRI-NF training approach to enable subjects to volitionally enhance functional connectivity in amygdala-prefrontal regulatory pathways to facilitate top-down control of negative affect. A cross-over single-blind sham- controlled design (n=26, healthy) was employed to evaluate the feasibility of

connectivity- based rtfMRI-NF and determine its functional relevance. During four subsequent training runs (4min each) with amygdala-ventrolateral prefrontal functional connectivity feedback subjects learned to volitionally increase connectivity in this pathway. On the behavioral level anxiety levels decreased following the training with the strengths of training-induced connectivity increases being predictive of the anxiety reduction. The regulatory ability was maintained when subjects were re-tested three days after the training. Importantly, a sham-training that used connectivity feedback from motor-circuits was not associated with comparable effects, arguing against unspecific training effects. Findings provide the first evidence for the feasibility and functional relevance of real-time fMRI connectivity- informed neurofeedback trainings. This approach might allow to evaluate the functional relevance of specific pathways in basic research and could provide a therapeutic strategy to normalize dysfunctional amygdala-prefrontal connectivity and strengthen emotion regulation in neuropsychiatric populations.

HOW AROUSAL INCREASES NEURAL GAIN AND ATTENTIONAL SELECTIVITY *Mara Mather – University of Southern California* Under arousal, people focus more on whatever is salient and remember it better later— but at the cost of processing other less salient information, which can lead to lapses of attention and memory. In this talk, I review evidence that the locus coeruleus, a small brainstem region with activity levels closely linked with arousal levels, increases mental selectivity under arousal by interacting differently with cortical regions representing highly salient stimuli than those representing less salient stimuli. This differential modulation based on salience is hypothesized to occur because local glutamate levels influence local norepinephrine release. Thus, local cortical conditions help determine how the locus coeruleus modulates brain activity. Consistent with this, in an fMRI study we found that the salience of place images interacted with arousal such that functional connectivity between the locus coeruleus and the place area was strongest when both the place stimulus being shown on that trial was highly salient and the tone played on that trial was arousing. At a more global level, our fMRI functional connectivity data also suggest that the locus coeruleus increases mental selectivity by stimulating the frontoparietal attention network. Together, these mechanisms explain how mental focus narrows and sharpens when people are in high arousal situations, and how the locus coeruleus flexibly and rapidly identifies what mental processing to enhance under arousal and what to suppress.

Keynote Keynote Address

Thursday, May 3, 2018

4:45 – 5:45 PM

Introduced by: Elizabeth Phelps

Joseph LeDoux Center for Neural Science, NYU; Emotional Brain Institute, NYU; Nathan Kline Institute

ABSTRACT

HAVE WE MISUNDERSTOOD FEAR? *Joseph LeDoux – Center for Neural Science, NYU; Emotional Brain Institute, NYU; Nathan Kline Institute* Fear is a fundamental part of human life, and plays a central role in psychiatric disorders. One of the main ways that fear has been related to brain mechanisms is through studies of defensive behavior in animals. This research has been very successful in revealing the brain's so-called "fear" system. The field has now matured to the point where a sharper conceptualization of what is being studied could be very useful as we go forward. Terms like "fear system" blur the distinction between processes that give rise to conscious feelings of fear and non-conscious processes that control defense responses elicited by threats. While mechanisms that detect and respond to threats contribute indirectly to conscious feelings of fear, they are not the same as those that give rise to conscious fear. This is an important distinction since symptoms based on conscious and non- conscious processes may be vulnerable to different predisposing factors and may also be treatable with different therapeutic approaches in people who suffer from uncontrolled fear or anxiety.

Posters Poster Session A & Welcome Reception

Thursday, May 3, 2018

5:45 – 7:00 PM

See page 35 for abstracts.

Friday, May 4, 2018

Breakfast

Friday, May 4, 2018

8:00 – 9:00 AM

Symposium Learning

Friday, May 4, 2018

9-10:15am

Philippe Tobler, University of Zurich

Julia M. Rodriguez-Buritica, Freie Universität Berlin
Geert-Jan Will, Leiden University

Daphna Shohamy, Columbia University

ABSTRACTS

SOCIAL REINFORCEMENT LEARNING *Philippe Tobler – Laboratory for Social and Neural Systems Research, Department of Economics, University of Zurich* Humans and animals learn not only about their own outcomes but observe also those of others and may apply individual learning for the benefit of others. Social learning can be modulated by characteristics of the other individual such as group membership and by characteristics of the learning individual, such as prosocial value orientation. For both of these cases, I will present example studies from my group where we introduce computational models into the domain of social learning. I then focus on more recent research for which we use functional neuroimaging in the context of a randomized intervention design, where either an ingroup or an outgroup member provided costly help to the learning individual inside the scanner. We find that individuals who learn that others provide costly help can overcome negative biases, such as reduced neural empathy for the physical pain experienced by outgroup members. Moreover, individuals may learn to react less strongly to their own physical pain after having received costly help from outgroup members. These effects are implemented by the insula, a region that is responsive to both social and individual pain. The findings suggest that computational models originally developed to capture individual learning easily extend into the domain of social learning and that learning could provide a route for overcoming group-related social biases.

EXAMINING NEURAL CORRELATES OF OBSERVATIONAL REINFORCEMENT LEARNING ACROSS DEVELOPMENT *Julia M. Rodriguez-Buritica – Freie Universität Berlin; Ben Eppinger – Concordia University; Hauke R. Heekeren - Freie Universität Berlin; Eveline Crone, Anna C.K. van Duijvenvoorde – Leiden University* Childhood and adolescence are considered as important periods for social development and learning, but little is known about children's learning in social situations. An important type of social learning is observational learning that can be more beneficial than learning from own outcomes, for instance when potential outcomes are negative. In an functional magnetic resonance imaging (fMRI) experiment we investigated the behavioral and neurobiological changes underlying individual and observational learning in 30 children (8-10-year-olds) and 30 young adults (18-20-year-olds) using a probabilistic reward- based observational learning paradigm. Results showed that optimal option was chosen more frequently in the observational (i.e., other's actions and outcomes observable) than individual learning condition (i.e., neither actions nor the outcomes of other's observable) and more by adults than adolescents. Reinforcement learning models were used to determine prediction-errors to own and other's feedback. Model-based parametric fMRI analyses revealed that for own outcomes, reward-related regions (e.g., striatum and ventral medial prefrontal cortex) showed increases in activation when outcomes were better than expected, across both age groups. When observing other's outcomes, however, a reversed pattern was observed. That is, reward and cognitive control regions (e.g., striatum and dorsolateral prefrontal cortex (dlPFC)) increased activation when other's outcomes were worse than expected. Interestingly, children showed a diminished activation to other's outcomes in the dlPFC. Moreover, this dlPFC activation mediated the age-related increase in observational learning performance. These results suggest that neural mechanisms for learning from others are prone to developmental change, which is reflected in brain regions foremost related to cognitive control.

NEUROCOMPUTATIONAL MECHANISMS OF INDIVIDUAL DIFFERENCES IN SELF-ESTEEM *Geert-Jan Will – Leiden University; Michael Moutoussis, Palee M. Womack - Wellcome Trust Centre for Neuroimaging, University College London; Robb B. Rutledge, Raymond J. Dolan - Max Planck University College London Centre for Computation Psychiatry and Ageing Research* People differ in the extent to which their self-esteem is shaped by what other people think of them. We used functional MRI to examine the neural mechanisms underpinning such individual differences in young adults (n =61) who performed a task in which they repeatedly reported on their self-esteem after receiving social feedback. Participants were recruited from a large community sample (n = 1,025) based on prior assessments of self-esteem to ensure that our sample included the full spectrum of trait self-esteem. We used a computational model that quantifies social prediction errors that capture the difference between expected and received social feedback. We find that trait self-esteem predicts the extent to which people use these social prediction errors to: 1) learn what to expect from others and 2) update their self-esteem based on the outcome of these expectations. Low trait self-esteem was associated with low expectations about being liked and a decreased tendency to use social prediction errors to update beliefs about whether others would like them, which correlated with activity in the nucleus accumbens. Low trait self-esteem was associated with increased fluctuations in self-esteem, and this was reflected in increased prediction error responses in the anterior insula. Our results demonstrate that neural signals involved in learning about

the social environment and updating self-esteem are represented in different parts of the brain. Our findings reveal the neurobiological basis of cognitive mechanisms associated with low self-esteem that may act as vulnerability factors to a range of common mental health problems.

USING MEMORY TO GUIDE DECISIONS *Daphna Shohamy – Columbia University* The ability to learn from experience is essential to adaptive behavior. In this lecture, I will present recent advances in understanding the neurobiological and behavioral mechanisms that allow everyday experiences to change the way we perceive, act, and make decisions. The lecture will focus on how multiple brain regions interact to support learning, what this means for how memories are built, and the consequences for how decisions are made. Results emerging from this work challenge the traditional view of separate learning systems and advance understanding of how memory biases decisions in both adaptive and maladaptive ways.

Coffee Break

Friday, May 4, 2018

10:15 – 10:30 AM

Blitz Talks Trainee Data Blitz

Friday, May 4, 2018

10:30-11:30am

Björn Lindstrom, University of Zürich

Federica Meconi, University of Birmingham

Hayley M. Dorfman, Harvard University

Sivan Kinreich, Icahn School of Medicine at Mount Sinai
Daniel Ames, UCLA

Rosemarie E. Perry, New York University

Yuan Chang Leong, Stanford University

Marianne Reddan, University of Colorado Boulder

ABSTRACTS

TRANSFER OF SOCIAL FEAR LEARNING TO DECISION MAKING *Björn Lindstrom – Department of Economics, University of Zürich and Department of Clinical Neurosciences, Karolinska Institutet; Arimita Golkar – Stockholm Univeristy and Karolinska Institutet; Simon Jangard – Karolinska Institutet; Pyungwon Kang - Department of Economics, University of Zürich; Philippe N. Tobler – Department of Clinical Neurosciences, Karolinska Institutet; Andreas Olsson - Department of Economics, University of Zürich* Pavlovian conditioning, involving the formation of predictive associations between stimuli, is the standard model of how humans learn fear and avoidance. However, both etiological and experimental studies have shown that social learning is a common cause of human fears and phobias. These studies have so far only examined threat responses that are passively acquired and expressed. Yet, in real-life, associations acquired through observation is likely to influence active behavior, such as instrumental decision-making. The nature of this influence is however unknown. In three behavioral experiments (n=120) and one fMRI experiment (n = 44), we established this link between social fear learning and decision-making. We contrasted the influence of fear acquired by social observation (Exp. 1), direct experience (i.e., Pavlovian conditioning) (Exp. 2), and by verbal instruction (Exp.3) on subsequent decision-making (involving the cues from the conditioning session) using behavioral experiments and computational modeling. We found that the influence of observational fear conditioning on decision-making is remarkably strong, surprisingly inflexible, and can lead to distinctly maladaptive behavior. Comparison between experiments indicated that observational and direct, but not instructed, fear conditioning are based in the same Pavlovian computational system. Finally (Exp. 4), we found that that activity in the perigenual anterior cingulate cortex (pgACC), during both observational fear conditioning and decision-making, predicted the maladaptive transfer of social fear. Our results demonstrate the tremendous influence others' expressions of fears can have on one´s own behavior, and shed light on the underlying computational and neural mechanisms.

EMPATHY DRAWS ON AUTOBIOGRAPHICAL MEMORIES *Federica Meconi, Ian Apperly, Simon Hanslmayr – University of Birmingham* Empathy relies on the ability to mirror and to explicitly infer others' inner states. Accumulating evidence supports the idea that our memories interact with empathy when building a representation of others' inner states. However, direct evidence of a reactivation of autobiographical memories when it comes to empathizing with others' inner states is yet to be shown. We collected electroencephalographic activity from 28 participants while performing an empathy (i.e., the pain decision task) and a retrieval task. For each trial, participants viewed pictures of faces and were required to imagine that individual in a context described by a written sentence representing either non- autobiographical or autobiographical experiences of painful and neutral events. Participants judged how much empathy they felt for each individual depicted in the specified context. The success of these manipulations was confirmed by participants' higher self-reported empathy for faces depicted in autobiographical compared to non-autobiographical contexts. In the retrieval task participants were cued to imagine the painful and neutral contexts "in their mind's eye", and these data became the training set for a pattern classifier, which was then applied to data from the empathy task to test for evidence

that the same memories were activated. The results showed evidence for the reactivation of autobiographical memories in preparation for the empathy judgement independent of the emotional content of the memory. These findings demonstrate that autobiographical memories are involved in drawing our empathy

CAUSAL INFERENCE EXPLAINS ASYMMETRIC LEARNING OF POSITIVE AND NEGATIVE OUTCOMES *Hayley M. Dorfman, Rahul Bhui – Harvard University; Brent L. Hughes – University of California at Riverside; Samuel J. Gershman – Harvard University* People learn disproportionately from good and bad outcomes, but the factors that influence this asymmetry remain unclear. We argue that these valence-dependent learning asymmetries are partly driven by people's beliefs about the causal structure of the environment. If hidden forces in the environment can intervene to generate bad (or good) outcomes, then a Bayesian observer will assign blame (or credit) to them, thereby reducing the effect of the outcome on learning about the underlying reward structure. To test this hypothesis, we conducted two experiments in which we explicitly manipulated participants' beliefs about the behavior of hidden agents. In Experiment 1, we sought to test whether we could create asymmetric learning between positive and negative feedback by manipulating outcome controllability in a novel behavioral task. We also investigated whether participant behavior could be modeled with a Bayesian reinforcement learning model that accounted for inferences about the probability of hidden outcome intervention. We demonstrate both kinds of learning asymmetries in the same paradigm as predicted by our hypothesized model. In Experiment 2, we replicate the results of Experiment 1 in a more realistic scenario, where the probability of hidden interference is not known and must be estimated from observed outcomes. We also provide evidence that participants' beliefs about latent causes are related to individual differences in trait optimism, and can be partially explained by early-life environment.

BRAIN-TO-BRAIN NEURAL SYNCHRONY DURING SOCIAL INTERACTION IN COUPLES *Sivan Kinreich – Icahn School of Medicine at Mount Sinai; Amir Djalovski – Interdisciplinary Center; Yourom Louzoun – Bar Ilan University; Ruth Feldman – Interdisciplinary Center* Humans are fundamentally social and the capacity to function competently within the social world shapes our physical health and emotional well-being throughout life. However, the mechanisms by which humans coordinate their brain response during social interactions are not fully understood. We used hyperscanning EEG recordings to measure brain-to-brain synchrony during male-female social interaction, comparing romantic couples to strangers. Results revealed that gamma synchrony between brains was found for couples, but not for strangers, localized to temporo-parietal structures. Notably, couples' neural synchrony was anchored in behavioral synchrony; during episodes of shared gaze and positive affect brain coupling was observed but synchrony was minimal during moments of no gaze or neutral affect. Among strangers, longer periods of gaze and positive affect and perceived involvement in the interaction increased brain-to-brain synchrony. Our findings, the first to describe mechanisms of neural synchrony between two individuals during natural interaction in relation to ongoing social behavior, ground neural coordination in micro-level nonverbal social cues. Results also highlight the role of familiarity and shared emotionality in neural coupling, implicate attention and prediction-making in brain coordination, and suggest the involvement of embodied simulation and mentalizing processes in brain-to-brain synchrony.

PREDICTING THE EFFECTIVENESS OF HEALTH MESSAGING THROUGH FMRI AND FNRIS *Daniel Ames, Grace Gillespie, Shannon Burns, Macrina Cooper-White, Kevin Tan, Matthew Lieberman - UCLA* Many people want to take better care of themselves (e.g., to exercise more or to get more sleep). However it can be difficult to translate these intentions into actions. Persuasive messaging that encourages healthier choices can be helpful or harmful depending on whether it is perceived as encouragement or nagging. The present research investigates the neural mechanisms of persuasion--specifically, how to successfully persuade people to actually enact the heathy behaviors that they themselves endorse. Participants wore biotrackers (FitBits) for two weeks, providing an objective index of sleep behavior. Participants also provided daily diary data on sleep and exercise. After the first week of biotracking (baseline), participants underwent scanning-- either fMRI (N=60) or fNRIS (N=60)--while viewing messages that encouraged them to get more sleep. These persuasive messages were ostensibly culled from the online forum reddit.com. Their content was held constant across participants. However the framing of the messages was systematically varied. For half of participants, the persuasive vignettes were framed as prescriptive statements ("You need to sleep more, because here's what will happen to your thinking and creativity..."). The other half of participants saw the same information framed as a set of personal narratives ("I slept more, and here's what happened to my thinking and creativity..."). Neural responses in medial prefrontal cortex predicted whether participants got more sleep following persuasive messaging. Moreover, results suggest that narrative may provide a vehicle for translating intentions into actions.

ENRICHED PEER RELATIONSHIPS PREVENT SOCIAL NEUROBEHAVIORAL DEFICITS FOLLOWING EARLY LIFE ADVERSITY *Rosemarie E. Perry, Stephen H. , Catherine Ubri, Divija Chopra, Eric D. Finegood , Meriah L. DeJoseph, Regina M. Sullivan, Cristina M. Alberini , Cybele Raver, Clancy Blair – New York University* Early-life adversity is associated with disrupted social developmrent interventions for at- risk children target the improvement of caregiver-child relationships to optimize the context in which a child's social learning occurs. Less research is assessing the ability of peer-to-peer relationships to influence social development following adversity, especially in middle childhood when peer groups are more central in youth's lives. Using a rodent model, this study investigated whether peers influence social development following adversity at both behavioral and neurobiological levels. We hypothesized that an early- life environment of scarcity would negatively impact social behavior and stress physiology in peri-adolescent rats. We further hypothesized that following a 2-week intervention in which scarcity-reared rats were pair-housed with a control rat, scarcity-reared rats would show restored social behavior. Subjects were randomly assigned to control or scarcity conditions (insufficient wood shavings) from postnatal days (PN) 8-12. At weaning, rats were randomly assigned to matched (two animals from same rearing condition) or mismatched peer housing conditions (one scarcity animal, one control animal). At PN37- 47 social behavior was assessed and glucocorticoid receptor (GR) levels were quantified in the medial prefrontal cortex (mPFC) and dorsal hippocampus (dHC). Results showed that early-life scarcity reduced social motivation, which correlated with heightened GR levels in the dHC and mPFC. The co-housing of scarcity and control rats repaired social motivation levels of the scarcity cage-mate, without affecting the social development of the control cage-mate. Our results provide a novel manipulation of peer relationships that supports the remediation of altered social behavior following early-life adversity.

NEUROCOMPUTATIONAL MECHANISMS UNDERLYING MOTIVATIONAL BIASES IN DECISION-MAKING *Yuan Chang Leong – Stanford University; Brent L. Hughes – University of California, Riverside; Yiyu Wang, Jamil Zaki – Stanford University* Our desires and wants can often cloud our judgment, resulting in systematic biases in how we make decisions. Here, we combined computational modeling with fMRI to study motivational biases in decision-making. Participants were presented with morphed images comprising a mixture of a face and a scene, and were rewarded for correctly categorizing whether each image predominantly displayed a face or a scene. On each trial, we manipulated the category participants wanted to see by instructing them that they would win or lose extra money if the upcoming image was of a particular category. Even though the reward maximizing strategy was to perform the categorization accurately, the motivation manipulation biased participants' categorizations and impaired their performance on the task. This motivational bias was associated with greater activity in the salience network and reward-sensitive regions in the brain, as well as an enhanced neural representation of the motivation-consistent category. In particular, activity in the nucleus accumbens was associated with individual and trial-by-trial differences in motivational bias. Participants' choices were well described by a drift diffusion model in which motivation biased both the starting point and rate of evidence accumulation in favor of the motivation-consistent category. Furthermore, the bias in the rate of evidence accumulation was not fixed across trials, but varied as a function of trial-by-trial activity in the nucleus accumbens. Our results highlight the role of the reward circuitry in motivational biases, and provide a computational description of how the drive for reward can lead to suboptimal decisions.

A NEURAL BASIS FOR EMBODIED EMOTION *Marianne Reddan – University of Colorado Boulder; Luke Chang – Dartmouth College; Tor Wager – University of Colorado Boulder* Emotion is often described as something people 'feel' in their bodies (i.e., sadness can be described as a 'lump in the throat'). Embodied emotion theorists propose that this connection is not purely linguistic; perceiving an emotion may require somatosensory and motor simulations. However, it remains unclear whether self-reports of emotion-related bodily sensations are related primarily to (1) autonomic physiological responses, or (2) brain regions responsible for perception, bodily action, and sensation, or (3) cognitive appraisals. To investigate this, participants were shown arousing emotional images ranging in valence, complexity, and content. fMRI data and physiological responses were recorded. Participants then rated the images on a set of emotion appraisal scales, both in the lab and online, and indicated where on a body map they experienced sensation in response to the image. Representational similarity analysis was used to compare the emotional content in the body maps with physiological responses and appraisals. Rank correlations revealed that physiology was more closely related to self-reported body maps than appraisals. A pairwise distance matrix between the body maps generated for each stimulus was then used in a whole brain voxel-wise searchlight analysis to identify brain regions which reflect the representational geometry of embodied emotion. This analysis revealed a network including bilateral primary somatosensory and motor cortices, precuneus, insula, and medial prefrontal cortex. The results of this exploratory study suggest that the relationship between emotion and the body is not abstract: It is supported by both physiological responses and sensorimotor cortical activations.

Symposium SOCIAL COGNITION

Friday, May 4, 2018

11:30am-12:45pm

Grit Hein, University of Würzburg

Niv Reggev, Harvard University

Julia Sliwa, The Rockefeller University

Frank Van Overwalle, Vrije Universiteit Brussel

ABSTRACTS

A neuroscience approach to prosocial motivation *Grit Hein – Translational Social Neuroscience Unit, Department of Psychiatry, Psychosomatic and Psychotherapy, University of Wuerzburg, Germany* All goal directed human behavior is driven by motives. With regard to prosocial behaviors, this fundamental assumption becomes complex. Prosocial behaviors can be incited by different motives such as concern for the other (empathy), concern for a social norm (e.g., reciprocity), or concern for one's own group (collectivism). Identifying the motive(s) behind a prosocial decision is difficult, because motives are not directly observable, and different motives might interact. In my talk I will present recent work that illustrates how neuroimaging methods such as functional magnetic resonance imaging (fMRI) can be used to investigate prosocial motives. The potentials and limitation of this approach will be discussed and important questions for future research will be outlined.

STEREOTYPE CONFIRMATION TRIGGERS REWARD-RELATED NEURAL ACTIVITY *Niv Reggev, Jason P. Mitchell – Harvard University* Changing pre-existing stereotypes is a notoriously daunting task. However, little is known about the neural mechanisms supporting their persistence. Here we probe a novel hypothesis suggesting that the confirmation of stereotype-based predictions triggers reward-related neural activity, therefore leading to a positive experience whenever stereotypes are confirmed. Undergoing fMRI, participants were presented with 204 verbal statements describing various characteristics which were pre-tested to be either consistent, ambiguous or inconsistent with gender stereotypes. Each statement was followed by a male or a female face, and participants judged how likely the presented person was to be characterized by the description. Subsequently, participants completed the monetary incentive delay (MID) task, which allowed us to localize reward-sensitive neural regions. Results indicated that viewing stereotype-consistent information was associated with more activation in reward-related regions relative to stereotype- inconsistent (and stereotype-neutral) information. Subjective likelihood of statement-face association also predicted reward-related neural activity. Importantly, even stereotype- consistent associations which were subjectively judged as unlikely triggered more activity in these regions compared to stereotype-inconsistent information. Initial behavioral evidence from additional experiments further supported the

rewarding nature of stereotype confirmation. After judging the likelihood of 80 face-statement associations, participants provided their preferences of individuals in a two-alternative forced choice (2AFC). Within each face pair, one individual was previously associated with stereotype- consistent information and another with stereotype-inconsistent information. Participants' preferences of the former individuals increased compared to their pre-task preferences. Overall, these findings provide initial support for the role of the reward system in the reinforcement of established stereotypes.

COMPARING HUMAN AND MONKEY NEURAL CIRCUITS FOR PROCESSING SOCIAL SCENES *Julia Sliwa – The Rockefeller University; Sadie R. Marvel – Bard College; Geena Ianni, Winrich A. Freiwald – The Rockefeller University* Recognizing agents, their actions, and their interactions is essential for understanding the world around us. In the monkey brain, these cognitive steps engage serially three distinct neural circuits: The face and body patches, the Mirror Neuron System (MNS) and finally the Exclusively Social Interaction Network (ESIN), a putative precursor of the Theory of Mind (ToM) network in monkeys (Sliwa J and Freiwald WA, Science 2017). It remains unknown however whether homologous brain regions are involved in humans, or whether humans and monkeys employ different neural strategies to process social scenes. To answer these questions we scanned twenty-six human subjects for fMRI acquisition, while they were presented with the same videos as the ones presented to monkeys, and additionally with videos of social scenes involving human actors. Whole-brain activity for watching individuals, their actions and their interactions was compared to the activity for watching control videos of objects' still, moving and interacting, using RFX GLM. We show that similarly to monkeys, humans 1) engage face and body areas (mapped independently) in all social video conditions, and 2) engage the MNS (mapped independently) in a generic manner for watching agent-object, agent-agent and object- object interactions. Yet contrary to monkeys, humans spontaneously engage the ToM network (mapped independently) even when watching non-acting agents or agents performing goal-directed actions. These preliminary results identify which neural strategies are shared and which ones adapted to the specific needs of the species, and specifically emphasize the uniquely human interest in understanding peers' goal-directed actions.

THE ROLE OF THE CEREBELLUM IN UNDERSTANDING SOCIAL ACTION SEQUENCES *Frank Van Overwalle, Sarah De Coninck, Mario Manto, Peter Mariën - Vrije Universiteit Brussel* Recent neuroimaging research has revealed that the posterior cerebellum plays a critical role in social reasoning, and in particular in understanding false beliefs and making trait attributions. A recent meta-analysis (Van Overwalle, Baetens, Mariën, & Vandekerckhove, 2014), including over 350 functional magnetic resonance imaging (fMRI) studies, identified robust clusters in the cerebellum that showed activity in about one third of the fMRI studies on social cognition, and in about all studies that involved complex social inferences (cf. Trope & Liberman, 2010). Although initially a domain- general modulatory explanation was offered (Van Overwalle et al., 2014), novel evidence substantially favored the view of a domain-specific process (Van Overwalle et al., 2015). This domain-specific social function was confirmed by a meta-analytic connectivity analysis involving 34 studies (578 participants; Van Overwalle, D'aes, & Mariën, 2015), and a multi-study analysis exploring functional connectivity within individual participants pooled across five published studies (92 participants; Van Overwalle & Mariën, 2015),

showing unique cerebro-cerebellar links between the mentalizing networks of the cerebellum and the cerebrum. But what exactly is the cerebellum doing during social mentalizing? One hypothesis is that the cerebellum is responsible for the understanding of sequences of motions and actions, and the automatization of these action sequences. Automatization of actions in their correct order are a prerequisite for understanding false beliefs and traits. In order to explore this hypothesis, we tested for the first time patients with generalized cerebellar degenerative lesions on a number of tests of social and affective understanding, and compared their performance with matched control volunteers. The tests involved matching of different faces showing the same affective expression, understanding mentalizing during reading false belief stories (Dewey, 1991), making causal and trait attributions on the basis of short behavioral sentences (Kestemont et al., 2016), and generating the correct order of social actions depicted in cartoons (Langdon & Coltheart, 1999). Only the latter tests showed clear deficits in cerebellar patients. In particular, patients performed at or close to normal in generating the correct order in mechanical stories and social scripts, but performed much worse when dealing with cartoons depicting false beliefs. In addition, cerebellar patients performed marginally worse on trait attributions inferred from verbal behavioral descriptions. We discuss extensions of the present tests in order to develop additional control conditions and tasks, including matched true beliefs stories that are equally non- scripted as the false stories, and verbal versions of the false and true belief cartoon test, in order to get a better understanding of the social impairments of the cerebellar patients and the critical role of the cerebellum in social understanding.

Lunch

Friday, May 4, 2017

12:45 – 2:15 PM

Session on Grant Funding Process (begins at 1:15 PM):

Tamera Schneider, Deputy Division Director, Behavioral and Cognitive Sciences, National Science Foundation **Janine Simmons**, Chief, Social and Affective Neuroscience Program, National Institute of Mental Health **Lisbeth Nielsen,** Chief, Individual Behavioral Processes Branch, National Institute on Aging **Luci Roberts,** Program Officer, Division of Neuroscience, National Institute on Aging

Symposium COMMUNICATION

Friday, May 4, 2018

2:15-3:45pm

Janice Chen, Johns Hopkins University

Benjamin Turner, Nanyang Technological University

Beau Sievers, Dartmouth College

Asif A. Ghazanfar, Princeton University

ABSTRACTS

SHARED EXPERIENCE, SHARED MEMORY; NEURAL DYNAMICS UNDERLYING PERCEPTION AND MEMORY DURING CONTINUOUS NATURAL EVENTS *Janice Chen – Johns Hopkins University* How do we construct and recall memories of complex real-world episodes? I present a series of studies examining memory encoding and retrieval using naturalistic continuous stimuli: audiovisual movies and auditory narratives. Inter-subject temporal and spatial correlation techniques allow us analyze neural responses as subjects view audiovisual movies and then freely recount aloud their memories of the events. Activity patterns in the default network reveal a common neural code: event-specific brain states that are robustly similar across individuals during spoken recall, despite the fact that each person chooses their own words to describe each memory. Furthermore, listening to a person's spoken recollection elicits signatures of the described movie events in the brains of the listeners, illustrating how speech is used to communicate memories between people. These studies probe the nature of brain activity underlying our ability to comprehend and recall real-world events that unfold continuously across time.

WHAT MAKES BRAINS DIFFERENT? INDIVIDUAL DIFFERENCES FACTORS EXPLAIN SHARED ACTIVITY PATTERNS DURING MESSAGE PROCESSING *Benjamin Turner – Nanyang Technological University, Wee Kim Wee School of Communication and Information; Richard Huskey – The Ohio State University, Cognitive Communication Science Lab, School of Communication; Rene Weber – UC Santa Barbara, Media Neuroscience Lab, Department of Communication* Much communication research treats individuals as interchangeable. However, individuals vary widely, behaviorally as well as neurally. Using a task in which 28 participants watched anti-drug public service announcements (PSAs), we have previously shown that by considering individual differences (IDs) along a single binary dimension (drug-use risk), we can gain important insights into message processing (Huskey et al., 2017; Weber et al., 2014). However, the variety of individuals is far richer than one binary dimension can capture. Therefore, in the present work, we take a multi-dimensional ID approach (see, e.g., Miller et al., 2012) to explore which ID factors—including sensation seeking, brain structure, and message perception measures—drive patterns of brain activity to be more or less similar across individuals encountering the same anti-drug PSAs. Our results demonstrate that several ensembles of regions show activity patterns driven by unique factors; for instance, activity patterns in regions including the middle temporal, inferior frontal, and precentral gyrus were all related to perceived message sensation value (Morgan et al., 2003), while those in regions including perirhinal cortex, inferior insula, and precuneus were related to sensation seeking and brain structure. Standard group fMRI analyses failed to detect activity in several of these regions, as it was washed out through averaging. This work demonstrates the importance of considering the correct level of specificity when studying message processing—in terms of brain region, message features, and IDs—and points the way

toward possible advances in message tailoring based on neural as well as message features.

CONVERSATION AND NEURAL INFLUENCE IN SOCIAL NETWORKS *Beau Sievers – Dartmouth College; Adam M. Kleinbaum – Tuck School of Business, Dartmouth College; Thalia Wheatley – Dartmouth College* Short conversations can create lasting changes in belief. On the level of the community or society, these changes have profound effects. For example: we choose who to vote for in part based on conversations with others, and jury deliberations decide the fates of tens of thousands every year. We present a neuroimaging and social network study of how conversation changes belief, testing three hypotheses: (1) consensus-building conversation synchronizes neural activity, (2) social influence is neural influence— influential people can alter others' neural activity to become more like their own, and (3) people who exert strong neural influence hold privileged, central positions in their social networks. Students at Dartmouth's Tuck School of Business (N~=275) completed an online social network survey, mapping the social network of the entire population. Study participants (N=33) viewed 5 silent movie clips with ambiguous narrative content during functional magnetic resonance imaging (fMRI). Participants split into groups of 3–6 and discussed the movie clips with the goal of reaching a consensus interpretation of their content. Participants then underwent a final fMRI session, viewing the movie clips a second time alongside new clips from later in each movie. We show increased neural inter-subject correlation and pattern similarity across a network of brain areas within discussion groups, versus both other groups and controls. This approach introduces a novel measure of neural influence and elucidates the relationship between neural and behavioral measures of influence and social network centrality.

THE INTEGRATIVE BIOLOGY OF SOCIAL BEHAVIOR AND ITS DEVELOPMENT *Asif A. Ghazanfar – Princeton Neuroscience Institute, Princeton University* Behavioral development is the adaptive coordination of biomechanics, muscles and the nervous system with social experience. My lab explores one type of social behavior— vocal communication—to illuminate how this process works. It is typically conceived that adaptive coordination occurs through a sequence of two processes—an early maturation phase where vocal sounds change as a function of body growth followed by a period during which social experience can influence vocal production. I will review my lab's work on developing marmoset monkeys — a species that exhibits strikingly similar vocal developmental processes to those of prelinguistic human infants — that demonstrates how bodily growth and experience are actually parallel, interactive processes. Our experiments reveal how some behavioral changes that are typically attributed to changes in the developing nervous system are actually off-loaded to the body (i.e., they are "morphologically computed"), while at the same time social reinforcement from caregivers leads to an acceleration of other behavioral changes through learning. Together, these data underscore the importance of considering the whole organism, not just the nervous system, when trying to understand how social behavior works or may go awry.

Posters Poster Session B & Coffee Break

Friday, May 4, 2017

3:45 – 5:00 PM

See page 64 for abstracts.

Symposium Presidential Symposium

Friday, May 4, 2018

5:00 – 6:15 PM

Deanna Barch, Washington University in St. Louis

Kevin Pelphrey George Washington University

ABSTRACTS

MOTIVATIONAL FUNCTION ACROSS THE SPECTRUM OF PSYCHOPATHOLOGY *Deanna Barch – Washington University in St. Louis* The Research Domain Criteria (RDoC) initiative has recognized the importance of studying motivation and hedonic processing in psychopathology and includes a “positive valence” system domain that captures many relevant constructs. This talk will review behavioral and neuroimaging studies examining impairments in these constructs in individuals with psychosis versus depressive pathology, as there appear to be important differences patterns and neural alterations associated with reward and hedonic function in psychosis versus depression. In depressive pathology, impairments in the experience of pleasure may propagate forward and lead to impairments in other aspects of the positive valence system that are reliant on hedonic responses, such as anticipation, learning, effort, and action selection. Such pleasure impairments in the context of depression could reflect disruption in dopamine and/or opioid signaling in the striatum related to depression more generally, or more specifically to anhedonia symptoms. In contrast, the existing data indicate relatively intact in-the-moment pleasure experience in psychosis, but disruptions in other components involved in the positive valence system. Specifically, individuals with schizophrenia exhibit altered reward prediction and associated striatal and prefrontal activation, impaired reward learning, impaired reward- modulated action selection, and impaired effort-cost decision making, which may combine to disrupt goal-directed behavior and function in everyday life. Thus, this talk will illustrate the potential for diverse mechanistic pathways leading to common proximal outomes.

Towards a Social Neuroscience of Autism Spectrum Disorders *Kevin Pelphrey – George Washington University* As humans, we are constantly engaging in social perception and social cognition, using cues from facial expressions, gaze shifts, and body movements to infer the intentions of others and plan our own actions accordingly. In this talk, I will describe my laboratory’s research using functional neuroimaging techniques including functional magnetic resonance imaging (fMRI), electroencephalography (EEG) and functional near infrared spectroscopy (fNIRS) to chart the development of brain

mechanisms for social cognition in typically developing infants, children, and adolescents. Our work has served to characterize the functional properties and development, from infancy to adulthood of a set network of interacting, distributed neuroanatomical structures dedicated to processing social meaning. With this understanding of the typical development of the neural basis of social cognition as a backdrop, I will describe our efforts to chart the atypical development of these brain mechanisms in infants at increased risk for developing autism and children with autism, as well as their unaffected siblings. I will then describe a developmental experimental therapeutics approach to using social neuroscience findings in the development and evaluation of more precise, individually-targeted behavioral and pharmacological treatments for autism spectrum disorders.

Posters **Poster Session C & Coffee Break**

Friday, May 4, 2018

6:15 – 7:30 PM

See page 94 for abstracts.

Saturday, May 5, 2018

Breakfast

Saturday, May 5, 2018

8:00 – 9:00 AM

Symposium **DECISION-MAKING**

Saturday, May 5, 2018

9:00-10:15am

Nathaniel Daw, Princeton University
Candace Raio, New York University

Pin-Hao Chen, Dartmouth College

Cendri Hutcherson, University of Toronto

ABSTRACTS

APPROXIMATE ACTION EVALUATION: HABITS AND BEYOND *Nathaniel Daw – Princeton University* In many tasks, such as mazes or social interactions, effective decision making typically requires enumerating the expected outcomes of candidate actions over a series of subsequent events. Because of the computational complexity of such evaluation, it is believed that human and animal brains use a range of shortcuts to simplify or approximate it. I review behavioral and neural evidence that humans rationally trade off exact and approximate evaluation in such sequential decision making. This research offers a new perspective on healthy behaviors, like habits, and pathological ones, like compulsion, which are both viewed as approximate evaluations that fail to incorporate experiences relevant to a decision and instead rely on inappropriate or out-of-date evaluations. I also present new theoretical and experimental work that aims to address the the positive counterpart to such neglect: which particular events are considered, in which circumstances, to support choice. This brings the reach of the framework to many new phenomena, including pre-computation for future choices, nonlocal activity in the hippocampal place system, consolidation during sleep, and a new range of disordered symptoms such as craving, hallucinations, and rumination.

A NOVEL APPROACH TO QUANTIFYING THE SUBJECTIVE COST OF SELF-CONTROL *Candace Raio, Paul Glimcher – New York University* Emerging theoretical accounts suggest that rather than a 'failure' of self-control, deviations from goal-directed behavior may arise from a rational decision-making process that weighs the costs and benefits of exercising control. These 'control costs' are thought to stem from the limited cognitive resources available to support the cognitive demands of exercising control. This proposal dovetails nicely with behavioral economic theory, which posits that choosers aim to maximize expected utility, extending these cost-benefit principles to the mobilization of self-control. Yet, we still lack an empirical qualification of how individuals construct self-control costs. Here, we employed a novel economic decision-making task to quantify self-control costs in healthy dieters and further tested how these costs are modulated by stress, a prominent risk factor for self-control failure. Before and after exposure to tempting food rewards, dieters reported how much they were willing-to-pay to adopt strategies to eliminate temptation from their environment, effectively revealing their subjective cost of exercising self-control. Across two studies, we found novel evidence that individuals were willing to incur monetary costs to avoid using self-control, offering a quantifiable index of individuals' aversion to deploying control processes. Further, we found these costs were higher in stressed individuals, revealing a novel mechanism through which self-control is compromised under stress. Consistent with emerging value-based framework viewing self-control as a cost-benefit decision, our results suggest that the subject cost of self-control can be quantified in humans and that these costs are strongly modulated by changes in affective and motivational states.

TOWARDS A NEUROMETRIC-BASED CONSTRUCT VALIDITY OF TRUST *Pin-Hao Chen – Dartmouth College; Dominic S. Fareri – Adelphi University; Berna Güroğlu, Eveline Crone – Leiden University; Mauricio Delgado – Rutgers University; Luke J. Chang – Dartmouth College* Trust is a nebulous construct central to successful cooperative

exchanges and interpersonal relationships. In this study, we introduce a new approach to establishing construct validity of trust using “neurometrics”. In study 1, we combine data from two studies (n=40) to develop a whole-brain multivariate pattern that can classify whether new participants will trust a relationship partner using a linear support vector machine combined with leave-one-subject-out cross-validation. Our trust signature was able to successfully discriminate decisions to invest compared to keep money with 74% accuracy ($p < 0.001$). In study 2, we find that the pattern can accurately discriminate trust decisions with an accuracy of 68% ($p < 0.001$) in participants collected in a separate country (n=17) demonstrating generalizability of the pattern. In study 3, we establish construct validity by testing the pattern on ten separate datasets measuring distinct psychological processes. We find that our trust signature can successfully discriminate safe compared to risky decisions (accuracy = 93%, $p < 0.001$) and viewing neutral images from those depicting negative arousing scenes (accuracy = 65%, $p < 0.001$). This is consistent with the notion that trust involves an expectation of reciprocation by a relationship partner to avoid negative betrayal experiences. Moreover, we find that the signature does not generalize to reward, social closeness, facial familiarity, cognitive control, self-referential processing, and language processing indicating that the pattern is highly specific. These results provide strong support for the use of “neurometrics” in identifying the psychological processes associated with a brain-based multivariate representation.

NO TIME TO BE NICE? MOTIVATIONAL AND COMPUTATIONAL DYNAMICS UNDERLYING ALTRUISTIC CHOICES *Cendri Hutcherson – University of Toronto*
Altruistic behavior is a ubiquitous feature of human behavior, yet is still incompletely understood. One fundamental and still contentious question concerns its underlying drivers: does altruism require the controlled suppression of rapid and automatic selfish instincts, or do people intuitively default to prosociality? Dual process models of choice have used a variety of approaches to answer this question, with conflicting results. To shed new light on these questions, we have begun to develop a neurocomputational model of altruistic choice capable of simulating and predicting the temporal dynamics of neural and behavioral responses. Here, I will show how a combination of data from fMRI, eye tracking, mouse-tracking, and time pressure studies can be used to inform and constrain the parameters of the computational model, generating unique insights into the processes driving prosocial behavior. Our results suggest that altruism is neither wholly automatic nor wholly controlled. Instead, selfish and altruistic motives evolve and shift dynamically over the course of just a few seconds depending on a host of inter- and intra- personal factors that change the motivational and attentional priorities of the decision maker. Our results have important implications for predicting when, why and for whom altruism might feel like a battle between inner demons and better angels, or like an intuitively obvious choice.

Posters Poster Session D & Coffee Break

Saturday, May 5, 2018

10:15 – 11:45 AM

See page 123 for abstracts.

Award Award Ceremony Address

Saturday, May 5, 2018

11:45 AM – 12:45 PM

Introduced by: Mauricio Delgado

Leah Somerville, Harvard University
SANS Early Career Award

Betsy Murray, National Institute of Mental Health
SANS Distinguished Scholar Address

ABSTRACTS

LOOKING AT SOCIAL AND AFFECTIVE NEUROSCIENCE THROUGH A DEVELOPMENTAL LENS *Leah Somerville – Harvard University* The field of social and affective neuroscience has made great strides toward revealing how the brain instantiates our social and emotional lives. My lab's developmental approach highlights the dynamic nature of these processes. We have begun to uncover how the transition from childhood to adulthood remodels social and emotional behaviors, and how those processes are yoked to active brain development. My talk will highlight the value of a developmental approach, and some of the new directions of our work.

SPECIALIZATIONS FOR DECISION MAKING IN PRIMATE PREFRONTAL CORTEX *Betsy Murray – National Institute of Mental Health* Some of the most sophisticated behaviors of primates, including humans, depend on the granular prefrontal cortex (PFC), yet there are few well defined and experimentally verified functional specializations within the primate PFC, especially at a causal level. Recent work from our laboratory has demonstrated contrasting specializations of the ventrolateral PFC (VLPFC) and the orbital PFC (also known as orbitofrontal cortex, OFC). We found that the OFC and the VLPFC play complementary roles in updating representations of value (i.e., valuations) that underlie decision making. Valuations represented in or accessed by the OFC depend on the dynamic internal state of an individual, what an object or action is worth at any given time based on current biological needs; valuations represented in or accessed by the VLPFC depend on dynamic external contingencies. In other words, the OFC updates valuations based on reward desirability whereas the VLPFC updates valuations based on reward availability. Additional studies have identified distinct functional subdivisions within the OFC. Its posterior part (area 13) is necessary for updating the valuations of objects and actions, while its anterior part (area 11) translates these valuations into choices and actions. According to comparative neuroanatomy, the granular parts of OFC and all of the VLPFC emerged during the evolution of primates, and it seems likely that their valuation-updating specializations elaborated on related functions performed by the agranular orbitofrontal areas that all mammals share.'

Lunch

Saturday, May 5, 2018

2:30 – 3:45 PM

Blitz Talks Faculty Data Blitz

Saturday, May 5, 2018

2:30-3:45pm

Harma Meffert, Boys Town National Research Hospital

Yoni (Jonathan) Levy, IDC Herzliya

Brendan Gaesser, SUNY Albany

Jennifer A. Silvers, University of California, Los Angeles

Peter Mende-Siedlecki, University of Delaware

Ebony M. Glover, Kennesaw State University

Yoko Nomura, Queens College, CUNY
Susanne Quadflieg, University of Bristol

ABSTRACTS

THE ROLE OF THE AMYGDALA IN THE EMPATHY-BASED STIMULUS-REINFORCEMENT LEARNING FOR DISGUSTED AND HAPPY FACIAL EXPRESSIONS
Harma Meffert – Center for Neurobehavioral Research, Boys Town National Research Hospital; Joseph Leshin – Carolina Affective Science Lab, University of North Carolina; James Blair - Center for Neurobehavioral Research, Boys Town National Research Hospital
Consistent with previous animal work, we recently showed that the human amygdala is computationally involved in empathy-based stimulus-reinforcement learning for fearful and happy expressions. Historically, the amygdala has been most consistently linked to the processing of fear, although more recent data suggests that it also processes sad and happy expressions. Given its more general involvement in aversive and appetitive stimulus-reinforcement learning, we wanted to examine whether the amygdala is involved in learning from facial expressions that do not consistently activate it. We utilized a social referencing paradigm to examine whether the amygdala is engaged in establishing object value from happy and disgusted facial expressions directed towards these objects. Thirty healthy adult volunteers observed objects in the middle of the screen. Neutral faces appeared next to the object, directed their gaze towards the object and then remained neutral or changed their emotion to happy or disgust depending on the object

(probabilistically). We show that the amygdala codes learning cues for happy as well as disgusted facial expressions. Interestingly, we also show that, apart from the amygdala, a larger network of regions, including the anterior insula, ventral striatum and inferior frontal gyrus processes learning cues as a function of participants overall learning accuracy. In summary, our data suggests that the amygdala is involved in learning from expressions that do not consistently activate it. This appears to be embedded within a larger network involving anterior insula, ventral striatum and inferior frontal gyrus.

THE EMERGENCE OF MULTIDISCIPLINARY APPROACHES SUPPORTING INTERGROUP CONFLICT RESOLUTION *Yoni (Jonathan) Levy – IDC Herzliya; Abraham Goldstein – Bar-Ilan University; Moran Influs - Bar-Ilan University; Shafiq Masalha – College of Academic Studies; Ruth Feldman – IDC Herzliya* One of civilization's most important challenges is finding ways to minimize intergroup conflicts. Despite their prevalence, few interventions have been rigorously researched to evaluate their actual impact on intergroup relations. In the present study, which is framed within the Israeli-Palestinian conflict, we applied an innovative approach to evaluate the impact of a traditional intergroup intervention. Guided by advances in the neuroscience of intergroup relations and building on our recent pioneering multidisciplinary study between Jewish-Israeli and Arab-Palestinian youth, we implemented a multi-level assessment (brain, implicit associations and social behavior) evaluating the impact of a contact-based intervention. To this end, 55 Jewish-Israeli and Arab-Palestinian adolescents were randomly assigned to participate either in a contact-based intervention or not (i.e., the control group). Participants' brain response to implicit associations was assessed right before and several months after the intervention using magnetoencephalography (MEG), and social behavior towards the outgroup was evaluated through one-on-one ecologically-valid interactions. Results show that the intervention did not significantly reduce negative implicit associations toward the outgroup at the reaction time level, yet, rhythmic neural activity associated with the implicit associations was strongly inhibited following the intervention. Importantly, the neural effect was coupled by a reduction in hostile social behavior toward the outgroup. These findings highlight the potential impact of the contact-based intervention, and at the same time reveal the utility of conducting multidisciplinary assessments. Finally, we currently evaluate the potential impact of other forms of intergroup contact (e.g., immersive virtual contact) and of interventional strategies in supporting intergroup conflict resolution.

A ROLE FOR THE MEDIAL TEMPORAL LOBE SUBSYSTEM IN GUIDING PROSOCIALITY: THE EFFECT OF EPISODIC PROCESSES ON WILLINGNESS TO HELP OTHERS *Brendan Gaesser – SUNY Albany; Mary Horn, Emily A. Wasserman, Liane Young – Boston College* Why are we willing to help others? Social neuroscience research has focused on neural systems supporting person perception and emotional reactions to the person in need; however, this person-centric view of prosociality overlooks the importance of how the helping event itself is represented. Recent behavioral work on episodic processes (i.e., the ability to represent an event that is specific in time and place) suggests that imagining and remembering scenes of helping a person in need increases intentions to help. Here, we provide insight into the cognitive and neural mechanisms that enhance prosocial intentions via episodic simulation and memory. In Experiment 1, we scanned participants using functional neuroimaging as they imagined and remembered

helping episodes, and completed non-episodic conditions that controlled for exposure to the story of need and conceptual priming of helping. Imagining and remembering helping episodes increased activity in brain regions within the default network and medial temporal lobe subsystem, and heightened participants' willingness to help others compared to control conditions. ROI analyses revealed that activity in the parahippocampus, hippocampus, as well as the RTPJ predicted the effect of conditions on the strength of prosocial intentions. In Experiment 2, we used transcranial magnetic stimulation to disrupt activity in the RTPJ, and better isolate the contribution of medial temporal lobe subsystem to prosocial intentions. These findings point to novel neurocognitive mechanisms for facilitating prosocial decisions, suggesting that our willingness to help others in need is guided, in part, by how easily we can construct imagined and remembered helping episodes.

A NEURODEVELOPMENTAL FRAMEWORK FOR THE ACQUISITION OF SELF-REGULATION *Jennifer A. Silvers – University of California, Los Angeles* Childhood and adolescence present novel socioemotional challenges. As such, a hallmark of health development is the acquisition of effective self-regulation skills. In the present two studies, we investigated age-related differences in self-regulation and their neural mechanisms across childhood and adolescence. Study 1 employed fMRI scanning in a sample of 112 healthy individuals ranging in age from 6-23 years. To assess self- regulation ('Regulation' trials), participants were instructed to emotionally distance themselves from aversive images on a subset of trials. These trials were compared to an emotional "baseline" condition wherein participants viewed images without regulating ('Reactivity' trials) to assess self-regulation. Age predicted significant linear reductions in negative affect and amygdala reactivity on Regulation trials. Study 2 followed up on Study 1 by examining whether increased cortical specialization in lateral prefrontal regions were associated with better self-regulation during childhood and adolescence. To this end, we used the same experimental paradigm in 38 youth aged 8-17 years as they underwent fMRI scanning. Cortical specialization was operationalized with a novel approach that entailed calculating Gini coefficients for lateral prefrontal regions of interest (Leech et al., 2014). Results revealed that youth who were more successful at self- regulating showed greater specialization in the lateral prefrontal cortex for Regulation, but not Reactivity trials. Together, these studies reveal that age-related changes in self- regulation hinge upon enhanced engagement of lateral prefrontal cortex and specifically, enhanced cortical specialization within lateral PFC. These data are significant both for both basic and translational neurodevelopmental work of self-regulation.

PERCEPTUAL AND NEURAL CONTRIBUTIONS TO RACIAL DISPARITIES IN PAIN CARE *Peter Mende-Siedlecki, Jennie Qu-Lee, Robert Backer – University of Delaware; Jay J. Van Bavel – New York University* The pain of Black Americans is systematically under-diagnosed and under-treated, compared to the pain of Whites. While other work has examined social-cognitive factors driving such biases (e.g., gaps in empathy, judgments of status, stereotypes about biological differences between Blacks and Whites), we tested whether racial bias in pain care stems from a perceptual source, as well. Across a series of behavioral and neuroimaging experiments (total N = 1297) using a novel stimulus set, we observed race- based disparities in both perceptual and neural indices of pain recognition. White participants consistently showed more stringent thresholds for recognizing pain on

Black faces, versus White faces. This bias was indeed perceptual in nature — arising from disruptions in configural processing associated with other-race faces, and was supported by divergent patterns of activity in brain regions associated with social perception — and could not be explained by differences in low-level stimulus features (e.g., luminance, contrast), or subjective evaluations related to pain (e.g., masculinity, dominance). We even observed these biases when facial structure and expression intensity were objectively equated across digitally rendered Black and White targets. Critically, we repeatedly observed that bias in pain perception predicted subsequent bias in treatment recommendations (specifically, grams of a non-narcotic pain reliever), over and above participants' explicit racial prejudice and stereotypes regarding status, strength, and pain tolerance. These data illuminate the perceptual underpinnings of disparities in pain care and can inform new interventions to bridge those gaps.

SEX DIFFERENCES IN EMOTION REGULATION: COMPARING NATURALLY CYCLING WOMEN, WOMEN USING HORMONAL CONTRACEPTION, AND MEN
Ebony M. Glover – Kennesaw State University Women are disproportionately diagnosed with anxiety disorders at more than twice the rates than men. There is a growing need for research examining biological underpinning of these sex disparities. Previous research has characterized estrogen as playing an important modulatory role in emotion regulation. However, there are mixed findings and limited understanding of the activational effects of natural cycling estrogen versus exogenous estradiol exposure (via hormonal contraceptives) on emotion regulation in women contrasted with men. The current study uses the fear-potentiated startle (FPS) paradigm to quantify psychophysiological correlates of emotion regulation (i.e., ability to inhibit acoustic startle responses in a safe context relative to a threatening context) in naturally cycling women, women on oral contraceptives, and men. Female participants were grouped as naturally cycling or combined oral contraceptive (COCs) users. Naturally cycling women were further divided into menstrual cycle phases (luteal vs. follicular) according to what day they fell on the menstrual cycle at the time of testing. In addition, saliva samples were collected for analysis of circulating levels of salivary 17β- estradiol immediately prior to testing. Women in the follicular (low estrogen) phase of their menstrual cycle and women using COCs showed deficits in emotion regulation compared to women in the luteal phase (high estrogen) and men. These data support previous findings that low estrogen may be a risk factor for anxiety. They also underscore the need for assessing contraceptive use as a critical variable when attempting to understand sex differences in emotion regulation and its clinical implications.

MICROBIOTA OF MECONIUM IN NEWBORNS IS ASSOCIATED WITH MATERNAL PREGNANCY SPECIFIC ANXIETY *Yoko Nomura, Wei Zhang – Queens College, CUNY; Melissa Huang, Scott Koenig – Graduate Center, CUNY; Jiazong Hu – Icahn School of Medicine at Mount Sinai* Emerging evidence shows that newborn infants' meconium is not sterile and the bacterial transmission between a mother and her infant takes place in utero via an unknown transmission mode. So far, little is known about whether mother's psychological well- being, measured by antenatal mood and anxiety, influences transmission of bacteria in utero from mothers and infants. The first intestinal discharge (i.e., meconium) from the 148 newborns was collected at birth. The meconium microbiome

was profiled using multi- barcode16S rRNA sequencing followed by taxonomic assignment and diversity analysis. The study aims to assess the diversity of the meconium microbiome and determine if the bacterial community is affected by mother's anxiety and depression during pregnancy. The results found that the meconium samples were not sterile and contained diversified microbiota. The most robust predictor for the overall meconium microbiota composition was pregnancy-specific anxiety (p-value=0.001). At specific taxa level, the greater pregnancy specific anxiety during pregnancy was related to the lower level of Enterococcaceae family (i.e., Enterococcaceae, comamonadaceae, enterococaceae, moraxellaceae, and enterococcacea) (p-value=0.00025, r=-0.42). In conclusion, our study supports evidence that meconium contains diversified microbiota and suggests that the initial colonization of the gut flora may start prior to birth. Furthermore, the meconium microbiome of babies born to mothers with greater pregnancy-specific anxiety is less enriched for specific bacterial OTUs. These findings can enhance our understanding of a non-genetic risk of transmission, and can potentially help design novel preventive measures among children of anxious women.

BIASED ATTITUDES AGAINST POSITIVE CROSS-RACE ENCOUNTERS *Susanne Quadflieg – University of Bristol; Yin Wang – Temple University; Thomas Schubert – University of Oslo* Initial data indicate that positive encounters between people of different racial backgrounds can elicit negative impressions in uninvolved bystanders. To examine this phenomenon in further detail, this study combined unobtrusive methods from social psychology and social neuroscience to probe Black as well as White Americans' attitudes towards other people's cross-racial encounters. In Experiment 1, an affective priming paradigm was used to demonstrate that both Black (n = 44) as well as White Americans (n = 44) evaluate the same positive encounters (e.g., a friendly chat) less favorably when it occurs between a Black and a White individual than when it occurs between two Black or two White individuals. In Experiment 2, functional magnetic resonance imaging (fMRI) revealed that both Black (n = 46) as well as White Americans (n = 42) respond with brain activity indicative of reduced reward processing (i.e., lower activity in the ventral striatum) and enhanced mentalizing (e.g., higher activity in the dorsomedial prefrontal cortex and the bilateral temporoparietal junction) towards other people's cross-race relative to same- race encounters. Together, the data begin to elucidate people's attitudinal bias against instances of racial egalitarianism in everyday life.

Presidential Closing Remarks

Saturday, May 5, 2018

3:45 – 4:00 PM

Mauricio Delgado, Rutgers University
SANS President

Poster Session A

Thursday, May 3, 5:45 – 7:00 PM

A-1 THE DYNAMIC PROCESS OF AMBIGUOUS EMOTION PERCEPTION *Michael Berkebile, Jonathan Freeman - New York University; Maital Neta - University of Nebraska– Lincoln* Everyday social interactions hinge on our ability to resolve uncertainty in nonverbal cues. For example, although some facial expressions (e.g., happy, angry) convey a clear affective meaning, others (e.g., surprise) are ambiguous, in that their meaning is determined by the context. Here, we used mouse tracking to examine the underlying process of resolving uncertainty. Previous work has shown suggested that negative ratings would be faster than positive ratings of surprise. We examined responses to filtered images in order to emphasize the faster, more automatic response (low spatial frequencies; LSF) as compared to slower, more elaborate processing (high spatial frequencies; HSF). We found a significant rating (positive, negative) x filter (LSF, HSF) x time (3 levels) interaction on mouse trajectory X-coordinates. This suggests there was a higher attraction to the negative response option even when participants responded "positive", and that this effect is significantly stronger for HSF than LSF trials, specifically in the middle of the response process. Further, mean trajectories were unimodally distributed, suggesting a parallel activation of both positive and negative responses on surprise trials, as opposed to sequential activation of one response option followed by the other. Since LSF images are processed more quickly than HSFs, decisions on these trials are attracted more directly to the negative response, and experience less response competition than HSFs. These results are consistent with previous work examining responses to filtered images of surprised faces, and demonstrating that a more regulated (prefrontal cortex) response is associated with positivity.

A-2 **SANS Poster Award winner USING TRANSCRANIAL DIRECT CURRENT STIMULATION TO EXAMINE THE DORSOLATERAL PREFRONTAL CORTEX'S ROLE IN INTERGROUP EMPATHY** *Claire R. Leibowicz - the D. E. Shaw group, New York, United States of America; Mina Cikara, Joshua, W. Buckholtz - Harvard University, Cambridge, United States of America* Counter-empathic responses (e.g., pleasure in response to another's pain or displeasure in response to another's fortune) are important drivers of intergroup aggression. This observation is consistent with recent models linking antisocial aggression to the positive valuation of harm to others; it also corresponds with data showing impaired prefrontal modulation of striatal action valuation in antisocial syndromes. Moreover, it suggests that group status comprises an important factor for considering social context-related adjustment of harm valuation. While counter-empathic emotions correlate with ventral striatal activity, what is not known is whether prefrontal modulation downregulates these counter-empathic responses. We used excitatory transcranial direct current stimulation (etDCS) to untangle the role of dorsolateral prefrontal cortex (DLPFC) in modulating the counter-empathic response to competitive out-group members. Participants (N = 113) were randomly assigned to one of two teams, and they received either active or placebo

stimulation while ostensibly competing in a problem-solving challenge. In contrast to our predictions, upregulating DLPFC function altered intergroup empathic, but not counter-empathic, responses. Specifically, etDCS attenuated the intergroup bias for negative empathy by increasing negative empathy toward out-group members and leaving in-group empathy relatively unchanged. By contrast, etDCS diminished the intergroup positive empathy gap by both increasing out-group empathy levels and simultaneously decreasing in-group empathy levels, by almost equal amounts. These surprising results suggest a potential role of the corticostriatal circuit in empathy and link to a growing literature examining the role of cortical asymmetry in empathic responding.

A-3 MIDBRAIN RESPONSES IN SOCIAL AVERSIVE LEARNING: NEURAL AND NEUROPHARMACOLOGICAL MECHANISMS *Jan Haaker - Department of Clinical Neuroscience, Karolinska Institute, Stockholm, Sweden & Department of Systems Neuroscience, University Medical Center Hamburg-Eppendorf, Hamburg, Germany; Björn Lindström - Department of Clinical Neuroscience, Karolinska Institute, Stockholm, Sweden & Department of Economics, University of Zurich; Jonathan Yi, Predrag Petrovic, Andreas Olsson - Department of Clinical Neuroscience, Karolinska Institute, Stockholm, Sweden* Social learning through observation of others shapes many of our expectations of aversive events. Yet, the precise neural processes that translate experiences observed in others into our defensive responses against aversive events are unclear. The midbrain PAG is a structure that is central in regulating how we learn from direct experiences of aversive events in order to orchestrate our defensive responses. However, the function of the PAG in responses to socially transmitted experiences is unexplored.We here show that conjunct activity within the PAG towards directly experienced as well as observed experiences in others is central for aversive learning to anticipate dangers. As such, the temporal dynamics of PAG responses were found to reflect others` and direct experiences of aversive events and modulation by expectancy. Furthermore, we provide evidence from another experiment that replicates the involvement of the PAG in social learning of threats through observation. Critically, PAG activity in this experiment is found to be sensitive to pharmacological blockade of opioid receptors as a critical neurochemical regulator in scaling social aversive learning. Diminished opioid receptor function led to enhanced PAG responses, which were functionally coupled to responses in the Superior temporal sulcus (STS) and strengthen long-term memory (tested 72 hours later). This collection of results suggests a functionality of the PAG within social aversive learning and orchestrating defensive responses in humans. Thereby, we provide a revisited model of social aversive learning that includes functions of the midbrain, in particular the PAG.

A-4 TEENS CARE MORE ABOUT THEIR FRIENDS: AN ERP STUDY OF SOCIAL REWARD LEARNING IN ADOLESCENTS AND ADULTS *Chen Xingjie, Youngbin Kwak - University of Massachusetts Amherst* Adolescents spend a significant amount of time with their friends and peer relationships are particularly valued during adolescence. We investigated how adolescents and adults made decisions during the social gambling task (SGT) in which they earned money for themselves and their best friends. EEG was continuously recorded. Outside the task, participants were also asked how much they would share with the friend if they were given $50 (intended share). Behavioral results suggested that adolescents (N=34, 10-17 yrs), compared to adults (N=30, 21-32 yrs), earned relatively more money for their friend than themselves during SGT. They also showed greater intended share with friend compared to adults. ERP analyses were focused on the fronto-central feedback-related negativity (FRN) and the attention- related P3, time-locked to choice outcomes. A three-way ANOVA with age groups (adolescents vs. adults), outcome valence (gain vs. loss) and recipient (self vs. friend) was used to compare the ERP magnitudes. For FRN, adolescents showed greater difference in gain vs. loss for friend than self, while the adults showed no difference across recipients. For P3, we looked at P3a

focalized in the fronto- central electrode and P3b in the parietal electrode both relevant in late-attention evaluative processing. For both P3a and P3b, adults showed greater amplitude for self than friend, while adolescents showed no difference across self and friend. Moreover, within adolescents, greater loss – gain FRN was associated with greater intended share with friend. Collectively these results highlight how peer relationships shape adolescent's brain and influence their decisions involving friends.

A-5 THE ROLE OF THE CEREBELLUM IN EXPLICIT AND INCIDENTAL PROCESSING OF FACIAL EMOTIONAL EXPRESSIONS: A STUDY WITH TRANSCRANIAL MAGNETIC STIMULATION *Chiara Ferrari - Department of Psychology, University of Milano-Bicocca, Milan 20126, Italy; Viola Oldrati - Department of Brain and Behavioral Sciences, University of Pavia, Pavia 27100, Italy, Marcello Gallucci - Department of Psychology, University of Milano-Bicocca, Milan 20126, Italy; Tomaso Vecchi - Department of Brain and Behavioral Sciences, University of Pavia, Pavia 27100, Italy; Zaira Cattaneo - Department of Psychology, University of Milano-Bicocca, Milan 20126, Italy* Growing evidence suggests that the cerebellum plays a critical role in non-motor functions, contributing to cognitive and affective processing. In particular, the cerebellum might represent an important node of the "limbic" network, underlying not only emotion regulation but also emotion perception and recognition. Here, we used transcranial magnetic stimulation (TMS) to shed further light on the role of the cerebellum in emotional perception by specifically testing cerebellar contribution to explicit and incidental emotional processing. In particular, in three different experiments, we found that TMS over the (left) cerebellum impaired participants' ability to categorize facial emotional expressions (explicit task) and to classify the gender of emotional faces (incidental emotional processing task), but not the gender of neutral faces. Overall, our results indicate that the cerebellum is involved in perceiving the emotional content of facial stimuli, even when this is task irrelevant.

A-6 MOTHER-CHILD FEEDING INTERACTIONS: ASSOCIATIONS WITH NEURAL RESPONSES TO FOOD CUES IN CHILDREN *Afroditi Papantoni, Liuyi Chen, Susan Carnell - Johns Hopkins University School of Medicine, Baltimore, USA* Maternal pressuring to eat has been associated with lower food intake and weight in children, while restrictive feeding has been associated with greater child food intake and weight. To explore potential neural mechanisms for these associations, we analyzed data from 76 children (14.1-18.9 y, mean BMI z-score 0.62±1.20, 39F, 37M) and their biological mothers. Mothers completed the Comprehensive Feeding Practices Questionnaire. Adolescents underwent fMRI scanning while viewing photos representing high-calorie foods and low-calorie foods, in a fed and a fasted condition, and rating their desire to eat each food. Greater maternal scores on 'Pressure' were correlated with lower child BMI zscore ($r=-0.27$, $p<.05$) as well as with lesser child responses to high- vs. lowcalorie cues in visual areas in both conditions (fasted: superior occipital and fusiform gyri, fed: precuneus, $p<0.001$, $k=20$), consistent with a decreased salience of high calorie foods in children whose mothers pressure them to eat. Greater scores on 'Restriction for Weight Control' were correlated with higher child BMI z-score ($r=0.42$, $p<0.001$) as well as with greater inferior frontal gyrus activation during high- vs. low-calorie cues in the fasted condition, and lesser middle frontal gyrus activation in the fed condition, $p<0.001$, $k=20$), consistent with conscious efforts to inhibit desire to eat when fasted which become disinhibited following food consumption, among children whose mothers attempt to restrict their food intake. Genetic and longitudinal behavioral data support a bidirectional explanation of these findings such that mothers are responding to children's appetitive tendencies, as well as potentially influencing them.

A-7 FUNCTIONAL CONNECTIVITY BETWEEN REWARD REGIONS AND EXECUTIVE FUNCTION REGIONS DURING SELF-AFFIRMATION *Hayoung Woo, Janine Dutcher - Carnegie Mellon University* Self-affirmation, the process of focusing on important personal values, has been shown to have beneficial effects on our executive functions (EF) including enhanced academic performance, better processing of health messages, faster response speed in the Stroop task, and fewer errors in N-back task. Previous studies found increased neural reward-related activity during the self-affirmation process; however, functional connectivity between affirmation associated brain regions has not been studied. The present study investigates functional connectivity to understand the neural mechanism underlying the effect self-affirmation has on facilitating EF. We hypothesized that there would be a greater functional connectivity between a key reward-related region (ventral striatum) and EF regions including DLPFC, DMFPC, and VLPFC during a self-affirmation condition relative to a control condition. We conducted a psychophysiological interaction (PPI) analysis based on the neuroimaging data from Dutcher et al. (2016). During experimental blocks, participants made decisions about important values; during control blocks, they made decisions about less important values. Contrast estimates (self- affirmation > control) from each subject's first-level PPI analysis were compared. We found an increased functional connectivity between the right VS and the left VLPFC during the self-affirmation. This strengthened connectivity provides supporting evidence that the self-affirmation process may be associated with increases in regulatory processes of EF. However, bilateral VS showed reduced functional connectivity with primary motor cortex, TPJ and DLPFC. These patterns imply that self- affirmation's effects on EF may depend on the specific mechanism or process. The finding suggests a plausible neural link between self-affirmation and previously demonstrated increases in EF.

A-8 TITLE *Bruce P. Dore, Nicole Cooper, Christin Scholz, Matthew B. O'Donnell, Emily B. Falk - University of Pennsylvania* Persuasive messages can be an effective way to change attitudes and behavior, but their effects depend on how people think about and appraise their meaning. Drawing from research in attitude change and emotion regulation, we used neuroimaging to investigate neural mechanisms underlying cognitively regulating the affective and persuasive impact of advertisements targeting binge drinking, a significant public health problem. Using cognitive control to up-regulate (versus down-regulate) responses to anti-binge drinking ads increased negative affect and perceived ad effectiveness, and also increased ratings of ad self-relevance made after a one-hour delay. Neurally, cognitive regulation of responses to these ads engaged lateral prefrontal, posterior parietal, and lateral temporal cortical regions implicated in controlled processing, evoked goal-congruent changes in ventromedial prefrontal cortex (vmPFC), and modulated expression of distributed whole-brain patterns indexing negative emotion and integrative value. Moreover, immediate effects of cognitive regulation on negative affect and ad effectiveness were predicted by vmPFC activity and expression of all three of these patterns, and lasting effects on self-relevance were predicted by vmPFC activity. These findings demonstrate robust effects of cognitive control on responses to persuasive messaging and identify mechanisms of emotional reactivity, controlled regulation, and integrative valuation that underlie these effects.

A-9 INVESTIGATING THE DEVELOPMENT OF LINGUISTIC DISTANCING IN EMOTION REGULATION FROM CHILDHOOD TO ADULTHOOD *Erik C. Nook, Constanza M. Vidal-Bustamante, Hyun Young Cho, Laurel E. Kordyban, Leah H. Somerville - Harvard University* Regulating one's emotions is a critical affective skill at all stages of development. Research suggests that cognitive reappraisal—changing one's interpretation of a stimulus to make it less aversive—is an effective strategy for down-regulating negative affect. Recent work suggests that adults spontaneously distance their

language when engaging in cognitive reappraisal and that greater linguistic distancing is associated with more successful emotion regulation. Linguistic distancing involves shifting the words one uses when processing a stimulus to be less focused on oneself and the "here and now" by reducing use of present-tense verbs and first-person singular pronouns such as "I," "me," or "mine." However, the extent to which children and adolescents utilize linguistic distancing during emotion regulation remains unknown. Here, we address this question by investigating the developmental trajectory of linguistic distancing in emotion regulation. Participants (N=112) aged 10-23 completed a standard emotion regulation task in which they said their thoughts and feelings aloud while either responding naturally to negative images, cognitively reappraising negative images, or responding naturally to neutral images. Results replicated prior findings in this developmental sample: Participants spontaneously distanced their language while engaging in cognitive reappraisal and stronger linguistic distancing was correlated with more successful emotion regulation. Initial analyses suggest that linguistic distancing and emotion regulation success did not vary across age, but these analyses are ongoing. Greater insight into the cognitive underpinnings of emotion regulation across development may facilitate clinical interventions aimed at helping youth effectively manage their emotions.

A-10 EFFECTS OF PERCEIVED SOCIAL STATUS ON PROSOCIAL BEHAVIOR AND SUBSEQUENT LEARNING IN ADOLESCENCE *Katherine Powers, Alexandra Rodman, Juliet Davidow, Laurel Kordyban, Katya Kabotyanski, Abigail Stark, Leah Somerville - Harvard University, Cambridge MA USA*
During adolescence, peer relationships and social hierarchies take on heightened importance. Once low social status is conferred it remains remarkably stable over time, making it difficult for adolescents to shift into more desirable social ranks. Here we tested whether perceptions of social status selectively bias learning processes within peer groups to disregard favorable behaviors exhibited by low status individuals, cementing existing status structures. Adolescent and adult participants (N=101, ages 12 - 24) played an iterated trust game with hypothetical peers who occupied positions of high and low status. In the trust game participants decide whether or not to make financial investments with each peer and subsequently, through repeated interactions, learn how likely each individual is to return those investments. Unbeknownst to participants, all peers returned investments at an equivalent rate. We found that decisions to trust peers were influenced by initial perceptions of status, such that participants were less likely to invest money with the low status peer relative to the high status peer. This status-driven pattern of sharing was consistent across all ages, though adolescents were more prosocial in their decisions overall. Initial analyses indicated that adults more readily updated impressions of the peers based on the feedback received through repeated interactions, while this rate of learning was attenuated in adolescence. This work reveals how initial impressions of status and subsequent social experiences interact to shape prosocial behavior, identifying ways in which fundamental learning biases may contribute to social hierarchy stability.

A-11 THE RELATIONSHIP BETWEEN A NEUROCOGNITIVE MEASURE OF EMOTION REGULATION AND INHIBITORY CONTROL IN CHILDREN *Rohini Bagrodia - Hunter College, CUNY; Sarah Myruski - The Graduate Center, CUNY; Tracy A. Dennis-Tiwary - Hunter College, CUNY*
Although a positive association between inhibitory control and emotion regulation (ER) has been well documented (e.g. Dennis, O'Toole, DeCicco et al., 2012), less is known about associations between inhibitory control and neurocognitive indices of ER, especially early in development. We recently demonstrated that the late positive potential (LPP) is a behaviorally-relevant neurosignature of ER in children (Babkirk, Rios, Dennis, 2014). The present study examined the association between inhibitory control, LPP measures of ER, and parent report of child attention control problems. Forty-three 5-to-8-

year-old children (19 female, Mmonths = 84.97, SD = 13.11) completed a Directed Reappraisal Task (DRT) while EEG was recorded. LPP residual scores were computed such that more positive scores indicated successful reduction of LPP amplitudes following reappraisal versus negative interpretations of unpleasant images. Children completed the Hearts and Flowers task (HF) to measure cognitive inhibitory control, and parents reported on child attention control problems (CBCL; Achenbach & Edelbrock, 1983). Children who demonstrated greater reappraisal-induced reductions of the LPP had fewer parent-reported attention problems ($r = -.304$, $p < .05$). Then children were grouped according to whether they showed positive (effective reappraisal) or negative LPP scores. Those with positive [M(SE) = 767.81 (29.91)] versus negative [M(SE) = 897.31 (60.01)] LPP scores responded correctly more quickly during the HF task, $F(1, 39) = 5.461$, $p = .025$]. Findings demonstrate that LPP indices of ER are sensitive to individual differences in inhibitory control and attention control, two purported mechanisms underlying the development of adaptive ER across the lifespan.

A-12 BRAIN-TO-BRAIN SYNCHRONY AND LEARNING OUTCOMES VARY BY STUDENT-TEACHER DYNAMICS: EVIDENCE FROM A REAL-WORLD CLASSROOM EEG STUDY *Dana M Bevilacqua, Ido Davidesco - New York University; Lu Wan - University of Florida; Matthias Oostrik, Kim Chaloner, Jess Rowland - New York University; Mingzhou Ding - University of Florida; David Poeppel, Suzanne Dikker - New York University* How does the human brain support real-world learning? We used wireless electroencephalography (EEG) to collect neurophysiological data from a group of twelve senior high school students and their teacher during regular biology lessons. Six scheduled classes over the course of the semester were organized such that class materials were presented using different teaching styles (videos and lectures), and students completed a multiple-choice quiz after each class to measure their retention of that lesson's content. Both students' brain-to-brain synchrony and their content retention were higher for videos than lectures across the six classes. Brain-to-brain synchrony between the teacher and students varied as a function of student engagement, as well as teacher likeability: Students who reported greater social closeness to the teacher showed higher brain-to-brain synchrony with the teacher, but this was only the case for lectures, i.e. when the teacher is an integral part of the content presentation. Furthermore, students' retention of the class content correlated with student-teacher closeness, but not with brain-to-brain synchrony. Taken together, these findings provide further evidence pertaining to the neural basis of real-world learning, social dynamics, and academic outcomes in group settings such as the classroom.

A-13 EXPOSURE TO VIOLENCE PREDISPOSES ANTISOCIAL BEHAVIOR BY BLUNTING AMBIGUITY SENSITIVITY DURING COST-BENEFIT DECISION-MAKING *Franchesca Ramirez - Harvard University; Arielle Baskin-Sommers - Yale University; Joshua Buckholtz - Harvard University* Exposure to Violence predisposes diverse forms of mental illness, and is a prominent risk factor for externalizing psychopathology (e.g. antisocial behavior, impulsivity, and substance abuse). Less clear are the underlying cognitive and neurobiological mechanisms that link exposure to violence and externalizing. Recent work suggests that externalizing behaviors are associated with aberrations in cost-benefit decision-making. For instance, blunted sensitivity to ambiguity during cost-benefit decision-making is observed in individuals with high levels of externalizing, and predicts real-world antisocial outcomes (e.g. criminal arrests). These findings raise the possibility that violence predisposes externalizing by disrupting the appropriate integration of reward and cost information during decision-making. To test this hypothesis, we used a financial decision-making task in a community-based sample enriched for externalizing. Participants' choice behavior was fit to an economic model of decision-making under conditions of ambiguity; a scaling parameter corresponding to ambiguity sensitivity (λ) was derived for each subject. We found that 1) individual variation in exposure to violence predicted externalizing and

2) decreased sensitivity to ambiguity during choice was associated with both greater exposure to violence and higher levels of externalizing. Finally, we used conditional process modeling to test the hypothesis that blunted ambiguity mediates the relationship between exposure to violence and externalizing. A significant indirect effect was observed for λ, indicating that the relationship between exposure to violence and externalizing is mediated, in part, by the observed decrease in ambiguity sensitivity during choice behavior. Together, these findings identify a proximal cognitive mechanism underlying the effects of violence exposure on externalizing psychopathology.

A-14 ASSOCIATIONS BETWEEN RELAPSE PREVENTION PROGRAMS FOR RECURRENT DEPRESSION AND MOOD-INDUCED NEURAL REACTIVITY *Philip A Desormeau - University of Toronto Scarborough; Norman AS Farb - University of Toronto Mississauga; Adam K Anderson - Cornell University; Zindel V Segal - University of Toronto Scarborough* Mindfulness-Based Cognitive Therapy (MBCT) is a group-based intervention that emphasizes the cultivation of metacognitive and decentering skills. Through these cognitive capacities, MBCT reduces vulnerability to depression by enhancing tolerance of negative affect and reducing rumination. Moreover, MBCT impacts stress reactivity at a neural level, increasing sensory processing of sadness while reducing its motivational salience. This differs markedly from Cognitive-Behavioral Therapy (CBT), which activates neural systems promoting cognitive elaboration of visceral representations. However, the neural signatures of treatment responders and relapsers from these interventions have yet to be compared directly. In the present study, a large cohort (N=83) of fully remitted MDD participants with ≥2 past depressive episodes were recruited and randomly assigned to either 8-week group-formatted CBT (n=36) or MBCT (n=47). Participants underwent pre- and post-intervention fMRI scans that measured neural reactivity, operationalized through the contrasting of brain activity between viewing sad and neutral film clips. Analyses did not reveal significant differences between interventions in treatment responders and relapsers, nor were shared neural activations detected across treatment responders. However, relative to responders, relapsers at pre- and post-intervention exhibited greater deactivation of the posterior insula and somatosensory cortex, which have been previously associated with viscerosomatic processing. These findings suggest that greater suppression of visceral processing is a marker of depressive vulnerability, and may reflect inflexible tendencies toward experiential avoidance—the avoidance of negative internal experiences. Taken together, these findings have important implications for addressing cognitive reactivity as a vulnerability factor in depression, informing accounts of maladaptive regulatory strategies.

A-15 FACIAL FEEDBACK: ADAPTATION OF FACIAL MOTOR RESPONSES IN INTERACTIVE DYADS AS A FUNCTION OF PUNISHMENT. *Jonathan Yi, Philip Pärnamets, Andreas Olsson - Karolinska Institutet* Responding appropriately to others' facial expressions is key to social functioning, and depending on the identity of your interactive partner, it might save you from being harmed. Despite the large body of work on face perception and spontaneous responses to static faces, surprisingly little work has examined responses to dynamic faces in more naturalistic situations. No studies have investigated how goal directed responses to faces are influenced by learning during dyadic interactions. To study this, we developed a novel method based on online integration of electromyography (EMG) signals from the participants' face (frowning; corrugator supercilli and smiling; zygomaticus major). In two experiments, participants' EMG signals were recorded during their interaction with frowning and smiling dynamic target faces. The participants learned by trial-and-error to avoid mild electric shocks by expressing the same (congruent) or different (incongruent) expression. If incorrect facial expression was formed (measured by EMG), they received a mild electric shock to their wrist. Experiment 1 validated our new method and replicated classical visual motor findings, showing faster and more accurate responses in congruent vs. incongruent conditions. Experiment 2 manipulated facial dominance of the target faces

to examine biased responding. Participants performed worse toward highly dominant vs. low dominant faces by habitually imitating their angry expressions. Our results introduce a new method to study decision-making in dynamic interactive social situations and help us understand gradual adaptation of motor responses to social contexts. Our method can be used to study decision-making biases caused by manipulating facial traits of an interactive partner.

A-16 MICROSTRUCTURAL INTEGRITY OF A PATHWAY CONNECTING THE PREFRONTAL CORTEX AND AMYGDALA MODERATES THE ASSOCIATION BETWEEN COGNITIVE REAPPRAISAL AND NEGATIVE EMOTIONS *Tracy C. d'Arbeloff, M. Justin Kim, Annchen R. Knodt, Spenser R. Radtke, Bartholomew D. Brigidi, Ahmad R. Hariri - Duke University, Durham NC, USA* Cognitive reappraisal is a common form of emotion regulation that requires top-down executive control to re-construe a potentially emotional situation in order to mitigate its emotional impact. Individuals who typically employ reappraisal techniques in daily life report fewer depressive symptoms, less anticipatory anxiety, and greater over-all well-being. Here we report that an association between typical use of cognitive reappraisal in daily life and the experience of anxiety and depressive symptoms is moderated by the microstructural integrity of the uncinate fasciculus, which provides a major anatomical link between the amygdala and prefrontal cortex. Our findings are consistent with the nature of top-down regulation of bottom-up negative emotions and suggest the uncinate fasciculus may be a useful target in the search for biomarkers predicting not only disorder risk but response to psychotherapy utilizing cognitive reappraisal.

A-17 FOCUSING ON SELF VS. OTHERS: AN HD-TDCS STUDY OF ACHIEVEMENT GOALS AND DECLARATIVE MEMORY *Yuliya Ochakovskaya - The Graduate Center (CUNY); Jennifer Mangels - Baruch College (CUNY); Elizabeth F Chua - Brooklyn College (CUNY)* Motivating students to perform better than others might facilitate achievement on a task, but may undermine longer-term learning. In contrast, mastery goals that focus students on developing their own knowledge may impart an advantage for learning, possibly by orienting attention toward deeper processing of corrective information. We addressed the effects of performance and mastery goals on incidental learning of corrective information, and examined whether goals were associated with differential engagement of brain regions associated with successful encoding. Students were asked to answer 4 blocks of difficult general knowledge questions and received active or sham brain stimulation (i.e., HD-tDCS) during the 3rd block. Active stimulation was administered over the left inferior temporal cortex (ITC; TP7), indexing ventral stream processing of verbal information, and over the left dorsolateral prefrontal cortex (DLPFC; F3), putatively involved in the sustained elaborative processing of that information. Following each question, students were presented with the correct answer, and learning of this corrective information (i.e., error correction) was assessed a week later on a surprise retest. It was expected that DLPFC stimulation would primarily benefit mastery goals, while ITC would benefit both relative to sham. Results show only ITC compared to sham, led to benefits in error correction across blocks and regardless of goals. The boost in error correction seen with ITC stimulation, even for blocks during which there was no stimulation, suggests that ITC stimulation may lead to consolidation effects that benefited learning for both goals.

A-18 AN FMRI LOCALIZER FOR DELIBERATIVE COUNTER ARGUING *Matthew Brook O'Donnell - University of Pennsylvania, Philadelphia, USA; Jason Coronel - Ohio State University, Columbus, USA; Christopher N. Cascio - University of Wisconsin–Madison, USA; Matthew D. Lieberman - UCLA, USA;*

Emily B. Falk - University of Pennsylvania, Philadelphia, USA When confronted with ideas that are counter value (e.g. differing ideological position) or calling for behavior change (e.g. health messaging) individuals are likely to engage in counter arguing. Unable to measure online counter arguing, behavioral tasks use post-message thought listing with valence classification and associate the presence of counter arguing with entrenchment of opinion. We designed an fMRI task to localize neural activity associated with forced deliberative counter argumentation to generic low-ideology statements (e.g. People should eat broccoli, text while driving). We hypothesized deliberative argumentation engaging the dorsolateral prefrontal cortex (DLPFC) and deliberative counter argumentation focused in the right DLPFC. We collected statements completing the stem People should (not)..., normed them on MTurk, producing 70 items--half easy to argue in favor of and half against. In deliberative conditions participants had to generate as many reasons in favor or against a statement as possible. The quick judgement condition required a single agree/disagree response. We examined two contrasts: 1. deliberative>quick-judgement and 2. against>in-favor deliberation. As hypothesized the first contrast resulted in bilateral DLPFC clusters ([- 33,56,16] and [35,56,22]). The second produced a more posterior right DLPFC cluster ([46,15,55]) and also a right posterior parietal cluster [52,-67,43]. In a second study, we adapted the task to present ideological statements (e.g. gun control, affirmative action) with deliberative argumentation congruent with individuals' views. The against>in-favor contrast produced overlapping clusters with the general localizer in both the rDLPFC and rTPJ. We offer the general localizer task as a resource for discovering functional ROIs for deliberative counter arguing.

A-19 INDIVIDUAL DIFFERENCES IN CONCEPTUAL KNOWLEDGE SHAPE FACIAL EMOTION PERCEPTION *Jeffrey A Brooks - New York University; Junichi Chikazoe, Norihiro Sadato - National Institute for Physiological Sciences; Jonathan B Freeman - New York University* Recent models of emotion perception and face-based person perception suggest that conceptual knowledge may dynamically influence face perception, including the representational structure of facial emotion categories. We used a representational similarity analysis (RSA) approach in which we collected perceptual similarity data (using a computer mouse-tracking paradigm) and conceptual similarity data for every pairwise combination of the 6 “basic” emotions anger, disgust, fear, happiness, sadness, and surprise. The mouse-tracking paradigm measures the extent to which faces co- activate multiple emotion categories simultaneously (e.g., both anger and disgust) through the trajectory of response-directed hand movements. We found that more conceptually similar emotions were also perceived more similarly (as assessed through category co-activation), even when statistically controlling for the visual similarity of the stimuli used. These results suggest subtle individual differences in conceptual knowledge manifest in the process of perceiving a face’s emotion. We also collected neuroimaging data for each participant, using a task in which they passively viewed emotional facial expressions. Multi-voxel pattern analyses, which are forthcoming, will identify regions with a representational structure of facial emotion categories and whether it is similarly shaped by conceptual knowledge. Theoretical implications of conceptually structured facial emotion categories will be discussed.

A-20 THE STRENGTH OF HUMAN CONSCIENCE: COLLECTIVE GUILT PROMOTES INTERGROUP RECONCILIATION *Zhiai Li - East China Normal University, Shanghai, China; Hongbo Yu - University of Oxford, Oxford, United Kingdom; Yongdi Zhou - East China Normal University, Shanghai, China; Xiaolin Zhou - Peking University, Beijing, China* In situations of group conflict, individuals may be more likely to legitimize harmful behavior towards innocent bystanders by in-group others (vs. by out-group individuals) due to feelings of in-group identity. Conversely, this sense of in-group identity may also cause individuals to exhibit stronger guilt responses to harmful behaviors by in-group than by out-group others. In this

study, we conducted a group-based interpersonal transgression task in which participants observed third-party members receiving moderate electric pain when in-group or out-group others failed in a random dot estimation task. Behaviorally, participants reported stronger guilt when harm was caused by in-group than by out- group others, a manifestation of collective guilt (Exp.1). Moreover, participants allocated more money to third-party victims when facing harm caused by in-group than by out-group others (Exps. 2 and 3). These results suggested that collective guilt serves a prosocial function by evoking stronger compensation behaviors and promoting intergroup reconciliation. To investigate the neural substrates of collective guilt, we recorded the BOLD activities of participants in Exp.3 and found that anterior middle cingulate cortex and bilateral insula were more activated when the harm was caused by in- group than by out-group others. The functional connectivity between left anterior insula and left OFC negatively predicted the amount of monetary allocation. Overall, our results suggest that collective guilt promotes intergroup reconciliation by increasing compensation behaviors.

A-21 THE EFFECTS OF BOTULINUM TOXIN ON THE DETECTION OF GRADUAL CHANGES IN FACIAL EMOTION *Luis Carlo Bulnes - Université libre de Bruxelles (ULB), Consciousness, Cognition and Computation Group (CO3), Center for Research in Cognition & Neurosciences, ULB Neuroscience Institute, Brussels, Belgium; Peter Marien - Vrije Universiteit Brussel (VUB), Clinical and Experimental Neurolinguistics, Brussels, Belgium. & ZNA Middelheim, Department of Neurology and Memory Clinic, Antwerp, Belgium; Marie Vandekerckhove - Vrije Universiteit Brussel (VUB), Biological Psychology Research Unit (BIPS), Brussels, Belgium; Axel Cleeremans - Université libre de Bruxelles (ULB), Consciousness, Cognition and Computation Group (CO3), Center for Research in Cognition & Neurosciences, ULB Neuroscience Institute, Brussels, Belgium.* When we feel sad or depressed, our face invariably “drops”. Conversely, when we try to cheer someone up, we might tell them “keep your smile up”, so presupposing that modifying the configuration of our facial muscles will enhance our mood. A crucial assumption that underpins this hypothesis is that our mental states are shaped by information originating from the peripheral neuromotor system — a view operationalised as the Facial Feedback Hypothesis. We used botulinum toxin (BoNT-A) injected over the frown area to temporarily paralyze muscles necessary to express anger. Using a pre-post treatment design, we presented participants with gradually changing video clips of a face morphing from neutral to full-blown expressions of either anger or happiness, and asked them to press a button as soon as they detected a change in the display. Our findings indicate that while all participants (control and BoNT-A) improved their reaction times from pre-test to post-test, the BoNT-A group was impaired when detecting anger in the post-test. Specifically, frown paralysis impaired the participant’s ability to improve their detection of gradual changes involving anger. Our findings suggest that facial- feedback causally affects perceptual awareness and people’s ability to use perceptual information to learn.

A-22 THE DEVELOPMENT OF SELF-PROTECTIVE BIASES IN RESPONSE TO PEER REJECTION *Alexandra M Rodman, Katherine E Powers, Erik K Kastman, Leah H Somerville - Harvard University*
The growing popularity of social media, especially among youth, has resulted in peer feedback (including rejection) pervading everyday life. Given that peer ostracism has been linked to depression and suicide, it is critical to understand the psychological impact of peer feedback from a developmental perspective. While adults have been shown to enact self-protective processes to buffer their self-views from evaluative threats like peer rejection, it is unclear whether adolescents avail themselves of the same defenses. The current study examines how social evaluation shapes views of the self and others differently across development. N=107 participants ages 10-23 completed a reciprocal social evaluation task that involved predicting and receiving peer acceptance and rejection feedback, along with

assessments of self-views and likability ratings of peers. We show that, despite equivalent experiences of social evaluation, adolescents internalized peer rejection, experiencing a feedback- induced drop in self-views, whereas adults externalized peer rejection, reporting a task-induced boost in self-views and deprecating the peers who rejected them. These results identify co-developing processes underlying why peer rejection may lead to more dramatic alterations in self-views during adolescence than other phases of the lifespan. Ongoing analyses investigate whether corticostriatal functioning supports these biases and associated changes in self-views during adolescence. More broadly, this work advances theoretical insights into how development shapes social-evaluative experiences, and informs sources of vulnerability that could put adolescents at unique risk for negative mental health outcomes.

A-23 EMOTION PROCESSING IN YOUTH PRESENTING WITH SUBSTANCE USE PROBLEMS

Emily K. Leiker, Harma Meffert - Center for Neurobehavioral Research, Boys Town National Research Hospital, Omaha, NE; Joseph Aloi - Center for Neurobehavioral Research, Boys Town National Research Hospital, Omaha, NE; University of Nebraska Medical Center, Omaha, NE; Patrick Tyler - Center for Neurobehavioral Research, Boys Town National Research Hospital, Omaha, NE; Kayla Pope - Center for Neurobehavioral Research, Boys Town National Research Hospital, Omaha, NE; Creighton University, Omaha, NE; Karina Blair, Stuart White, Laura Thornton, R. James R. Blair - Center for Neurobehavioral Research, Boys Town National Research Hospital, Omaha, NE Background: Substance use is highly prevalent among adolescents, and associated with adverse health, poorer social outcomes and substance use in adulthood. Extensive evidence links adult substance use to reduced emotion regulation and attenuated sensitivity to affective stimuli in brain regions important for emotion processing. However, this relationship is less well studied in adolescence. This is surprising, given that substance use during this critical developmental period will likely have a strong impact on the neural mechanisms underlying emotion processing. Methods: 83 youths (14-18 years old) were recruited from a residential treatment facility and the surrounding community. Participants completed a gender discrimination task for faces displaying differing levels of fear or happiness. Alcohol and chemical use were assessed using the Alcohol Use Disorder Identification Test (AUDIT) and Chemical Use Disorder Identification Test (CUDIT). Reported alcohol and chemical substance consumption ranged from none at all to heavy, with 61% reporting some to heavy consumption. Results: A repeated measures ANCOVA was conducted on the emotional intensity modulated BOLD responses for Emotion (Fear, Happy), using AUDIT, CUDIT, and AUDIT x CUDIT as covariates. Substance use was associated with aberrant fearful face intensity modulation in
posterior cingulate, dorsolateral prefrontal cortex, and posterior parietal cortex. Discussion: These data suggest that substance use in youth does indeed impact the neural mechanisms underlying emotion processing. Given the critical role facial expressions play in social interactions, these early substance-use induced impairments may be related to some of the later adverse effects associated with adolescent substance use.

A-24 NEURAL AND BEHAVIORAL MARKERS OF EMOTION FACE PERCEPTION ARE RELATED TO TRAJECTORIES OF CLINICAL AND REAL-WORLD FUNCTIONING IN PSYCHOTIC DISORDERS

Kayla R Donaldson, Amri Sabharwal, Roman Kotov, Aprajita Mohanty - Stony Brook University, Stony Brook, NY, USA Humans depend heavily on emotional face perception (EFP) for effective social communication. Individuals with psychotic disorders experience impairment in EFP which is associated with negative symptoms and deficits in global (social and occupational) functioning. However, it is unknown whether behavioral and neural measures of EFP impairment are related with course and progression of negative symptoms and global functioning over time. The present longitudinal study

sought to examine this association in fifty-four participants with psychotic disorders (schizophrenia spectrum disorders, mood disorders with psychotic features, substance-induced psychotic disorders, and psychosis not otherwise specified) who were interviewed 6 times over 2 decades and, at year 20, underwent functional magnetic resonance imaging (fMRI) while performing an EFP task. Our results showed that worse EFP accuracy and elevated EFP-related insula and early visual cortical activity were linked with concurrent negative symptoms and worse functional outcomes in psychotic disorders. Furthermore, our results showed that individuals with psychotic disorders who showed low EFP-related accuracy and high EFP-related insula and visual cortex activity started out with worse negative symptoms and global functioning at baseline and continued to worsen, ending up with worse symptoms and global functioning at year 20. In contrast, individuals with high EFP-related accuracy and low visual cortex activity started out with lower symptoms at baseline which remained stable over time. Overall, these findings highlight that behavioral and neural EFP measures in psychotic disorders are markers not only of current symptoms and functioning, but also the trajectory of symptoms and social/occupational functioning over time.

A-25 DIVISIVE NORMALIZATION DRIVES TRANSITIVITY VIOLATIONS IN SOCIAL CHOICE *Linda W. Chang, Samuel J. Gershman, Mina Cikara - Harvard University, Cambridge MA, USA* Classical rational theories of choice dictate that decision makers' preferences between any two options should remain the same irrespective of the number or quality of other options. However, previous research finds that people consistently exhibit violations of rational choice theory, including transitivity- violations, when they choose among several alternatives in a set. Many of society's most significant social decisions—hiring, voting—similarly involve the assessment of multiple candidates simultaneously. Across two studies we found that single-attribute transitivity violations generalize to two consequential social contexts: hiring scenarios and past U.S. congressional race outcomes. Importantly, we compared different models of value representation (untransformed, divisive normalization, range normalization) as sources of this context-dependence. Study 1 revealed that divisive normalization best characterized transitivity-violations across a series of hiring decisions. In Study 2, we used a combination of archival electoral data and survey data to examine whether normalization models could explain the outcomes of congressional elections. Transitivity-violations occurred along political candidates' inferred competence ratings and were again best characterized by divisive normalization. Our findings offer a formal account of when and how specific alternatives exert their effects on social evaluation and choice.

A-26 BLAME ATTRIBUTIONS OF SOCIETAL THREATS MODERATE ISSUE-BASED PARTY EVALUATIONS *Elisa van der Plas - Donders Institute for Brain Cognition and Behaviour at Radboud University (NL), University of Twente (NL); Martin Rosema - University of Twente (NL); Jansen Giedo - University of Twente (NL); J. Sanfey Alan - Donders Institute for Brain, Cognition and Behaviour at Radboud University (NL)* Past research on vote choice has provided insights into the role of policy issues as well as emotions, but seldom on how their interplay influences evaluations of political actors. We synthesize such theories from political science with theories of associative learning and appraisal theories of emotion in order to better understand attitudes towards political parties. More specifically, we analyzed if issue- based voting is moderated by appraisals of blame with which societal issues are considered. In order to test our ideas, we developed videos about climate change, immigration and health care. The issues were either framed as being uncertain, personally relevant, or caused by a third party. The videos strictly followed a controlled interval format, which currently allows us to measure event related potentials from electroencephalogram, functional magnetic resonance and physiological recordings. 1825 Dutch citizens participated in a 3x3 between-subjects design and rated issue importance, emotional affect (12-item PANAS) and party-attitudes in an online survey. The results

confirm the expectations derived from appraisal theories of emotion: personal emphasis triggered fear, whilst adding blame attributions triggered anger. The oversimplified framings increased party attitudes, yet strikingly, blame manipulations predicted party attitudes without mediation of issue importance. This effect was found for both inherently uncertain issues (e.g. climate change) and more often blamed issues (e.g. immigration). This suggests that considering the personal relevance of societal issues is crucial for their consideration, but that blameful appeals blunt the relation between issue importance and party attitudes. Implications for modern-day political communication in social media are discussed.

A-27 k TESTOSTERONE ADMINISTRATION REDUCES GENEROSITY IN SOCIAL DISCOUNTING AMONG HEALTHY MALES *Yin Wu, Jiajun Liao - Shenzhen University, China* Testosterone is thought to be associated with dominant and aggressive behavior. However, the evidence is mixed in the literature regarding if testosterone causes prosocial or antisocial behavior in social economic interaction. Here we used the social discounting task to address these two conflicting hypothesis. Healthy male participants (n = 63) received a single dose of 150 mg testosterone gel in a double-blind, placebo-controlled, crossover design. At 180 min post-administration, participants performed the social discounting task, where they make choices between selfish and generous rewards for themselves and for others that varied in social distance. Our results showed that testosterone reduced generosity towards others, i.e. they placed less value on others' well-being, using both non-parametric comparison (i.e. hyperbolic function) and after converting these values to parametric values (i.e. AUC). To further investigate if any change in social discounting is due to variations of construed social distance, we administered a second social distance perception task. Participants were asked to use computer avatars to represent psychological distance between themselves and individuals of varying social distance. Testosterone has no observable influence on the representation of the social distance, highlighting the dissociation of valuation and perception in social preference.

A-28 ***SANS Poster Award winner**** **THE INFLUENCE OF OXYTOCIN AND SOCIAL STRESS ON OPTIMISTIC BIAS** *Ingrid Huang - International School of Beijing* Abstract: How we deal with our stress is key to our survival. Adapting to our dynamic environment requires learning and responding to different situations. Humans exhibit a positive learning bias: we tend to form and update beliefs in an optimistic manner by incorporating desirable feedback into our beliefs and disregarding undesirable ones. In this study, stress heightened the positive effects of OT by increasing belief updates in response to desirable feedback. These findings reveal the nature of our responses to social stress, as well as how oxytocin can be used to increase learning of desirable feedback. This research suggested potentials of oxytocin in boosting optimistic updating within high- stress individuals such as those with social-anxiety disorder.

A-29 THE IMMORAL OPPONENT IN POLITICAL ATTACK ADS: INTERSUBJECT CORRELATIONS ACROSS THE MORAL BRAIN DIFFER BY PARTY AFFILIATION *Benjamin O. Turner - Nanyang Technological University, Wee Kim Wee School of Communication and Information; Richard Huskey - The Ohio State University, Cognitive Communication Science Lab, School of Communication; Ori Amir, Rene Weber - UC Santa Barbara, Media Neuroscience Lab, Department of Communication* In this research we use political attack advertisements from the 2016 US Presidential election campaign as a test case for understanding the neurocognitive processes underlying Moral Foundation Theory (MFT, Haidt, 2001). Previous analyses of our data suggested that within localized moral intuition networks, participants of all party affiliations show greater activation for attack ads against Clinton relative to attack ads against Trump. Brady and colleagues (2017) have demonstrated that moral messages are more

engaging. Schmälzle and colleagues (2015) have shown that more politically engaging messages elicit higher inter subject correlations (ISCs) in audiences. Here, we investigate how these findings are modulated by source and receiver characteristics. A total of 64 participants (22 Democrats, 22 Republicans, and 20 Unaffiliated; 50% women) evaluated 22 Trump/Clinton attack ads while undergoing fMRI. A region-of-interest based ISC analysis was used to examine a set of a priori defined structures previously implicated in moral judgment. We found that ISCs were modulated by partisan grouping and ad type (anti-Clinton or anti-Trump), but no single pattern emerged across all ROIs. Some results align with predictions on the basis of moral judgments. For instance, within anterior cingulate, which is often associated with conflict monitoring, Democrats have high ISCs in response to anti-Trump ads, whereas Republicans have high ISCs in response to anti-Clinton ads, and Independent viewers have low ISCs for both ad types. These results illuminate the ways in which audience characteristics interact with message content to shape neural responses to morally charged political attack ads.

A-30 NEURAL REPRESENTATIONS OF MENTAL STATES REMAIN STABLE ACROSS MODALITIES AND TARGETS *Miriam E. Weaverdyck - UCLA, Los Angeles, CA; Mark A. Thornton, Diana I. Tamir - Princeton University, Princeton, NJ* Humans possess a remarkable ability to richly represent other people's internal mental states, such as happiness, sleepiness, or planning. How do people deploy these representations across the diverse range of targets and contexts they encounter in the social world? Does reading about a person's suffering elicit the same thought as seeing their face in pain? Do we think about our own happiness in the same way as a stranger's? Three neuroimaging studies test whether mental state representations are stable across targets and modalities, or are instead context-dependent. In all studies, on each trial, participants were prompted to think about a target experiencing one mental state across a variety of scenarios. In Study 1, lexical stimuli prompted participants to mentalize about a generic other experiencing various mental states. In Study 2, lexical stimuli prompted participants to mentalize about three specific targets – the self, a close similar other, and a dissimilar stranger. In Study 3, pictorial stimuli prompted participants to mentalize about two targets – the self and a dissimilar stranger. Representational similarity analyses extracted neural pattern similarities between each mental state pair, then compared these similarities across targets and modalities. Results demonstrated stable pattern similarity across targets (self, friend, stranger) and modalities (lexical, pictorial) throughout the social brain network. That is, people thought about each mental state in a similar way, regardless of who was experiencing it, or how it was elicited. These findings suggest that people deploy the same core conceptual knowledge about mental states across many contexts.

A-31 HERITABILITY OF NEURAL REACTIONS TO SOCIAL EXCLUSION IN MIDDLE CHILDHOOD *Mara van der Meulen - Leiden University; Nikolaus A.J. Steinbeis – UCL; Michelle Achterberg, Marinus H. van IJzendoorn, Eveline A. Crone - Leiden University* Observing social exclusion can be a distressing experience for children that can be followed by concerns for self-inclusion, as well as prosocial behavior to help others in distress. Behavioral studies have shown that observed social exclusion elicits prosocial compensating behavior, but little is known about heritability of this behavior. To distinguish between self-concerns and other-concerns when observing social exclusion in childhood in a twin sample (N=512), we used a four-player Prosocial Cyberball Game in which participants (aged 7-9) could toss a ball to three other players. When one player was excluded by two other players, participants showed consistent prosocial compensating behavior in response to this exclusion by tossing the ball more often to the excluded player. In a sub- sample (N = 283) we studied neural reactions to social exclusion. We found activity in social perception related areas (mPFC, IFG, and subACC) for the experience of exclusion, and

activity in reward and salience related areas (striatum, insula, and ACC) for the experience of inclusion. Further, we found that activity in mPFC and right IFG was best explained by genetic and unique environmental factors, whereas activity in left IFG and right insula was best explained by shared and unique environmental factors. Activity in other regions was best explained by unique environmental factors and measurement error. This suggests that reactions to social exclusion are both heritable and driven by shared environmental factors, providing new opportunities for interventions aimed at parenting.

A-32 THE ROLES OF BIOLOGICAL SEX AND AGE IN THE INTRINSIC BRAIN OF INDIVIDUALS WITH AUTISM *Dorothea L Floris - Hassenfeld Children's Hospital at NYU Langone Health, Department of Child and Adolescent Psychiatry, Child Study Center, New York City, USA; Meng-Chuan Lai - Child and Youth Mental Health Collaborative at the Centre for Addiction and Mental Health and The Hospital for Sick Children, Department of Psychiatry, University of Toronto, Toronto, Canada; Michael P Milham - Center for the Developing Brain, Child Mind Institute, NYC, NY, USA; Adriana Di Martino - Hassenfeld Children's Hospital at NYU Langone Health, Department of Child and Adolescent Psychiatry, Child Study Center, New York City, USA* The male preponderance in the prevalence of autism spectrum disorder (ASD) has sparked research into its sex differences. While sex-differences have been reported to vary with age in cognitive- behavioral studies of typical and atypical development, little is known about neural sex-differences across ages in ASD. Thus, we aim to explore the role of sex and age in the intrinsic functional properties of the brain in males and females with ASD relative to neurotypical males and females. We leveraged the combined large-scale Autism Brain Imaging Data Exchange repositories to select resting-state fMRI (R-fMRI) data between ages 5-30 years resulting in 422 males with ASD, 90 females with ASD, 218 neurotypical females and 464 neurotypical males. R-fMRI data was preprocessed using the Configurable Pipeline for The Analysis of Connectomes. We set a general linear model at each voxel of distinct R-fMRI metrics assessing the main effect of sex, age and diagnosis and their three- way-interaction while accounting for motion, sites and mean measure signal. We employed Gaussian random field theory correction with stringent statistical thresholds (voxel-level:$Z \geq 3.1$; cluster- level:$p < 0.05$) There were significant main effects of diagnosis, sex, and age, along with their significant three-way interaction. A region in the right inferior parietal lobule showed decreases as a function of increasing age in females with ASD compared to males with ASD. The opposite pattern was evident in neurotypicals. The pattern in males with ASD resembles that seen in neurotypical females, and vice versa, suggesting that age-related factors come into play in models of 'gender-incoherence' of ASD.

A-33 HEIGHTENED AFFECTIVE RESPONSES FOLLOWING SUBTOTAL LESIONS OF MACAQUE ORBITAL PREFRONTAL CORTEX *Maia S. Pujara - Section on the Neurobiology of Learning and Memory, National Institute of Mental Health, National Institutes of Health, Bethesda, MD; Peter H. Rudebeck - Friedman Brain Institute, Icahn School of Medicine at Mount Sinai, New York, New York; Elisabeth A. Murray* Aspiration lesions of orbitofrontal cortex (OFC) in macaques typically produce blunted affective responses to threatening stimuli. Recent evidence involving restricted (excitotoxic, fiber-sparing) damage to OFC neurons has shown contradictory effects of either no involvement of OFC or heightened affective responses, but these studies differ with respect to the species studied and the extent of OFC damage. To address these discrepancies and further examine the putative role of OFC in emotion regulation, we studied rhesus monkeys (Macaca mulatta) with restricted bilateral excitotoxic lesions targeting either Walker's areas 11/13 (lateral OFC; n=4) or area 14 (medial OFC; n=4). The performances of these groups and a group with total bilateral lesions of OFC (areas 11, 13, and 14; n=7) were compared to that of a group of unoperated controls (n=12) on defensive responses to the presentation of a rubber snake, rubber spider, and neutral objects for comparison. Both subtotal lesion

groups showed heightened defensive responses as indexed by latency to retrieve a food reward in the presence of the spider and snake. Surprisingly, the area 14 group showed greater food-retrieval latencies even in the presence of neutral objects, compared to unoperated controls. This effect could not be attributed to heightened defensive responses to the neutral object following exposure to the snake object, since food-retrieval latencies for the neutral trials before and after the presentation of the snake were not significantly different. Our data indicate that medial and lateral OFC make dissociable contributions to emotion regulation.

A-34 THE ROLE OF IMAGERY IN THREAT-RELATED PERCEPTUAL DECISION MAKING *Gabriella Imbriano, Tamara Sussman, Jingwen Jin, Aprajita Mohanty - Stony Brook University* Making fast and accurate decisions about threats in our environment is critical for survival. Prioritized detection of threatening stimuli is traditionally attributed to their “automatic” or “bottom-up” processing. Emerging research shows that threat-related cues and contexts enhance the sensitivity and speed of subsequent perceptual decision-making more than neutral cues and contexts; however, the underlying mechanisms remain unclear. Several influential models of visual perception propose that the brain instantiates prior knowledge in the form of a template of the anticipated stimulus to which subsequent incoming sensory information can then be matched. Here, we examine whether the superiority of prior threat information in guiding perceptual decision-making is due to the vividness with which we can mentally image forthcoming threatening stimuli compared to neutral stimuli. Participants (N=123) completed the vividness of visual imagery questionnaire-2 (VVIQ2) and a task in which cues encouraged participants to use threat or neutral cue-induced “perceptual sets” to discriminate between perceptually degraded threatening and neutral faces. We show that threat cues improve accuracy, sensitivity and speed of perceptual decision-making compared to neutral cues. Higher VVIQ2 scores were associated better performance following threat and neutral cues. Importantly, in accordance with our hypothesis, greater accuracy and reduced false alarms following threat cues were associated with greater VVIQ2 scores even after controlling for performance related to neutral cues. The findings demonstrate that fast and accurate detection of threatening stimuli can be attributed not only to their “bottom-up” processing but also our ability to image them more effectively prior to their arrival.

A-35 NEURAL RESPONSE TO EXTINCTION LEARNING IN PEDIATRIC CHRONIC PAIN *Laura E Simons, Lauren Heathcote, Inge Timmers, Corey Kronman - Stanford University; Farah Mahmud - Boston Children's Hospital; Maya Hernandez - Stanford University; David Borsook - Boston Children's Hospital* Recent research focused on anxiety patients and adult chronic pain patients demonstrates that impaired threat-safety discrimination and diminished response to extinction learning is indicative of enhanced vulnerability to chronic pain. Neural mechanisms of fear conditioning and extinction have not been previously examined in pediatric chronic pain. This study examines functional brain imaging responses in pediatric chronic pain patients and healthy peers to the screaming lady fear conditioning and extinction paradigm. Children ages 10-24 years with chronic pain (n=50) were recruited and cohort matched with healthy peer volunteers (n=19). Each participant was presented with two neutral stimuli. During the conditioning phase, one stimulus (CS+) was presented with an unpleasant scream (UCS), the other stimulus (CS-) was presented alone. During the extinction phase both stimuli were presented alone. fMRI data was collected during extinction using a Siemens Trio 3T MRI scanner and analyzed using SPM12. We conducted within group pairwise comparisons of evoked response to CS+ and CS- during early and late extinction. In early extinction, greater activation was observed in response to the CS+ compared CS- in healthy controls (e.g., thalamus; $p<0.05$), with no differences observed among patients. During late extinction, there was greater response to CS+ compared to CS- (e.g., ventromedial prefrontal cortex; $p<0.05$) in patients with no differences observed among healthy controls. These results

indicate altered response among pediatric chronic pain patients in brain areas responsible for extinction learning while healthy peers appear to demonstrate efficient encoding of threat discriminatory learning.

A-36 HIPPOCAMPAL TRACKING OF SOCIAL SPACE IS RELATED TO SOCIAL AUTISTIC TRAITS IN HEALTHY INDIVIDUALS *Nadia Rahman, Catarina Saiote, Temidayo Orederu, Daniela Schiller - Icahn School of Medicine at Mount Sinai, Departments of Psychiatry and Neuroscience, and the Friedman Brain Institute* Background: In a previous study, we found that participants with better social skills had a greater covariance between hippocampal activity and “movement” through “social space”. Given that social dysfunction is a hallmark feature of Autism Spectrum Disorder (ASD), we sought to elucidate the relationship between ASD-related social impairment and hippocampal activation during a social navigation fMRI task. Method: Healthy participants were lead characters in a role-playing game in which they were asked to navigate various real-life social situations during fMRI. Following the task, participants filled out the Autism Spectrum Quotient (AQ), a self-report measure that assesses autism symptom severity comprised of 5 subscales, including social skills.Results: Hippocampal activity was significantly negatively correlated with scores on the AQ social skills subscale (R=-.562, P=.0098) and no other AQ subscale. Conclusion: These results offer preliminary evidence suggesting that hippocampal dysfunction may underlie impaired social function in individuals with ASD.

A-37 MORNING BRAIN: EVIDENCE FROM EEG AND LEARNING OUTCOMES THAT HIGH SCHOOL CLASS TIMES MATTER *Suzanne Dikker - New York University, Utrecht University; Saskia Haegens - Columbia University Medical Center; Ido Davidesco, Dana Bevilacqua - New York University; Lu Wan - University of Florida; Kim Chaloner - Grace Church School; James McClintock - Trevor Day School; Tessa West - New York University; Mingzhou Ding - University of Florida; David Poeppel - New York University, Max Planck Institute for Empirical Aesthetics* Researchers (and parents) consistently observe in adolescents that there is a stark mismatch between biologically preferred sleep-wake hours and socially imposed sleep-wake hours. As a result, there is an ongoing public debate about high school start times. To contribute neural evidence to this debate, we examined changes in high schoolers’ brain activity throughout the school day. We collected electroencephalogram (EEG) data from 22 high school seniors at two different New York City schools during their regular classes. Classes were taught at three different times of day: early morning (8:30am), mid morning (10:30am), and afternoon (2:30pm; 17 recording days total). Class materials were presented using different teaching styles (videos and lectures), and students completed a multiple-choice quiz after each class to measure their retention of that lesson’s content. Our analysis focused on power changes in the alpha frequency band (~ 7-14 Hz, mean peak latency 9.5 Hz), a well- known correlate of attentional state, where higher alpha is typically linked to lower focus. Students’ baseline alpha power decreased as the time of day progressed, consistent with adolescents being least attentive early in the morning. During learning, academic performance was highest—and alpha power lowest—for mid-morning classes, consistent with previous research showing mixed effects: early morning performance is low for circadian reasons, whereas performance on tests taken at the end of a school day is low because of fatigue. Together, our findings demonstrate that class time is reflected in adolescents’ brain responsivity and suggest that mid-morning may be the best time to learn.

A-38 DANCING TOGETHER: THE NATURE OF INFANT-MOTHER LOCOMOTOR SYNCHRONY *Ori Ossmy, Justine E Hoch, Shohan Hasan - Department of Psychology, New York University, New York, NY 10003; Whitney G Cole - Max Planck Institute for Human Development, Berlin, Germany; Karen E Adolph - Department of Psychology, New York University, New York, NY 10003* Infants’ and mothers’

behaviors are sometimes so beautifully synchronized and coordinated in space and time that, in the case of face-to-face social interactions, researchers have referred to their joint behavior as a “dance.” Here, we examined whether infants and mothers continue the dance during free play on the floor. We observed 30 infant-mother dyads during 20 minutes of free play in a laboratory playroom filled with toys, furniture, and elevations. We identified periods when each partner was stationary or locomoting, the number of steps and distance traveled per bout of locomotion, their step- to-step location in the room, and the distance between infant and mother at each moment. We show that more active infants had more active mothers in terms of accumulated steps, distance traveled, and unique locations visited. However, infants took more steps than their mothers and visited more unique room locations. Moreover, dyads showed temporal and spatial synchrony in their moment-to-moment spontaneous locomotor activity. Using dynamic time warping, we showed that that each infant’s path was most similar to his or her own mother’s path, and they were usually a meter apart throughout the session (roughly arms’ reach). Finally, we determined whether one partner was more likely to take the lead and the other to follow. A multivariate Granger-causality analysis showed that when dyads were not seamlessly coordinated, infants usually took the lead. Results from this novel approach support the notion that freely mobile infants and their mothers are temporally and spatially coordinated as they “dance” through the playroom.

A-39 MBSR INCREASES PCC-DLPFC RESTING STATE FUNCTIONAL CONNECTIVITY RELATIVE TO ACTIVE CONTROL *Theodore P Imhoff-Smith, Tammi RA Kral, Dan W Grupe, Richard J Davidson - University of Wisconsin-Madison, Madison, United States* Previous research found that a brief, intensive mindfulness intervention increased resting state functional connectivity (RSFC) between nodes of the dorsal attention network (dorsolateral prefrontal cortex; DLPFC) and default mode network (posterior cingulate cortex; PCC) (Creswell et al., 2016). We investigated whether these effects generalized to one of the most commonly used mindfulness meditation interventions - an 8-week mindfulness-based stress reduction course (MBSR). We compared the impact of MBSR on DLPFC-PCC RSFC to a health enhancement program (HEP), a validated, active control intervention. Healthy adults were randomized to MBSR (N=27, mean age(SD)= 38.8(13.4) years) or HEP (N=30, mean age(SD)= 42.8(12.6) years), and completed a resting state scan pre-randomization (T1) and post-intervention (T2). We examined RSFC of a PCC seed (defined from Creswell et al., 2016) with DLPFC, both by conducting small-volume corrected voxel-wise analysis within the Harvard-Oxford atlas-defined middle frontal gyrus (MFG) and by extracting average connectivity weights from the MFG ROI. We also examined whole-brain RSFC with the PCC on a voxelwise level. Voxel-wise and ROI analyses revealed increased PCC-DLPFC RSFC (T2-T1) in MBSR relative to HEP ($p < 0.05$, corrected and $p < 0.0003$, respectively). Whole-brain analysis indicated increased PCC RSFC (T2-T1) with inferior frontal gyrus, middle temporal gyrus, and angular gyrus for MBSR relative to HEP ($p < 0.05$, corrected). Increased PCC RSFC was always significant within the MSBR group, but non-significant within HEP. These data provide a conceptual replication of prior work linking mindfulness meditation with increased RSFC between the DMN and the DLPFC in healthy adults.

A-40 META-ANALYTIC BRAIN NETWORKS UNDERLYING EMOTION REGULATION *Carmen Morawetz - Freie Universiaet Berlin, Berlin, Germany; Michael Riedel, Taylor Salo -, Angela Laird - Florida International University, Miami, USA; Simon Eickhoff - Heinrich-Heine University Düsseldorf, Düsseldorf, Germany; Nils Kohn - Radboud University, Nijmegen, Netherlands* Recent models suggest that cognitive emotion regulation is based upon neural systems implicated in generation and regulation of emotional responses as well as systems with an undefined or intermediary role. Despite the wealth of research in this field, the exact neural networks underlying emotion regulation remain unknown. To shed

light on this, we applied a meta-analytic grouping technique to identify networks of clusters of emotion regulation experiments and performed functional decoding using BrainMap metadata terms (107 studies, 385 experiments, 3204 subjects). The results revealed four clusters of meta-analytic groupings (MAGs): MAG1 included dlPFC, parietal cortex and posterior cingulate cortex and is associated with attention and working memory. MAG2 consisted of vlPFC, SMA, temporal and parietal areas and is linked to language, semantics and speech. MAG3 involved the amygdala, thalamus, hippocampus and anterior insula and is related to paradigms implicated in emotion processing. MAG4 consisted of the precuneus, posterior insula and superior parietal lobe and is associated with paradigms of action execution, somesthesis, and pain. In the context of emotion regulation, we propose that these networks take over different functional roles. MAG1 directs attention to the emotional stimulus and holds the goal of the emotion regulation strategy in mind, MAG2 facilitates the selection of goal-appropriate reappraisals and the active reinterpretation of the meaning of the emotional stimulus, MAG3 generates the emotional response and relates it to past experiences, which are controlled by top-down processes, and MAG4 forwards sensory predictions to somatosensory cortices to initiate a change in affect.

A-41 INFANT REGIONAL CEREBRAL BLOOD FLOW IS CORRELATED WITH MATERNAL SENSITIVITY FOLLOWING SOCIAL STRESS *Amar Ojha - Stanford University; Maria C Camacho - University of Pittsburgh; Lucy S King, Kate L Humphreys, Ian H Gotlib - Stanford University* Background: Given the altricial nature of our species, caregivers are essential for development. Variation in human caregiving behavior is posited to affect brain development, including connectivity in brain regions associated with social cognition (e.g., anterior cingulate gyrus, orbitofrontal cortex, and ventromedial prefrontal cortex). The majority of infant functional neuroimaging research utilizes BOLD signal; however, the components of BOLD change with infant development. An alternative metric, perfusion MRI, directly quantifies regional cerebral blood flow (rCBF), making it ideal for studying in vivo infant neurodevelopment. Methods: Maternal sensitivity and intrusiveness for 19 infant–mother dyads was coded during a repeated Still Face Paradigm (M age child 29.59±1.91 weeks). Perfusion MRI scans were collected from the infants during natural sleep to quantify rCBF. Whole-brain voxelwise linear models were conducted, co-varying for infant age, to examine rCBF related to dimensions of caregiving behavior. Permutation tests were conducted to reduce likelihood of false discovery. Results: We found positive associations between maternal sensitivity and rCBF in the following regions: anterior and posterior cingulate cortices, orbitofrontal cortex, ventrolateral prefrontal cortex, precuneus, middle frontal gyrus, inferior parietal lobule, cerebellum, and occipital lobe (all ts>3.08, df=18; cluster FWE corrected $p<0.05$). There were no negative associations between sensitivity and rCBF; intrusiveness was unrelated to rCBF. Discussion: We found that brain regions associated with social cognition had increased rCBF in infants with more sensitive caregivers. This suggests that sensitive caregiving in early infancy promotes neural development in these regions, and provides insight into the neurodevelopmental consequences of caregiving behavior.

A-42 THE INFLUENCE OF STRESS AND CRAVING ON SUBJECTIVE VALUE: A TEMPORAL AND ATTRIBUTE BASED EXAMINATION *Nidhi V Banavar, Anna B Konova, Candace M Raio, Paul W Glimcher - New York University, New York, USA* Stress and craving are well-established drivers of reward-seeking behavior in health and psychopathology. Despite this, we still lack a basic empirical characterization of how these states affect reward valuation to bias behavior. Here, we developed an economic decision-making task designed to capture dynamic changes in subjective value (SV) for food rewards over time. Specifically, after a baseline period and before returning to the SV task, healthy non-dieters either underwent an acute stress induction (Cold-Pressor Test; ‘Stress’), this same stress test paired with craving induction (brief multi-sensory food exposure; ‘Stress+Craving’), or control procedures

('Control'). Results revealed an increase relative to baseline in the SV of food rewards in both the 'Stress' and 'Stress+Craving' groups compared to 'Control'. Interestingly, this increase peaked at different times: peak SV was observed immediately after induction in the 'Stress+Craving' group (+10 minutes), while peak SV was observed with delay in the 'Stress' group (+60 minutes). Individual differences in self-reported craving experience and perceived stress mirrored these distinct temporal profiles, with attribute ratings of food rewards eliciting further information about the SV change across conditions. Additionally, for the 'Stress' group, effects were enhanced for foods rated as most desirable prior to the study suggesting that, in the absence of explicit cue-exposure (as in 'Stress+Craving'), an individual's reward history guides the degree to which stress increases reward-seeking. Our results provide important insights into the mechanisms by which stress exposure and cue-induced craving influence SV and highlight differences in when individuals may be most susceptible to maladaptive choice behavior.

A-43 CAN TYLENOL AFFECT THE DECISIONS WE MAKE FOR OTHERS? *K M Sharika, Michael L Platt - University of Pennsylvania* Previous work in healthy humans has implicated the role of acetaminophen (active ingredient in Tylenol) in reduced empathy for others in distress (Mischkowski et al., 2016). In addition, imaging studies have shown dorsal anterior cingulate cortex (dACC) and anterior insula – areas associated with the affective component of pain (Rainville et al., 1997) – to be active while individuals empathized with others' pain (Singer et al., 2004). To further examine the hypothesis that acetaminophen reduces empathy for distress and probe the neural mechanisms underlying the processing of other's distress in self, we recorded the activity of ACC neurons while rhesus monkeys performed a 'willingness to pay' task in which they chose between two differently colored targets that were associated with varying magnitudes of juice across trials. In each trial, the juice on offer was cued to be either sweet tasting or bitter tasting for the actor monkey or a recipient monkey (sitting across the room and facing the actor monkey) by means of four differently colored reward cues. Early findings showed that not only did decisions made by the actor monkey indicate an awareness of vicarious reward outcomes learnt by observation alone, the activity of ACC neurons distinctly represented positive and negative outcome for self and other as well. We also recorded the activity of ACC neurons following an oral dose of Tylenol to further investigate ACC's role in valence specific decision-making for self vs. other.

A-44 A MULTIPLICATIVE INCREASE IN SUBJECTIVE VALUATION UNDERLIES BOTH FOOD AND DRUG CRAVING *Konova B Anna, Lopez-Guzman Silvia, John Messinger, Kenway Louie, Paul W Glimcher - New York University* Craving is a specific desire state that biases choice toward the desired object. Despite its ubiquity and role in addiction and obesity we still lack a basic neurocomputational understanding of craving. In 2 studies, in health and in opioid users in treatment, we test the hypothesis that craving is a specific change in an individual's valuation process. In a novel experimental protocol we specifically test the algorithmic nature of this change. Healthy non-dieters (n=45) were offered 1-8 units at a time of three snack foods. We induced craving for one of the snacks by having subjects interact with the snack while recalling its taste. Because we could not ethically give opioids to recovering users, in study 2 (n=27) we offered instead personalized opioid use-related goods in a similar task. To capture dynamics in naturally occurring opioid craving patients were studied over multiple days. Subjective valuation for all goods in both studies was quantified repeatedly as a BDM bid. This allowed us to—for each subject, good, and moment—construct a function mapping objective (number of units) to subjective value (relative increase in value/unit added). We tested three possible transformations of this function during peak craving: addition, multiplication, and exponentiation. In health, craving induction selectively increased the craved snack's value. In opioid users, opioid craving increased the value of the opioid use-

related goods. For both, multiplication best captured these increases suggesting a gain control-like process of craving. These findings offer new ways to model craving and other subjective states in economic terms.

A-45 NEURAL PHENOTYPE OF OBESITY: A POPULATION-BASED PREDICTIVE MODELING APPROACH *Samantha J Chavez, Robert S Chavez - University of Oregon; Dylan D Wagner, Sarah E Anderson - The Ohio State University* Health status is determined by multiple factors within individuals and their environments. Although there is broad interest in uncovering biomarkers that predict health outcomes, these efforts are often limited by the use of small convenience samples with little power to construct finely tuned models and independently test their accuracy. To address this, the current study combines population-based sampling methods with out-of-sample prediction testing to investigate how the structural connectivity of reward and inhibition systems predicts obesity status in a representative sample of 275 U.S. adults aged 18-85yrs. Probabilistic tractography was applied to diffusion data to delineate putative reward and inhibitory pathways. Next, we used a training dataset (n=193) to model predicted obesity status as a logistic function of proxy-measures (i.e., fractional anisotropy) for the structural integrity of these pathways. Then, we tuned this model with measures of sociodemographic status using bidirectional stepwise regression. Following model tuning, we defined a probability threshold for predicted obesity that maximized sensitivity and specificity and applied this model to an independent holdout sample (n=82). Classification accuracy in the holdout sample was 63.5% (sensitivity=72%; specificity=58%). Importantly, classification accuracy increased substantially (11.1%) when sociodemographic predictors were included, suggesting that they play a nontrivial role in brain-health relationships. Our results provide evidence for a neural phenotype of obesity, represented by the microstructural integrity of reward and inhibitory pathways. By using a representative sample and including sociodemographic predictors, we demonstrate the predictive utility that an epidemiological perspective may lend to translational goals in the social neuroscience of health behaviors.

A-46 SELF-ESTEEM MODULATES MORTALITY SALIENCE EFFECTS ON BEHAVIORAL AND BRAIN RESPONSES TO SELF-FACE *Lili Guan - School of Psychology, Northeast Normal University, ChangChun 130024, China; Yufang Zhao - Faculty of Psychology, Southwest University, Chongqing 400715, China; Juan Yang - Faculty of Psychology, Southwest University, Chongqing 400715, China; Shihui Han - School of Psychological and Cognitive Sciences, Peking University, Beijing 100871, China* Behavioral findings suggest that mortality threats influence the processing of self-relevant information of individuals with low self-esteem. How mortality threats influence self-related processing by modulating its neural underpinnings remains unknown. We addressed this issue by scanning 66 healthy adults, using functional MRI, while viewing photos of faces of oneself, a friend, and a stranger after being primed with mortality salience (MS) or negative affect (NA). We found that participants responded faster to head orientations for own-face than friend-face and this self-face advantage was reduced by MS (vs. NA) priming particularly in low self-esteem individuals. Self-face vs. friend-face increased activities in the bilateral insula, inferior frontal gyrus, inferior parietal lobule/supramarginal gyrus, thalamus, right middle frontal gyrus in the MS (vs. NA) conditions. Self-report of closeness to death caused by priming mediated the priming effect on the right insula and left thalamus activities. Moreover, the relationship between self-esteem and self-face advantage in behavioral responses was mediated by left and right insula activities in the MS condition. Our findings indicate that self-esteem modulates MS influences on behavioral responses to self-relevant information and such modulation effects are mediated by the insula activity related to self-consciousness. The brain imaging findings suggest a neural mechanism underlying self-esteem buffer of MS effects on cognitive and affective processes of self-relevant information.

A-47 INDIVIDUAL DIFFERENCES IN THE NEURAL SUBSTRATES OF FOOD CHOICE *Wendy Sun, Rebecca Boswell, Hedy Kober - Yale University, New Haven CT USA* Healthy food choice in the face of temptation may involve separate but interacting brain systems, including the medial prefrontal cortex (mPFC), implicated in value computation, and lateral prefrontal cortex (lPFC), implicated in cognitive control. However, individual differences in neural activity during food choice have not yet been investigated. Here, we specifically focused on the role of body mass index (BMI). Participants (NCURRENT=19; MBMI=26.26, RangeBMI:19.0-45.3) underwent fMRI and were presented with binary food choices between either 1) a healthy food and an unhealthy food (HU pair; defined as "self-control trials"), 2) two healthy foods (HH), or 3) two unhealthy foods (UU). Whole- brain analyses show that when participants chose a healthy vs. unhealthy food during self-control trials (HU-H>HU-U), this was associated with increased activity in lPFC. Further, trial-by-trial activity in lPFC increased as pre-scan health ratings of the chosen items increased, replicating prior work with non- binary food choice. Additionally, healthy choices in self-control trials vs. non-control trials (HU-H>HH-H) were associated with greater activity in lPFC and mPFC. Importantly, lPFC activity correlated with BMI when participants chose the healthy option during self-control trials (HU-H>HU-U), such that those with higher BMIs recruited lPFC to a greater degree ($r=.69$, $p<.001$). These results speak to the current debate over self-control as value-based decision-making, and suggest that binary food choices involve co-activated brain systems, including the mPFC and lPFC. Importantly, recruitment of these systems varies based on individual differences, such as BMI. These findings have implications for understanding how our food choices occur, and individual differences therein.

A-48 IMPLICIT EVALUATIVE PROCESSING OF MORAL AND EMOTIONAL CONTENT DURING DISCOURSE COMPREHENSION *Angelika Kunkel, Ian Grant Mackenzie - University of Tübingen; Ruth Filik - University of Nottingham; Hartmut Leuthold - University of Tübingen* Recently, using event-related potentials (ERPs), we showed that when participants read about daily moral transgressions, the task that they performed determined the processing of incoming linguistic information (Kunkel, Mackenzie, Filik, & Leuthold, in revision). Specifically, when explicit moral judgments were required a larger anterior negativity indicated increased cognitive processing of immoral than moral scenarios, whereas for emotional judgments a larger posterior positivity (LPP) indicated increased affective processing. The present two experiments examined which brain processes and embodied responses contribute to discourse comprehension if no task is required. Target sentences from negative vs. neutral emotional scenarios and from moral vs. immoral scenarios were presented using rapid serial visual presentation while ERPs (Experiment 1), and facial electromyogram (fEMG) and electrodermal activity (EDA, Experiment 2) were recorded. In Experiment 1, LPP (300-500 ms) was larger for negative and immoral compared to neutral and moral scenarios. In Experiment 2, fEMG and EDA results were not sensitive to experimental manipulations in either morality or emotion materials, despite participants showing clear fEMG/EDA effects to standard emotional pictures and words. We conclude that discourse comprehension involves the top-down affective evaluation (LPP) of incoming linguistic moral and emotional information but not the embodied simulation of emotion (fEMG, EDA).

A-49 THE EFFECT OF SLEEP DEPRIVATION IN MORAL JUDGEMENT BEHAVIOR *Ruri Katsunuma, Yuki Motomura, Michitaka Yoshimura, Yoshiya Moriguchi, Kazuo Mishima - National Center of Neurology and Psychiatry, Tokyo, Japan* Sleep deprivation disturbs moral judgments (Killgore et al., 2007), a behavior known to be influenced by subjective pleasantness (Carmona-Perera et al., 2013). Present study investigated the neural associations of moral judgements when sleep deprived, using fMRI. Fifteen males (mean±SD age = 26.5±6.14) participated in a within-subject, crossover, two-day sleep interventional study consisting of two conditions; sleep deprived (SD; 3h sleep) and sleep

controlled (CT; 9h sleep). Scanning was done on the last day, during moral judgement task: participants first viewed anonymous someone being ostracized in a virtual ball toss game (modified Cyberball paradigm; Williams et al., 2000), then, participants joined the game to be measured whether they toss to the excluded player (Excl) or the others (nonExcl). We focused on the right orbitofrontal cortex [OFC; (x,y,z) = (6,46,-15)(mm)], as the OFC is responsible for subjective pleasantness (Kühn and Gallinat, 2012) and was also a significantly- activated area for task engagement in our study ($F= 3.48$, $p<.001$). Overall hemodynamic responses in the OFC during any ball tosses were not different between sleep conditions [$F(1,14)=1.21$, $p=.29$]. However, responses were greater when tossing to Excl than to nonExcl [$F(1,14)=5.05$, $p=.04$]. More specifically, the differential responses (tossing to Excl vs. nonExcl) were different between sleep conditions [two-way interactive effect of Target (Excl/nonExcl) x Sleep (CT/SD), $F(1,14)=8.31$, $p=.012$], such that the differential responses were significant for CT [$T(14)=5.87$, $p=.001$] but not in SD [$T(14)=.4$, $p=.69$]. The result suggests that a sleep debt may affect moral judgments, which might be mediated by diminished activation in the OFC.

A-50 INTERGROUP THREAT SHAPES THE COMPUTATIONAL MECHANISMS OF IMPRESSION FORMATION *Jenifer Z Siegel - University of Oxford; Jim A.C. Everett - Leiden University; Talia Longhorne - University of Oxford; Molly J Crockett - Yale University* People form moral impressions rapidly, effortlessly, and from a remarkably young age. An open question is whether the underlying mechanisms for social impression formation are dynamically related to inferred beliefs about how threatening an agent is. In three studies we investigated how social threats impact the cognitive and computational processes of impression formation using a novel moral inference paradigm. In all studies participants predicted sequences of moral decisions made by two agents – one characteristically 'bad' and one characteristically 'good' – where each decision involved choosing whether to profit by inflicting pain on another. We used a hierarchical Bayesian reinforcement learning model to describe participants' evolving beliefs about the moral character of the agents. In study 1, we show that beliefs about the morality of bad agents are more uncertain (and thus more volatile) than beliefs about the morality of good agents. In studies 2 and 3, we manipulated perceived threat about the agents by indicating their voting intentions in the recent U.S. and UK elections. We show that beliefs about agents who support the opposing political party (outgroup) are more uncertain and volatile (and thus more rapidly updated) than beliefs about agents supporting the same party (ingroup). Furthermore, the extent to which people's beliefs are more uncertain and volatile about outgroup agents is predicted by how threatened people feel by the outgroup. We suggest that the learning mechanisms described here promote cognitive flexibility in the service of building richer models of potentially threatening others.

A-51 COMPARING TWO FACETS OF EMPATHIC ACCURACY IN NEURODEGENERATIVE PATIENTS: DIAGNOSTIC DIFFERENCES AND NEURAL CORRELATES *Casey L. Brown, Alice Y. Hua - UC Berkeley; Lize De Coster, Howard, J. Rose, Bruce L. Miller - UC San Francisco; Robert W. Levenson - UC Berkeley* Empathy, the ability to understand other's emotions, is a multifaceted ability. In addition to recognizing specific emotions (e.g., happy sad), empathy also requires tracking others' changing emotions over time. Deficits in empathy are caused by neurodegenerative diseases, however, which facets of empathy decline and their neural correlates remain unclear. We examined empathy in 155 patients with a variety of neurodegenerative diseases and 24 controls using two tasks: a film based emotion recognition task where participants were asked to identify specific emotions experienced by different target characters in film clips, and a tracking task where participants continuously indicated the emotional valence experienced by a character in a film using a rating dial. We compared performance on these two tasks by diagnosis, and found that patients with Alzheimer's disease, behavioral variant frontotemporal dementia, and progressive supranuclear palsy had significantly worse performance on the tracking task compared to the emotion recognition task; whereas patients with semantic variant primary

progressive aphasia had significantly worse performance on the emotion recognition task. Additionally, using whole brain voxel-based morphometry, we found grey matter atrophy in bilateral and predominantly right hemispheric regions such as the superior medial prefrontal, anterior cingulate cortex, and right insula was associated with worse performance on the tracking task. Atrophy in bilateral and predominantly left hemisphere regions was associated with worse performance on the emotion recognition task, including inferior frontal, left ventral striatum, and left posterior insula. These findings highlight the differing neural networks involved in two facets of empathy.

A-52 RETHINKING THE MEANING OF VENTRAL STRIATAL ACTIVATION: VENTRAL STRIATUM ACTIVITY DURING ACUTE STRESS IN FEMALES *Carrianne J. Leschak - University of California Los Angeles; Janine M. Dutcher - Carnegie Mellon University; Kate E. Byrne-Haltom, Julienne E. Bower, Naomi I. Eisenberger - University of California Los Angeles* The ventral striatum (VS), with dopamine projections from the ventral tegmental area (VTA), is considered a key reward region in humans. However, within the animal literature, there is general agreement that different portions of both the VS (specifically, portions of the nucleus accumbens [nACC]) and VTA are functionally heterogeneous. For example, past work shows that the dorsal VTA and rostral nACC shell are associated with appetitive behavior, in line with assumptions regarding VS's role in reward, while ventral VTA and caudal nACC shell are associated with aversive and stressful events. In humans, the highlighted role of the VS continues to be reward-related, with little to no attention to its possible role in stress. In the present work, we explored VS activity in response to a standard social stress task (N = 39 breast cancer survivors). We found increased VS activity during stress trials (relative to non-stress control trials). Additionally, VS activity during stress trials was positively correlated with self-reports of stress (r = .49). These findings suggest that the human VS may have a dual function: The VS may be involved in stressful or aversive experiences, in addition to its acknowledged role in reward.

A-53 THE ROLE OF AUTISTIC TRAITS IN REWARD ANTICIPATION *Magdalena Matyjek, Mareike Bayer, Isabel Dziobek - Berlin School of Mind and Brain, Humboldt- Universität zu Berlin, Berlin, Germany* Autism Spectrum Conditions may be associated with abnormal reward anticipation (Kohls et al., 2012). However, prior work concerning differences between social vs. non-social domains is inconclusive. The current ongoing study aims at identifying the influence of autistic traits in neurotypical participants (Autism Spectrum Quotient (AQ); Baron-Cohen et al., 2001) on reward anticipation. Hitherto 25 volunteers performed a cued incentive task with social and non-social rewards. During the performance, we recorded event-related potentials and pupillary responses. The pupillary data revealed decreased pupil sizes during anticipation of a reward in participants with higher AQ scores ($p<.01$, $d=1.47$). In a sample subset with extreme scores (low-AQ: n=7, m=9.86, sd=3.02; high-AQ: n=7, m=28, sd=5.03), the descriptive effects pointed at group effects in the contingent negative variation (CNV) amplitudes, regardless of the domain (d=.36). High-AQ was associated with descriptively smaller amplitudes of CNV (high-AQ: m=-.92, sd=1.86; low-AQ: m=-2.27, sd=2.4). According to power analyses based on these findings, sample size will be increased to n=50 (power at .85). The results from the full data set will be presented at the conference. Given the main effect of group in pupillary data, and the descriptive trends in CNV amplitudes, we conclude that the results point to atypical reward anticipation in individuals with higher AQ scores. This effect is insensitive to the reward domain (social vs. non-social), which suggests a general disturbance in reward processing associated with intensified autistic traits in undiagnosed individuals. By using a population-based approach, this study contributes to understanding reward sensitivity in autism spectrum.

A-54 OXYTOCIN-ENFORCED NORM COMPLIANCE REDUCES XENOPHOBIC OUTGROUP

REJECTION *Nina Marsh, Dirk Scheele - Division of Medical Psychology, University of Bonn Medical Center, Bonn, Germany; Justin Feinstein - Laureate Institute for Brain Research, Tulsa, Oklahoma 74136; Holger Gerhardt - Center for Economics and Neuroscience, University of Bonn, Bonn, Germany; Sabrina Strang - Department of Psychology, University of Lübeck, Lübeck, Germany; Wolfgang Maier - Department of Psychiatry, University of Bonn Medical Center & German Center for Neurodegenerative Diseases (DZNE), Helmholtz Association, Bonn, Germany; Rene Hurlemann - Department of Psychiatry, University of Bonn & Division of Medical Psychology, University of Bonn Medical Center, Bonn, Germany* The recent migration of Middle Eastern refugees requires the native populations of European societies to adapt to rapid growths in ethnic diversity, religious pluralism, and cultural differentiation. Resistance to this transition often goes along with xenophobic sentiment evident in a large divide in society between people who do and do not support the refugees. The biblical parable of the Good Samaritan (Luke 10:25–16:17) describes an ethical maxim of helping strangers in need and serves as an example of altruistic cooperation extending beyond the limits of the ingroup to members of the outgroup. Yet, the neurobiological conditions of outgroup directed altruism have not been determined. Only recently, the evolutionary conserved neuropeptide oxytocin has been identified as a key modulator of altruism. In three experiments settled in the context of the current refugee crisis, we used intranasal oxytocin and tested the propensity of 183 participants to make donations to people in need. Here we show for the first time that xenophobic rejection of refugees can be reversed by pairing enhanced activity of the oxytocin system with peer-derived altruistic norms. Neither intervention alone was sufficient to alter selfish responses in participants scoring high on a xenophobia inventory, whereas the combined administration of oxytocin and altruistic norms prompted the high scorers to increase their outgroup- related donations by 74%. Collectively, our results suggest that efforts to induce outgroup-directed altruism are most effective under conditions of heightened oxytocin-system activity and social cues, which instill the notion that one's ingroup shows strong affection for an outgroup.

A-55 INSTRUMENTAL SOCIAL VALUE MODULATES EARLY PERSON PERCEPTION: REINFORCEMENT LEARNING EFFECTS ON THE N170 *Jeffrey J Berg - New York University; Dan Cao - Shanghai University; Zoe Kleiman, Nicholas G Matese, Melissa Wessel, David M Amodio - New York University* How do we form an attitude about someone through direct social interaction? And does this attitude affect how we see them? We proposed that people can form attitudinal preferences for others through instrumental learning, based on the reception of positive or negative choice feedback. Moreover, we examined whether these instrumental preferences, once formed, could influence the visual encoding of others' faces. To test these propositions, participants completed an instrumental reinforcement learning task in which they learned to associate faces with diverging levels of probabilistic reward feedback. In a subsequent task, participants viewed each face passively, without feedback, while electroencephalogram (EEG) was recorded. Participants then provided self-reports of their attitudes towards the faces. Results show that participants successfully learned the value of the target faces through reinforcement, and that their self-reported attitudes toward the faces closely corresponded to this learning. Furthermore, analysis of the N170 event-related potential (ERP)—an index of structural face encoding—revealed that early visual face processing was modulated by the face target's instrumental value. These findings suggest that people form social attitudes via instrumental reinforcement learning, and that this learning can influence structural face processing—the earliest stage of social perception.

A-56 MEMORY FOR DANGERS PAST: THREAT CONTEXTS PRODUCE MORE CONSISTENT LEARNING THAN NON-THREATENING CONTEXTS *Akos Szekely, Suparna Rajaram, Aprajita Mohanty - Stony Brook University* It is hypothesized that threatening stimuli are detected faster and more accurately due to their salience or physical properties. Threatening stimuli typically occur

embedded in a rich context and we have shown that individuals are able to learn the regularities within visual contexts and use this contextual information to guide detection of embedded threatening targets. However, in real life, contexts once associated with threat can become associated with non-threatening targets and vice versa. To examine how contextual learning changes when the salience of the target changes, we presented threatening and non-threatening face targets in new or old spatial configurations and changed the target salience halfway through the experiment. We found that detection of threatening targets was faster in old than new configurations and this learning persisted even after the target changed to non- threatening. However, the same was not seen when the targets changed from non-threatening to threatening. Present findings show that detection of threatening targets is driven not only by stimulus properties as theorized traditionally but also by the learning of contexts in which threatening stimuli appear. Additionally, learning of the context associated with threatening targets is persistent and benefits detection of subsequent non-threatening targets presented in the same context. Neurally, it is likely that interactions between medial temporal lobe, amygdala, and frontoparietal spatial attention regions play an important role in contextual learning guided detection of threatening targets. Overall, our findings highlight the importance of top-down factors such as context and learning in the detection of threatening targets.

A-57 DISTINCT NEURAL COMPUTATIONS MEDIATE OBSERVATIONAL LEARNING DERIVED FROM SOCIAL VERSUS NON-SOCIAL FEEDBACK *Damian A. Stanley - Adelphi University; Jessica Stanley - Trinity College, Dublin; Richard M. Piech - Anglia Ruskin University; John P. O'Doherty - California Institute of Technology* We often learn not through doing, but through observing other people's actions and the outcomes they experience. An open question is how the source of information being observed influences observational learning. We investigated whether distinct neural computations underlie the contributions of non-social and social feedback to observational learning. 25 fMRI participants (observers) learned whether 6 lottery machines would deliver aversive (salty tea) or neutral (artificial saliva) outcomes by watching videos of 3 observees (interleaved), each playing a pair of lotteries (80:20/20:80 opposing contingencies; 1 reversal per lottery per experiment). Each observee belonged to 1 of 3 interleaved conditions: 1) Face Alone (FA), outcome depicted by facial expression alone; 2) Word Alone (WA), outcome depicted by a word alone. 3) Face+Word (F+W), outcome depicted by facial expression and a word. Accuracy was significantly above chance in all conditions ($p<0.005$) and significantly higher in the FW ($p<0.005$) than in the FA and WA conditions. Learning rates (Rescorla Wagner learning model) were also higher in the FW (0.51) than in the FO (0.37) and WO (0.38) conditions, though this difference was not significant. BOLD signals in the amygdala and face-selective temporal/occipital cortex correlated with aversive prediction error (i.e. highest for unexpected aversive outcomes) in conditions where face expressions depicted outcomes (FO & FW). Conversely, BOLD signals in the caudate head correlated with appetitive prediction error in conditions in which words described outcomes (WO & FW). These data suggest that observational learning from social and non-social observational feedback may depend on distinct neural substrates.

A-58 DYNAMIC INTERACTIONS BETWEEN THE AMYGDALA AND AROUSAL NETWORK IN STIGMATIZED INDIVIDUALS; INSIGHTS FROM THE STARTLE REFLEX *Rachel C Amey, Mengting Liu, Adam B Magerman, Matthew Scott - University of Delaware, Chad E Forbes* The amygdala is an integrative hub for the experience of emotion and detection of self-threats. Often amygdala activity is examined via a startle reflex that manifests as a unique eye blink; the magnitude of the blink serves as a direct index of amygdala activity. Current best practices discard startle blinks below a certain criterion. However, past research demonstrates that amygdala activity can fluctuate over time in response to threatening stimuli suggesting that the exclusion of eye blinks below a certain threshold would eliminate meaningful data. The current study examined how interpretations of stress and emotion in a condition

can change dramatically as a function of including startle blinks below standard thresholds. In a stressful context (stereotype threatening (ST) contexts) women and men completed math problems and were given veridical feedback after each trial yoked to random startle probes while continuous EEG data was recorded. Memory for presented feedback was tested after the task. Startle amplitudes and neural network connectivity in the arousal network were analyzed over time. Typical amygdala habituation patterns were seen in all participants except ST women, whose amplitudes exhibited a quadratic relationship over time. Arousal network connectivity was negatively correlated with startle amplitude; connectivity was highest when startle amplitudes were lowest. Memory encoding and performance were also affected as a function of amygdala activity. Findings suggest low amplitude startle trials contain valuable information that warrant inclusion and that stress prompts dynamic interactions between the amygdala and arousal network responses to affect performance and memory among stigmatized individuals.

A-59 DECODING THE EMOTIONS OF SOUND FROM PATTERNS OF NEURAL ACTIVATION *Matthew Sachs, Assal Habibi, Antonio Damasio, Jonas Kaplan - University of Southern California* The ability to identify emotions from auditory stimuli and respond appropriately is a key component of effective social functioning. While the brain regions involved in processing the affective information conveyed by sounds are known, it is unclear if these regions respond in the same way to different emotions regardless of the sound source. Sounds from numerous different sources, such as human voice or the violin, have the ability to express discrete emotions, though the acoustical properties that express them can vary remarkably. To address this, we had participants (N = 38, 20 females) listen to brief audio excerpts produced by the violin, clarinet, and human voice, each conveying one of three target emotions—happiness, sadness, and fear—while brain activity was measured with fMRI. We used multivoxel pattern analysis to evaluate whether emotion-specific neural responses to the voice could predict emotion specific neural responses to musical instruments and vice-versa. A whole-brain searchlight analysis revealed that patterns of activity within the primary and secondary auditory cortex, posterior insula, and parietal operculum were predictive of the affective content both within and across instruments, indicating that these brain regions carry emotion-specific patterns that generalize across sounds with different acoustical properties. Additionally, classification accuracy within the anterior insula was correlated with behavioral measures of empathy, suggesting that individuals with greater empathic ability have more distinct neural patterns related to perceiving emotions. These results extend previous knowledge regarding how the human brain extracts emotional meaning from auditory stimuli, enabling us to communicate and connect with others.

A-60 MODULATION OF NEURAL EMPATHIC RESPONSE TO PAIN VIA EXPRESSIVE SUPPRESSION *Steven R Anderson - Department of Psychology, University of Miami, Miami, USA; Wenxin Li, Shihui Han - School of Psychological and Cognitive Sciences, Peking University, Beijing, China; Elizabeth R Losin - Department of Psychology, University of Miami, Miami, USA* Neural empathic responses to the pain of others are consistently found to be modulated by characteristics of the individual in pain. However, considerably less is known about how characteristics of the pain observer modulate neural empathic responses. We used fMRI to investigate how the emotion regulation strategy of expressive suppression influences neural empathic responses. Participants were 30 healthy young adults (15 female) recruited from Peking University in Beijing, China. Participants underwent fMRI while completing an event-related expressive suppression task in which they viewed faces with painful or neutral expressions while engaging in expressive suppression (pain faces) or passive viewing (pain and neutral faces). After scanning, participants completed self- report questionnaires measuring trait empathy and expressive suppression. In a region-of-interest (ROI) analysis, we found that passively

viewing painful versus neutral faces resulted in increased brain activity in the right anterior insula (rAI), a region previously associated with empathy for pain. Analysis of the suppression condition revealed activation in the right amygdala and right inferior frontal gyrus (rIFG), regions previously associated with expressive suppression. In a correlation analysis, we found that activity within the rAI was negatively correlated with activity in the right amygdala and rIFG. This negative correlation was strongest for participants lowest in trait empathy and highest in habitual suppression. Together, our findings suggest that greater trait and experimental use of expressive suppression is associated with decreased neural empathy. These results add to our understanding of how observer characteristics modulate neural empathic responding and illuminate potential neurobiological mechanisms of this relationship.

Poster Session B

Friday, May 4, 3:45 – 5:00 PM

B-1 SOCIAL CONTEXT INFLUENCES A NEUROCOGNITIVE SIGNATURE OF CHILD EMOTION REGULATION: A CROSS CULTURAL STUDY *Sarah Myruski - The Graduate Center, CUNY, New York, NY, USA; Samantha Birk - Temple University, Philadelphia, PA, USA; Aya Kamikubo, Midori Kazama, Hidemi Hirabayashi, Mayumi Karasawa - Tokyo Women's Christian University, Tokyo, Japan; Tracy A. Dennis-Tiwary - Hunter College, CUNY, New York, NY, USA* The late positive potential (LPP) is a neurocognitive signature of emotion regulation (ER). In adults, LPP amplitudes are reduced when unpleasant stimuli are reappraised in a positive light. Yet, it remains unclear whether this reappraisal effect on the LPP is present in children, since developmentally- appropriate and context-sensitive assessments are absent, particularly across cultures. This study measured the LPP in Japanese and U.S. children, systematically varying socialization context (parent- scaffolding, parent-present, parent-absent). Fifty-eight 5-to-8-year-old Japanese children (26 female; Mmonth = 69.78, SD = 7.01), and 52 U.S. children (27 female; Mmonth = 76.19, SD = 8.88) completed a Directed Reappraisal Task (DRT). EEG was recorded during three conditions: unpleasant pictures interpreted negatively, unpleasant pictures interpreted with reappraisal, and neutral pictures interpreted neutrally. In the Parent-Scaffolding Group (njpn = 19; nus = 19), parents read scaffolding scripts before each picture. In the Parent-Present Group (njpn = 20; nus = 18), parents were present but not interacting. In the Parent-Absent Group (njpn = 19; nus = 15), children completed the DRT alone. Among Japanese children, only those in the parent-scaffolding group showed the predicted reappraisal effect, $t(18) = 2.65$, $p = .02$. Among U.S. children, those in the parent-scaffolding group and the parent- present group showed the reappraisal effect, $t(18) = 3.41$; $t(17) = 3.39$, p's $< .01$. Results suggest that scaffolding helped children reappraise in both cultures, while the parents' mere presence was helpful for U.S. children. Findings highlight the need for culturally-sensitive and developmentally-informed methods in social-affective neuroscience studies of child ER.

B-2 FACTORS PREDICTING THEORY OF MIND SUCCESS ACROSS THE LIFESPAN *Elisabeth E.F. Bradford, Victoria E.A. Brunson, Heather Ferguson - University of Kent, Canterbury, U.K.* Engaging in social communication requires the ability to understand the mental states of other people, such as what they may know, believe, or see, and to consider how these mental states may differ from our own. In this study, a computerised false-belief task (the Self/Other Differentiation task) was utilized to assess the ease with which typically developed adults (aged 18-78 years) could attribute beliefs to both the 'Self' and 'Other'. Participants were presented with images of three containers and asked to identify where

they or someone else would look for a particular object (e.g., '[You/John] are looking for some sugar, where would you look?]. The contents of the container was then revealed to be either congruent (e.g., sugar in the sugar bowl) or incongruent (e.g., marbles in the sugar bowl). Finally, participants were asked the critical probe question: 'What did [You/John] think was inside the container, before seeing inside?'). Results revealed a significant effect of perspective, with longer and more error prone responses to questions referring to another person's perspective compared to the 'self' perspective; this effect was larger in older adults, suggesting that differentiating between one's own and another person's perspective becomes more difficult with age, requiring more cognitive effort. Participants also completed tasks assessing executive functioning abilities, including inhibition, working memory, planning, and cognitive flexibility. Results indicated a key role of inhibition and working memory abilities in predicting performance on the Self/Other Differentiation task, but only in older rather than younger adults.

B-3 VISUALIZING HUMAN BEINGS: IMAGE FRAMING IN PHOTOJOURNALISM & THE DEHUMANIZATION OF REFUGEES *Manos Tsakiris - Department of Psychology, Royal Holloway, University of London & The Warburg Institute, School of Advanced Study, University of London, UK; Sophie De Beukelaer, Ruben Azevedo - The Warburg Institute, School of Advanced Study, University of London, UK* The ways in which human beings are depicted in the media have far-reaching consequences for our attitudes towards them, their well-being and our democracies. Here, we examined how the ways in which refugees are visually framed in the media affect their dehumanization. We identified photojournalistic images depicting refugees and classified them according to the visual framing of refugees as individuals or in small groups with identifiable faces, or in large groups without recognizable facial feature, and tested if and how these two types of visual framing lead to their dehumanization. Relative to the small group condition, participants seeing refugees in large groups tended to assign less uniquely human emotional states to them. Moreover, visual framing effects were stronger in photos showing refugees arriving by sea, rather than in land, and the effects of visual framing were extended to a refugee's moral dilemma task. When using photos depicting survivors of natural disasters, visual framing did not result in their greater dehumanization. Lastly, in a within- subjects design, refugees depicted in large groups, but not survivors of natural disasters, were rated lower in warmth. These studies demonstrate the power that prevalent depictions of large groups of individuals in the media have on the public's perception of refugees as human beings. There might not be neutral ways of visually depicting refugees, but our findings contribute to debates about the influence of the media's use of visual framing as vehicles for socially constructing our attitudes towards others.

B-4 ATTENUATION OF VALENCE-ACTION COUPLING PROMOTES BEHAVIORAL FLEXIBILITY DURING ADOLESCENCE *Hillary A Raab, Shivani Hiralall, Catherine A Hartley - New York University, New York, USA* An intrinsic tendency to couple valence and action can bias individuals to approach rewards and to inhibit action in the face of punishment. For example, upon smelling a delicious treat, you might enter the nearby bakery, or upon hearing a threatening noise, you might freeze. Although approaching rewards and inhibiting action in anticipation of punishment may be useful behavioral heuristics, these responses may not always be aligned with one's goals (e.g., healthy eating or seeking help). Behavioral flexibility refers to the ability to adapt one's actions to environmental demands and opportunities in accordance with one's goals. In adults, behavioral flexibility is constrained by the tendency to couple valence and action. In the present study, we characterized the developmental trajectory of behavioral flexibility, disentangling the effects of valence and action on reinforcement learning. Participants (n=61; 8-25 years old) performed a Go/No-go task in which valence and action were orthogonalized, resulting in four trial types: Go to Win, Go to Avoid Losing, No-go to Win, No-go to

Avoid Losing. Behavioral flexibility, indexed by relatively equal and accurate performance across trial types, was greatest in adolescents compared to children and adults. Conversely, children and adults' learning exhibited greater coupling between valence and action, reflecting less behavioral flexibility. Computational models fit to participants' data suggested that this flexibility in adolescence stems from an unbiased learning process. Greater behavioral flexibility during adolescence may foster accurate learning about the reward and punishment structure of one's environment, which may be particularly adaptive during the transition toward independence.

B-5 NEURAL AND BEHAVIORAL DIFFERENCES LEADING TO INCREASED RISK-TAKING IN METHAMPHETAMINE USERS *Vita Droutman - University of Southern California; Feng Xue - University of California San Diego; Barkley-Levenson Emily - Hofstra University; Smith Ben, Bechara Antoine, Read Steve - University of Southern California; VITALIYA DROUTMAN* Neuroadaptations caused by chronic methamphetamine use are likely major contributors to high relapse rates following treatment. Thus, focusing intervention efforts at pre-empting addiction in vulnerable populations would seem to be a more promising strategy, since it would prevent meth-use induced neurological changes that make the recovery so challenging. Casual methamphetamine users (cMU), not yet addicted, but at high risk due to their experience with meth are a good target group. Unfortunately, research on neuro-cognitive differences of cMU is currently lacking. In this work we start to bridge this gap. While undergoing fMRI, cMU and non-meth using participants performed the CUPS task, in which they decided to accept or refuse a series of mixed gambles. We examined differences in neural processing during decisions and feedback processing using whole brain, region of interest and psychophysiological interaction (PPI) analyses. cMU took significantly more risk in the task and made 5 times more errors (missed trials that resulted in immediate monetary loss) relative to non-users (NU). Whole brain analysis identified an amygdala-striatal cluster with weaker activation in cMU compared to NU during the decisions. Activity in that cluster inversely correlated with decision to gamble: lower activation corresponded to higher risk-taking. Using this cluster as a seed in PPI analyses we identified a wide range of neural network differences between MU and NU. We identified key differences in reward processing, executive functioning and outcome learning that may contribute to increased laboratory and real-world risk-taking in cMU and can be addressed in future intervention.

B-6 PAYING TO SEEK OR AVOID SOCIAL INTERACTIONS *Johannes W Schultz, Tom Willems, Ghada Chakkour, Alexander Franke, René Hurlemann - Division of Medical Psychology, University of Bonn, Bonn, Germany* Interacting with other people is a major source of happiness for most human beings. However, social interactions do not always evolve according to expectations and may result in the reception of negative social feedback. While many people spend money to seek social interactions with other people, anxiety about possible negative social feedback may lead some people to withdraw from social interactions, causing in some cases considerable loss of private and professional opportunities. To quantify the costs of pro-sociality and social anxiety, we devised a psychophysic task allowing to determine how much money participants would spend to avoid or seek a simple social interaction with uncertain outcome. In a sample of healthy participants, the more anxious participants paid to avoid the interaction, while the less anxious paid to seek the interaction. These differences were not found in a control condition in which the interaction partner was a computer instead of a human, demonstrating that risk aversion differences cannot explain our findings. Separate valence ratings of the interaction outcomes did not significantly vary between participant groups, suggesting that the observed effects were not due to differences in the valuation of the outcomes themselves. Our results demonstrate that tendencies towards pro-sociality and social anxiety among healthy participants are both costly. Our experiment allows to directly compare the costs of these personality traits and may prove useful for

investigating treatment effects of social anxiety. We are currently using it to investigate individual differences in the neural correlates of social decision-making.

B-7 REWARD ENCODING IN SUBCALLOSAL ANTERIOR CINGULATE CORTEX, VENTRAL STRIATUM, AND AMYGDALA *Megan E Young, Kristen D Esannason, Sarita Tamang, Clayton Moser, Peter H Rudebeck - Icahn School of Medicine at Mount Sinai* Dysfunction within the circuits linking subcallosal anterior cingulate cortex (ACC), ventral striatum (VS) and amygdala is related to changes in affect. However, a mechanistic understanding of how the subcallosal ACC interacts with VS and amygdala during the anticipation and receipt of reward in normal function is lacking. Here we investigated how neurons in subcallosal ACC, VS, and amygdala interact while monkeys anticipate and receive reward. Two rhesus macaques performed Pavlovian and instrumental trace conditioning tasks while single-unit and local field activity in subcallosal ACC, VS, and basolateral amygdala were recorded. Autonomic measures of arousal, such as pupil diameter and continuous EKG, and task-related behavioral responses were continuously collected. We found that monkeys showed elevated behavioral and autonomic responses in anticipation of rewards, which were modulated by each animal's individual reward preferences. Neurons in subcallosal ACC, VS, and amygdala encoded upcoming reward during the stimulus and trace intervals, and this activity was similarly modulated by individual reward preference. However, the timing of these responses differed between areas, with amygdala neurons signaling reward value first, followed then by subcallosal ACC and VS. In conclusion, we found that neuronal activity in subcallosal ACC, VS, and amygdala correlates with sustained behavioral and autonomic responses in anticipation of rewards, and that these responses occur on different time scales. We are now exploring how these areas interact as a functional circuit by looking at measures of oscillatory coherence and spike-spike correlations within and between subcallosal ACC, VS, and amygdala.

B-8 COMBINED FMRI-ADAPTATION (FMRI-A) AND MULTIVARIATE PATTERN ANALYSIS (MVPA) REVEAL DIFFERENCE BETWEEN MUSICIANS AND NON-MUSICIANS IN RESPONSE TO AUDITORY EMOTIONAL INFORMATION *Jocelyne C Whitehead, Jorge L Armony - McGill University, Montreal, Canada* Emotions portrayed in the auditory domain convey critical information that enables the listener to interpret the intent and affective state of the emitter. Recent work has shown musical expertise to shape how acoustic information is processed in the brain; however, little is known about its influence on emotional processing. To address this question, we employed an fMRI-adaptation (fMRI-a) paradigm with a fast multiband sequence (TR=0.529s, voxel: 2mm isotropic), where musicians (N =15) and non-musicians (N=15) passively listened to pseudospeech and musical excerpts, expressing a neutral or fearful emotion. FMRI-a, in combination with multivariate pattern analysis (MVPA) allowed for a more detailed and comprehensive view of the differences in neural responses to voice and music, as well as how these may be modulated by emotion. We observed a difference in processing music between musicians and non-musicians that was not present for voice. Moreover, only musicians showed music-specific adaptation effects, with the bilateral amygdala, thalamus, hippocampus and superior temporal gyrus (STG) contributing the most to this effect. In addition, only musicians showed a distinction in processing fear from neutral music, with the greatest contributions coming from the bilateral STG, thalamus, Heschl's gyrus, and left amygdala. These findings provide strong support for a role of expertise in the processing of musical emotions. Moreover, they demonstrate the advantage of using high-resolution fMRI and combining adaptation paradigms with multivariate analytical approaches.

B-9 GROUPS OF UNFAIR INDIVIDUALS BENEFIT FROM DECREASED SOCIAL PUNISHMENT *Marwa El Zein, Chloe Seikus, Lee De-Wit, Bahador Bahrami - University College London* In the last few

decades, research on collective decisions has focused on the accuracy of collectives, ignoring an important aspect of collective behaviors: the diffusion of responsibility. In a group, individuals share responsibility for their actions, which may protect them against negative consequences of these actions. In particular, when actions could trigger punishment (unfair behaviors, crimes), being in a group could decrease this punishment, as it is shared among several individuals. While it has been shown in previous studies that people in a group show increased free riding, no study has looked at how groups vs. individuals are punished. Following our reasoning that groups share responsibility for harmful acts, we predicted that a group would be punished less than an individual for the same act. We tested this hypothesis using two well-known cooperation games: the ultimatum and the dictator game (with third party punishment). One (individual condition) vs three (group condition) proposers made offers to recipients. In the ultimatum game, recipients could reject (i.e. social punishment) or accept the offer. In the dictator game, a third party could punish the proposer or proposers for their unfair offer at his/her own cost. In both games, groups were punished less than individuals who made the same unfair offers. Our results demonstrate a most useful adaptive value of collective actions: two heads are better off than one.

B-10 TEMPORAL DYNAMICS OF THE REPRESENTATION OF SOCIAL CLOSENESS OF FACES
Sarah L. Dziura, James C. Thompson - George Mason University The ability to perceive and understand social information rapidly is important in a highly interconnected world. While identification of identity from faces occurs within the first few hundred milliseconds of perception, timing of the retrieval of the social connections of an individual is unknown. We used event- related potentials and temporal representational similarity analysis (RSA) to examine the neural processing of social network information activated when viewing a face. Participants learned a social network through watching three episodes of an unfamiliar television show and reported the perceived closeness of ten characters. Closeness ratings were significantly related to the number of scenes and time in which characters were both present ($p<0.001$). Participants then viewed photos of the characters while EEG was recorded from 64 scalp sites. RSA was used to compare ERP neural similarity data among these faces with models of face processing at different stages. Computational models of visual similarity, face space, (expression-independent) identity, and ratings of social network closeness were correlated with the similarity of neural responses to the faces at different time points. Visual similarity, face space, and identity representations became significant at approximately 60-100 ms after face onset ($p<0.001$; 10,000 randomizations). Social network closeness then became significant between approximately 200-300 ms after face onset ($p<0.001$). These findings indicate that information about social network relationships is accessed shortly following the visual perception of faces. This data supports the proposal that information about social connections is closely linked to representations of face identity.

B-11 MAKING SOCIAL NEUROSCIENCE LESS WEIRD: NEURAL SIGNATURES OF INTERPERSONAL INFLUENCE IN THE MIDDLE EAST AS MEASURED WITH FNIRS
Shannon M Burns, Lianne N Barnes, Macrina Cooper-White – UCLA; Ian A McCulloh - Johns Hopkins University; Munqith M Dagher - IIACSS Research Group; Douglas Storey - Johns Hopkins University; Emily B Falk - University of Pennsylvania; Matthew D Lieberman – UCLA The large majority of social neuroscience research uses WEIRD populations – participants from Western, educated, industrialized, rich, and democratic. This makes it difficult to claim whether neuropsychological functions are universal or culture specific. In this study, we demonstrate how we can address the imbalance by using portable neuroscience equipment in two studies of persuasion and interpersonal influence conducted in Jordan with an Arabic-speaking sample. Participants were shown persuasive videos on various health, safety, or public affairs topics while their brain activity was measured using functional near infrared

spectroscopy (fNIRS). In one study, participants also discussed the videos with another person in a dyadic neuroimaging design. Consistent with previous research conducted with American subjects, this work found that activity in the medial prefrontal cortex predicted how persuasive participants found the videos and how much they intended to engage in the messages' endorsed behaviors. Further, interpersonal neural synchrony during discussion of video topics was evaluated as a prediction of discussion outcomes. Implications for these results on the understanding of the brain basis of interpersonal influence and on future directions for neuroimaging in diverse populations are discussed.

B-12 LEARNING ABOUT THE SELF IN THE PRESENCE OF OTHERS: THE IMPACT OF SOCIAL ANXIETY ON MENTALIZING AND UPDATING PROCESSES *Laura Müller-Pinzler, Nora Czekalla, Frieder M. Paulus, Sören Krach - University of Lübeck, Department of Psychiatry and Psychotherapy* In a social context self-related information needs to be constantly integrated to form beliefs about the self in order to adapt behavior to the demands of the environment. Studies indicate that people show a positivity bias when processing self-related feedback possibly stabilizing beneficial self-concepts. We hypothesized that self-related updating is altered by the mere presence of others, a fundamental aspect of any given social situations. The presence of others typically makes us think about their views of us, which then draws attention away from other sources of information relevant for self-related learning. In this line, we could show that receiving negative self-related feedback in a public context induced embarrassment, increased neural activation in the so-called mentalizing network and the anterior insula. Specifically, individuals high in social anxiety (SA) shifted attention towards the audience and showed increased mentalizing activation in line with attention biases towards cues for social threat. In a novel social learning paradigm we assessed participants' expectation updating in response to self-related positive and negative performance feedback. Participants showed a strong modulation of prediction error updating in public in line with a shift of attention away from the feedback towards the audience, another usually relevant source of social self-related information. Interestingly, individuals high in SA showed an overall greater updating after negative compared to positive prediction errors. This supports the notion of attention biases towards negative social information and points towards a mechanism contributing to negative self-related beliefs and a constant negative view of the self in SA.

B-13 TRICK OR TREAT: NEURAL SENSITIVITY TO SOCIAL RISK IN ADOLESCENTS WITH SEVERE CONDUCT PROBLEMS. *Michael T Perino - University of Illinois at Urbana-Champaign; Ethan M McCormick, Eva H Telzer - University of North Carolina at Chapel-Hill* Adolescents' neural and behavioral responses differ from their child and adult counterparts, suggesting disinhibition to appetitive cues may be particularly explanatory for increased risk-taking. However, much of this work has relied upon community samples, and may not generalize to the situations, mental processes, and populations most engaged in destructive risk-taking. We utilized a social variant of the Balloon Analog Risk Task during fMRI, to assess differential responses to social-risk cues. Our sample included adolescents with no disciplinary record (N=27), and adolescents engaged in delinquent behaviors, as measured by suspensions, expulsions, and arrests (N=25). Behaviorally, adolescents from the delinquent and community sample engaged in similar patterns of risk-taking; however, activation patterns suggested significant differences in the neural processing of risk. Specifically, we observed significant interactions in tracking of increasing social risk in the dorsal anterior cingulate (dACC), posterior cingulate (PCC), ventromedial prefrontal cortex (vmPFC), dorsolateral prefrontal cortex (dlPFC), bilateral ventral striatum (VS), bilateral insula, right temporoparietal junction (TPJ), and right posterior superior temporal sulcus (pSTS) that differentiated our community and delinquent sample. Greater tracking in these regions related to reduced risk-taking behaviors in the delinquent sample but increased risk-taking in the

community sample, suggesting that the mental processes potentially guiding normative risk-taking and currently discussed in the developmental neuroscience literature may not apply to delinquent samples. We suggest that theories of risk-taking that lack explicit focus on delinquent samples may have limited generalizability, requiring the field to re-evaluate our scope to inform interventions for those most susceptible to destructive risk- taking behaviors.

B-14 DEGRADED VISUAL INPUT EXACERBATES WEAPON IDENTIFICATION BIAS *Benjamin S. Stillerman, Jonathan B. Freeman - New York University* The racially biased identification of weapons is, at least in part, a result of stereotypes linking Black Americans to crime. In real-world scenarios of police officers identifying objects as potential weapons, viewing conditions are not always optimal and the visual stimuli can be ambiguous. This bears on recent models (Freeman & Johnson, 2016), which claim that social perception is the result of a dynamic process integrating bottom-up visual input and top-down stereotype information. We investigated whether degraded visual input would make way for a greater biasing influence of stereotypes. Using a modified Weapon Identification Task (WIT) combined with mouse-tracking, we investigated whether degraded visual input exacerbated the commonly observed weapon identification bias effect. Participants (N = 199) completed a WIT using both clear or degraded (visual noise superimposed) target objects. We found that mouse trajectories on Black-primed tool trials showed a greater attraction to gun responses than White-primed tool trials, suggesting that the Black primes partially activated the gun category. Additionally, this effect was greater for degraded objects, indicating a greater level of bias when the objects provided less reliable bottom-up information. We discuss putative neural mechanisms supporting the automatic activation of stereotypes and their influence on object identification, linking the present work to recent MVPA evidence. We also discuss consequences for bias reduction interventions.

B-15 ATTENUATED PAVLOVIAN LEARNING BIASES IN ADOLESCENCE *Juliet Y. Davidow, Rahul Bhui, Catherine Insel, Amanda M. Brandt, Abigail M. Stark, Katherine E. Kabotyanski, Leah H. Somerville - Harvard University* Adolescence is a time of life rich with affective learning experiences. Affective learning in adults has been linked to both Pavlovian (i.e. reflexive) and more flexible instrumental learning systems. When information is consistent, these systems can cooperate supporting goal-directed decision-making; however, when information conflicts, e.g. when action and outcome valence are opposed, strong influence from the Pavlovian system can disrupt the instrumental system, decreasing learning. The influence of these differential learning systems under conflict on goal-directed decision-making has not been studied over development. Participants 11–22 years old (N=87) learned from probabilistic reinforcement to execute or withhold a button press (action factor) to obtain reward or avoid punishment (valence factor); the intersection of these factors is congruent (press to obtain reward, withhold press to avoid punishment) or incongruent (press to avoid punishment, withhold press to obtain reward). We employed a computational model to estimate psychological parameters characterizing learning and biases in decisions. For learning, we found a significant interaction of age on action-by-valence. We investigated the direction of this complex interaction by fitting linear and non- linear models of age to a Pavlovian bias parameter estimated by the computational model. We found a significant U-shaped fit with lowest Pavlovian parameters in late adolescence. This better explained the group data than a linear age model, suggesting that during adolescence there is an attenuation of Pavlovian learning biases. This could allow for better instrumental learning when information is in conflict, to optimize learning during adolescence. Additional parameters, and competing computational models, will be discussed.

B-16 CAN PSYCHOLOGICAL TREATMENT SLOW DOWN CELLULAR AGING IN SOCIAL ANXIETY DISORDER? AN INTERVENTION STUDY EVALUATING CHANGES IN TELOMERE LENGTH AND TELOMERASE ACTIVITY *Kristoffer N T Månsson - Stockholm University, Stockholm, Sweden; Karolinska Institutet, Stockholm, Sweden; Uppsala University, Uppsala, Sweden; Daniel Lindqvist - Lund University, Lund, Sweden; University of California San Francisco (UCSF), School of Medicine, San Francisco, CA, United States; Owen Wolkowitz - University of California San Francisco (UCSF), School of Medicine, San Francisco, CA, United States; Gustav Nilsonne - StockholmStockholm University, Stockholm, Sweden; Karolinska Institutet, Stockholm, Sweden; Josef Isung - Karolinska Institutet, Stockholm, Sweden, Cecilia Svanborg - Karolinska Institutet, Stockholm, Sweden; C-J Boraxbekk - Copenhagen University Hospital Hvidovre, Copenhagen, Denmark; Umeå University, Umeå, Sweden, Håkan Fischer - Stockholm University, Stockholm, Sweden; Catharina Lavebratt - Karolinska Institutet, Stockholm, Sweden, Tomas Furmark - Uppsala University, Uppsala, Sweden* Mental illness, including anxiety disorders, is linked to accelerated cell aging. This is evidenced by shorter leukocyte telomere length. Cells with critically short telomeres may undergo apoptosis. In dividing cells, telomere shortening is counteracted by the telomerase enzyme. Telomerase is reportedly low following chronic psychological stress. We hypothesized that a psychological treatment may increase telomerase activity, and be associated with less telomere attrition and greater symptom improvement. Forty-six patients (91% SSRI naïve) with social anxiety disorder (SAD; mean age 31, 63% females) underwent a 9-week waiting period, and 9 weeks of Internet-delivered cognitive behavior therapy (CBT). During treatment, symptoms were assessed weekly using the Liebowitz Social Anxiety Scale (LSAS-SR). Fasting blood samples (before 11 am) were collected twice before treatment, and at post-treatment. Genomic DNA was extracted using DNeasy® Blood & Tissue Kit (Qiagene) to assess leukocyte telomere length. Telomerase activity was detected by real-time telomeric repeat amplification protocol (RT-TRAP). Patients improved significantly on the LSAS-SR ($p<.001$; Cohen's $d=1.5$). Pre- post changes in telomerase and telomere length correlated positively (Pearson's $r=.31$, $p=.05$). Patients exhibiting reduced telomerase activity (<33th percentile) was associated with less improvement and increased activity (>66th pctl) with more improvement on the LSAS-SR ($Z=-2.4$, $p=.02$). We demonstrate, to our knowledge for the first time, that altered telomerase activity is associated with clinical response to a psychological treatment in a psychiatric population. The observed CBT effect on telomerase in patients with SAD is consistent with results from animal trials and a small previous study of antidepressants in humans. Thus, telomerase activation may play an important role in clinical recovery.

B-17 LATENT-CAUSE INFERENCE IN SOCIAL BIASES *Yeon Soon, Yael Niv - Princeton University, Princeton, NJ, USA* When making decisions in a social environment, how do we form impressions about a group of people whose members are diverse? When the majority of members are alike and only a few are dissimilar from the rest of the group members, how does experience with those rare members influence the overall impression? Here, we explored how highly variable and/or rare events can gain prominence in overall estimation if people form impressions using semi-rational inference of latent causes—causal structures of the world that generate a set of observations—and heuristic averaging over these causes. We hypothesized that events that are sparse (due to being rare or variable) will be attributed to a large number of latent causes. This tendency to separate sparse events to small latent causes, while grouping common events in large latent causes that explain multiple events, can result in overweighting of sparse events if later averaging is across (unweighted) latent causes rather than individual events. We tested this hypothesis by manipulating sparsity of non-overlapping event distributions in model simulations and behavioral decision-making experiments. To test for estimation biases isolated from other social evaluation biases, subjects observed a sequence of coin donations and were subsequently asked to estimate the average donation amount. As predicted by the latent-cause

model, the average donation estimation was incorrectly biased toward the sparse donations These results suggest that social biases that have been found in empirical social cognition research may be the results of a semi- rational Bayesian latent cause inference process.

B-18 AGE-RELATED DIFFERENCES IN NEURAL ACTIVATION DURING THE RECOGNITION OF VOCAL EMOTIONAL PROSODY BY YOUTH *Michele Morningstar, Joseph Venticinque, Stanley Singer, Jr., Whitney I. Mattson, Eric E. Nelson - Research Institute, Nationwide Children's Hospital* Changes to the social brain network during adolescence have been linked to age-related maturation of social cognition ability, which includes skills such as emotion recognition (ER), or the ability to understand others' affect. Most studies on the development of this ability have focused on the recognition of facial expressions of emotion, but vocal ER skills also mature during adolescence. However, little is known about the neural underpinnings of this ability. The current study examined age- related changes in youth's neural activation during a vocal ER task. Twenty-five youth aged 9-18 heard recordings of emotional voices and selected the portrayed expression from 5 labels (anger, happiness, fear, sadness, neutral) while undergoing functional magnetic resonance imaging. Multivariate analyses were conducted to examine the effect of emotion type and age on neural activation during the task compared to baseline. Youth made fewer errors in labelling vocal prosody with increased age. Neural activation did not differ by emotion type, but the bilateral middle frontal gyrus, left inferior frontal gyrus, and left middle occipital gyrus showed linear increases in activation with age. Greater activity in these areas was linked to reduced ER errors. Maturational change in neural activation during the interpretation of vocal affect was primarily noted in frontal areas involved in top-down language processing and mentalizing, rather than in primary sensory areas like the auditory cortex or superior temporal sulcus. The development of vocal ER skills during adolescence may be supported by increased recruitment of brain structures involved in the cognitive processing of affect.

B-19 MODULARITY OF INTRINSIC FUNCTIONAL BRAIN NETWORKS PREDICTS AGE-RELATED CHANGES IN BASIC SOCIAL COGNITIVE FUNCTIONS *Colleen Hughes, Brittany S. Cassidy, Joshua Faskowitz, Andrea Avena-Koenigsberger, Olaf Sporns, Anne C. Krendl - Indiana University, Bloomington, Indiana, United States* Aging has been widely associated with declines in basic social cognitive functions (e.g., inhibiting prejudice, theory of mind). However, the mechanisms underlying age-related changes in those processes are poorly understood. Neuroimaging is uniquely suited to shed light on these mechanisms because it investigates aging at multiple levels of analysis. For example, prior work has identified specific neural regions underlying social cognitive processes (e.g., medial prefrontal cortex) whose function changes over the lifespan. However, the complexity of these changes may be further characterized by the intrinsic (i.e., undirected, resting-state) connectivity of many coordinated regions. Thus, we examined whether age-differences in the modularity (i.e., the strength of coupling within, and weakness of coupling between, networks of brain regions) of intrinsic networks predicted age- differences in social cognitive functions. Forty healthy young (18-33 years) and 35 healthy older (61-86 years) adults completed behavioral measures of implicit bias (e.g., race, age) and theory of mind several days prior to undergoing fMRI. Network modularity was obtained via resting-state fMRI. Consistent with prior work, older adults had higher implicit bias than did young adults. Older versus young adults also had less modular networks indicating potential dysregulation of the functional specialization of the networks. Critically, the modularity of the default mode network, which includes brain regions that have been widely implicated in social cognition (e.g., medial prefrontal cortex), predicted age-differences on behavioral tasks. These results suggest that age-related changes in the diffusivity of intrinsic connectivity in specific networks, implicating dysregulated specialization, may

explain deficits in social cognitive functions.

B-20 EFFECTS OF SOCIAL STRESS ON SELF-RELATED LEARNING PROCESSES *Nora Czekalla, Frieder M. Paulus, Sören Krach, Laura Mueller-Pinzler - University Lübeck, Department for Psychiatry and Psychotherapy* To flexibly act in a social environment, we must continuously integrate feedback about ourselves or others and adapt our expectations accordingly. Feedback about the self is often received in a context of social stress, e.g. after a public speech. It is known that people usually overweight positive information when learning self-related feedback (Sharot & Garrett, 2016). However, the influence of stress on feedback-based learning, especially regarding self-related information in a social context, has not been examined so far. In the current study we designed a learning paradigm to measure updating of self-related performance expectations after a social stress induction or control task. In an estimation task subjects were repeatedly asked to rate their performance expectations and received positive or negative performance feedback. Results show that participants updated their self-evaluations according to the given feedback. Self-evaluations of stressed individuals were significantly more positive compared to participants in the control group. This elevation effect correlated with cortisol levels. Stressed participants showed greater updating (linear regression between trial-by-trial prediction errors and updates) compared to the control group especially after positive prediction errors. The elevation and updating effect of the stressed participants is in line with theories claiming that a stress-induced modulation of the dopaminergic system could lead to a reward-biased learning (Mather & Lighthall, 2012). Our study gives first behavioral insights into self-related feedback learning in a social context and its relation to physiological stress responses providing an interesting starting point for future investigations on the neural systems level.

B-21 COMPUTATIONAL MODELING OF VALUE, WEIGHTING AND ATTENTION IN MULTI-ATTRIBUTE CHOICE *Daniel J Wilson, Cendri Hutcherson - University of Toronto* Some of the most important decisions we make on a daily basis involve the complex consideration and (noisy) integration of multiple attributes rather than a single discrete value. However, the computational process by which these multi-attribute values are constructed remains poorly understood. How are different attributes attended, and what shapes the relationship between an attribute's value, its weight, and the attention it receives? To answer these questions, we develop a computational model that describes the dynamics by which people search and attend to multiple attributes in a value-based decision making task as a function of their value and weight. In our paradigm, participants made choices about whether to accept combinations of attributes represented by house and face images associated with different positive or negative values. Critically, we manipulated the relative importance of these attributes through a "multiplier" applied on each trial to the value of the face, house, or both. We tracked attention to each attribute by requiring participants to press a button to switch between the face and house images in order to interpret the summed value. Computational model of choices and attentional allocation suggested that in contrast to assumptions made by the standard attentional drift diffusion model, fixation durations are not independent of value and weight. Our models suggest that attention itself is a value-based choice informed by both attribute value and context-dependent attribute weighting. EEG and fMRI data collection to further elucidate neural mechanisms is ongoing.

B-22 OXYTOCIN AND VASOPRESSIN EFFECTS ON MENTALIZING *Mark A Straccia, Matthew D Lieberman - University of California Los Angeles, Los Angeles, CA, USA; Benjamin A. Tabak - Southern Methodist University, Dallas, TX, USA* In the past decade, research on oxytocin has sky rocketed.

Oxytocin has been shown to have wide- ranging effects from increasing pair bonding to increasing trust to increasing fear of strangers. We examined whether oxytocin and vasopressin would also increase Theory of Mind performance on a mentalizing task. We recruited 186 undergrad students in a double blind fMRI study to respond to the Why-How task (i.e. answering the 'why' or 'how' of a person's action) after an intranasal administration of oxytocin, vasopressin, or a placebo. We found no improvement on accuracy or reaction time on the Why-How task for either oxytocin or vasopressin including when we controlled for sex. Even though we found very robust typical activation patterns for why vs. how, we did not oxytocin or vasopressin moderation effects on these activations. We also did not find tasked based differences in functional connectivity within and between the default mode network ('why' network) and mirror neuron network ('how' network). With more explorative analysis, we did not find consistent results of multiple individual differences (e.g. Autism-Spectrum Quotient, Empathy Quotient, perspective taking, etc.) moderating connectivity depending on oxytocin or vasopressin. Given the large sample size of our study, it is reasonable to infer we could not find evidence of either oxytocin or vasopressin altering mentalizing ability and brain activation in the areas required for these tasks.

B-23 NEUROMARKERS FOR PERCEIVED CONTROL: A MEGA-ANALYTIC STUDY *Catherine Cho - Sungkyunkwan University; Mauricio Delgado - Rutgers University-Newark; Tor D. Wager - University of Colorado Boulder; Perceived Control Mega-Study Initiative Group; Choong-Wan Woo - Sungkyunkwan University* A sense of control over our environment is empowering, and can mitigate the consequences of pain and other adverse events. Although a considerable number of neuroimaging studies have explored the neural mechanisms underlying perceived control over emotional events (i.e., aversive stimuli, monetary rewards and losses), there have been limited efforts to develop models of brain systems that correlate with and can be used to predict control experiences. Here, we launch a collaborative initiative involving more than 10 laboratories and 15 studies to aggregate data across multiple studies and sites. Using a mega-analytic approach combined with machine learning, our purpose is to identify population-level multivariate fMRI patterns that are sensitive and specific to perceived control across conditions, tasks, and datasets, and can be used to predict the degree of perceived control in out-of-sample participants. Furthermore, multivariate patterns of brain activity will be used to probe the representational geometry among different task designs and conditions. Preliminary analyses discriminated conditions with high perceived control vs. no control with 79-86% accuracy in forced-choice tests (n = 85). Our analyses also revealed cross-prediction across multiple datasets, with some of the pattern-based models generalizing to independent studies. Once data collection from participating laboratories is completed, in-depth analyses will be conducted to refine neural signatures for perceived control and to better understand pattern-level neural information across studies. The quantitative synthesis of data through collaborative efforts will provide a cumulative understanding of neural mechanisms underlying perceptions of control and suggests potential uses in applied settings.

B-24 MOTIVATED IMPRESSION UPDATES VARY AS A FUNCTION OF IMPRESSION DIMENSIONS *BoKyung Park, Liane Young - Boston College* Previous studies found that failure to recruit regions associated with social prediction error (e.g., temporo-parietal junction; TPJ) can hinder incorporating negative information of in-group members, contributing to in-group favoritism (Hughes, Zaki, & Ambady, 2017). We investigated whether the dimension of the impression that participants are asked to update can modulate these effects. Specifically, we investigated whether participants would become more defensive when they rate their relationship with an in-group member (i.e., a friend) compared to when they rate non-relational dimensions, such as personality traits. We recruited 181 participants and asked them to rate either to what extent a target person (their friend or a stranger) is trustworthy, or how close they feel towards the target person, based on the target's behavior (the target either gave or took money to/from the participants). We found that participants were less likely to update their impressions of

friends, especially when they rated closeness (p=.086, t=1.72). Moreover, participants' reaction time modulated these effects; the faster they made the ratings, the closer they rated their relationship with their friends, whereas the longer they took to make the ratings, the closer they rated their relationship with strangers (p=.069, t=-1.82). These results suggest that immediate and intuitive processing of new information helped the participants to maintain their perception of closeness with friends. Ongoing neuroimaging work will test whether failure in recruiting TPJ can account for participants' reduced updating of perceived closeness with friends. These findings suggest that motivated impression updating can be modulated by the type of specific impression dimensions.

B-25 DOES MANIPULATING VISUAL SCANPATHS DURING FACIAL EMOTION PERCEPTION INFLUENCE BRAIN ACTIVATION IN FACE-PROCESSING REGIONS IN SCHIZOPHRENIA PATIENTS AND CONTROLS? *Michael J. Spilka, Daniel J. Pittman, Signe L. Bray - University of Calgary; Vina M. Goghari - University of Toronto Scarborough* Individuals with schizophrenia have deficits in the ability to perceive and recognize emotions from faces. This impairment has been linked separately to functional activation abnormalities in the neural system for facial emotion perception, and to making fewer fixations to salient facial features compared to healthy controls. The present study investigated whether gaze behaviour modulates brain activation during facial emotion perception. Twenty-three individuals with a diagnosis of schizophrenia/schizoaffective disorder and 25 community controls underwent fMRI while viewing pictures of emotional faces. During the Typical Viewing condition, a moving fixation cue directed participants' gaze primarily to the eyes and mouth, while gaze was directed to peripheral facial features during the Atypical Viewing condition. Both conditions elicited activation in the distributed neural system for facial emotion perception. In both groups, Typical Viewing led to greater activation in extrastriate visual cortex, while Atypical Viewing elicited greater activation in primary visual cortex and regions involved in eye movement control. Region of interest analyses revealed greater activation during Typical than Atypical Viewing in the "occipital face area" but not in other face and emotion processing regions. No significant interactions between viewing condition and group were observed. The present study failed to find that increasing gaze toward salient facial features leads to greater activation throughout the facial emotion perception network, contrary to previous studies. However, we found that gaze behaviour modulates activation in an early face-processing region, suggesting that abnormal gaze behaviour may contribute to findings of dysfunction in this region during facial emotion perception in schizophrenia.

B-26 SINGLE-DOSE INTRANASAL OXYTOCIN ADMINISTRATION IS ASSOCIATED WITH LARGER AMYGDALA GREY MATTER VOLUME IN YOUNGER, BUT SMALLER VOLUME IN OLDER ADULTS *Håkan Fischer, S. Cortes Diana, Laukka Petri, N.T. Månsson Kristoffer - Stockholm university, Sweden; C. Ebner Natalie - University of Florida, USA* Introduction There is ample evidence regarding the role of intranasal oxytocin in social-cognitive and affective processing. Currently still understudied are the brain mechanisms underlying oxytocin's effects on structural neuroplasticity, such as in amygdala, a region central for social-cognitive and affective function and rich in oxytocin receptors. Further, emerging evidence suggests that oxytocin may target brain regions differently with age. Methods: Using a randomized, double-blind, placebo controlled within-group design, we investigated the extent to which a single-dose 40 IUs ntranasal oxytocin administration affects amygdala volume in younger (N = 47; age range 20-30 years) and older (N = 43; age range 64-76 years) adults 40 minutes prior to MRI scanning. Voxel based-morphometry was used to assess grey matter (GM) volume in the Computational Anatomy Toolbox implemented in SPM12. Voxel-wise analyses were small volume corrected on bilateral amygdala with a family-wise error (FWE) correction to determine statistical significance (controlling for total brain volume). Results: We found a significant condition x age interaction in the amygdala (xyz[-22,-6,-18], Z=4.25, pFWE=.001; xyz[22,2-,21], Z=3.08, pFWE=.055). In particular, for younger adults

amygdala GM volume was larger in the oxytocin compared to the placebo group. In contrast, older adults' amygdala GM volume was smaller in the oxytocin group, relative to the placebo group. Discussion: These findings provide first evidence in humans that amygdala neuroplasticity is affected by acute single-dose intranasal oxytocin administration. Further, our data suggest age-differential effects of oxytocin on brain structure across adulthood. Future studies will have to determine the structure-function relationship pertaining to these effects.

B-27 COMPUTATIONAL MODELING OF PREFERENCES AND INFERENCES ABOUT OTHER PEOPLE WITHIN RELATIONSHIPS *Michael Moutoussis - Wellcome Trust Centre for Neuroimaging, University College London, UK; Max Planck University College London Centre for Computational Psychiatry and Ageing Research, London, London, UK, Tobias Hauser - Wellcome Trust Centre for Neuroimaging, University College London, UK; Max Planck University College London Centre for Computational Psychiatry and Ageing Research, London, London, UK, Geert-Jan Will - Institute of Psychology, Leiden University, Leiden, The Netherlands; Leiden Institute for Brain and Cognition (LIBC), Leiden University, the Netherlands, Gita Prabhu - Max Planck University College London Centre for Computational Psychiatry and Ageing Research, London, London, UK, Karl Friston - Wellcome Trust Centre for Neuroimaging, University College London, UK, Raymond J. Dolan - Wellcome Trust Centre for Neuroimaging, University College London, UK; Max Planck University College London Centre for Computational Psychiatry and Ageing Research, London, London, UK* Computational models of inter-personal interactions have often used neuroeconomic games to study relationships. These models often condense relationship goals, and deduce feelings about others, via a few constants such as the 'guilt parameter' for unequal rewards. However, our preferences and goals depend on our beliefs about our partners' character situated within relationships. We suggest that such preferences are best modelled as joint (goal) probabilities, i.e. 'with someone like you, I hope our interaction to be thus'. Here, we present a rigorous computational model, broadly based on the 'active inference' approach. We used the model to construct computer avatars that interacted with people, in a variant of the iterated prisoner's dilemma. Real participants instructed the avatars about their own goals, or personality, in terms of joint preferences ('who I want us to be like') and initial beliefs about others. The model then proceeded by way of Bayesian inference including theory of mind (I act according to how you see my actions, but no deeper). The avatars then interacted with 24 people. Avatars behaved in a similar manner to the people that instructed them ($p=0.008$, $r=0.53$), but also induced in others similar feelings (approval ratings) as their 'instructors' mentalized their own behaviour to induce ($\rho=0.46$, $p=0.022$). Modelling approval ratings gave a consistent account of interpersonal evaluations, that is, self-of-other vs. mentalized other-of-self. Our approach formulates interactions in a new way and lays important grounds to study the neural mechanisms underpinning how we judge each other's character and set our goals within relationships.

B-28 INVESTIGATING THE NEURAL AND COGNITIVE MECHANISMS BEHIND 'LATITUDES OF ACCEPTANCE' FOR THE OPINIONS OF OTHERS *Macrina A. Cooper-White, Daniel L. Ames, Shannon M. Burns, Kevin A.M. Tan, Grace S.R. Gillespie - University of California, Los Angeles; Matthew D. Lieberman* How do individuals decide whether other people's opinions are reasonable, and what are the social consequences of these decisions? Previous work on attitude change has explored how individuals categorize opinions as reasonable (falling inside their "latitude of acceptance") or unreasonable in the abstract. However, few studies have investigated how people evaluate opinions of specific individuals. Furthermore, little is understood about how these evaluations lead to downstream consequences. We conducted behavioral studies and an fMRI study (N=37) to explore these phenomena. In the behavioral studies, we observed that it is essential to measure participants' reactions

to opinions associated with specific targets ("target-specific" opinions) in order to make predictions about their behavior toward hypothetical social targets. Participants consistently underestimated the number of opinions they would consider to be reasonable when asked in the abstract. Participants' judgments of target-specific opinions more consistently predicted social preferences as compared to abstract latitude measures. Similarly, in the fMRI study, we observed robust activations for contrasts between target-specific opinions judged by participants in the scanner as reasonable or unreasonable. Minimal differences in activation were seen between opinions that were sorted based on whether they fell inside or outside the latitude measured before scanning. We predicted that target-specific unreasonable opinions would activate negative affect related regions (insula, dACC), whereas target-specific reasonable opinions would recruit reward and self-processing related regions (VS, mPFC). Our results provide evidence for the former but not the latter, suggesting interventions for widening latitudes should focus on reducing negative affect versus invoking perceptions of similarity.

B-29 REWARD PROCESSING AND LASTING WELLNESS *Le-Anh Laurence Dinh-Williams, Norman Farb, Philip Desormeau - University of Toronto; Adam Anderson - Cornell University; Zindel Segal – University of Toronto* A major challenge in the treatment of Major Depressive Disorder (MDD) is its inherently chronic and recurring nature. Individuals who have recovered from a first depressive episode are at risk of experiencing 4 to 8 additional episodes during their lifetime. Identification of the mechanisms that support enduring MDD vulnerability has great public health significance. To date, most established vulnerability factors emphasize responses to negative events. However, MDD is also characterized by the tendency to discount the positive, including reduced neural responses to the anticipation and enjoyment of a reward. The issue is that there is limited understanding of the role of these reward- related responses in the recurrence of depression. To address this gap, we conducted a prospective, randomized, clinical study. Seventy-seven previously depressed participants were randomized to receive one of two evidence-based interventions developed to reduce the risk of relapse. Using fMRI, we examined BOLD reward-related responses during a gambling task before and after treatment, and monitored for the return of depressive symptoms during a two-year follow-up. Only regions that survived FWE corrections were retained. This design allowed us to identify common MDD vulnerability biomarkers that were present before treatment, resistant to change, and associated with the return of depression. This study found that individuals whom relapsed demonstrated chronic reductions in the ventromedial prefrontal cortex during the anticipation of a rewarding event. This finding suggests that the ability to effectively track reward-related probabilities and its incentive value during periods of uncertainty is an important predictor of the return of depression.

B-30 INTERHEMISPHERIC PAIRED ASSOCIATIVE STIMULATION OF THE PREFRONTAL CORTEX JOINTLY MODULATES FRONTAL ASYMMETRY AND EMOTIONAL REACTIVITY *Samuel Zibman, Edan Daniel, Uri Alyagon, Abraham Zangen - Ben Gurion University of the Negev* A major challenge in determining the role of frontal asymmetry in emotion is that while the correlation between deficits in lateralization and in cognitive functions has been established, a causal relationship has not been fully demonstrated. One technique that can be used to alter connectivity and establish causality in the brain is paired associative stimulation (PAS) which, through the coordinated stimulation of two regions by two TMS coils, targets the intervening connectivity. 27 healthy subjects were recruited for a three session, sham-controlled crossover study, receiving left to right PAS (LR-PAS), right to left PAS (RL-PAS) and sham during different weeks. The protocol consisted of 210 pulse pairs with an ISI of 8ms. Subjects performed the emotional Stroop task, assessed by measuring attentional bias, and brain activity was recording with EEG prior to and following the stimulation period. Our results reveal that LR PAS

increases attentional bias while increasing right frontal asymmetry whereas RL PAS decreased the attentional bias while decreasing right frontal asymmetry ($F(2,24) = 3.266$, $P=0.05$ and $F(2,27) = 5.936$, $P=0.005$ for attentional bias and frontal asymmetry respectively). These results confirm a relationship between frontal alpha asymmetry and attentional bias. This is the first demonstration of PAS's effectiveness in inducing cognitive changes by targeting interhemispheric PFC connectivity in a directional manner. Furthermore, by combining TMS with EEG, we provide a toolbox for evaluating effectiveness of PAS protocols that may facilitate development of novel therapies.

B-31 HIGH STAKES ENHANCE REINFORCEMENT LEARNING *Mahalia Prater Fahey, Catherine Insel, Mia Charifson, Gia Falcone, Leah H. Somerville - Harvard University* Reinforcement learning allows individuals to approach positive outcomes and avoid negative outcomes in the environment. This process involves using incremental feedback to update value representations about cues in the environment. Prior work suggests that feedback valence shapes learning, and individuals often learn better in the context of approaching financial gains than when avoiding financial losses. However, it remains unclear whether stakes, the relative value of prospective rewards and punishments, modulate reinforcement learning strategies. To test this, 33 young adults completed a probabilistic reinforcement learning task. In this task, participants repeatedly selected between fractals in a pair and received probabilistic monetary outcomes based on their choices. There were four fractal pairings that represented different monetary stakes: high gain (+50¢/+0¢), low gain (+25¢/+0¢), high loss (-50¢/-0¢), and low loss (-25¢/-0¢). Contrary to prior work, there was no effect of valence (gain/loss) on performance accuracy (proportion optimal choice), demonstrating that participants learned similarly from gains and losses. Notably, learning was impacted by stakes (high/low), and performance improved for high stakes incentives. Computational models identified how learning rate, a parameter measuring trial-by-trial sensitivity to feedback, varied as a function of motivational condition. Consistent with the performance effects, there was no significant difference between gain and loss learning rates. However, there was a significant difference between high stakes and low stakes learning rates, such that learning rates were higher in high stakes conditions. Together, these results suggest that individuals learn best when high value rewards and punishments are at stake.

B-32 PERSON KNOWLEDGE DISRUPTS DISTRIBUTED NEURAL RESPONSES TO ATTRACTIVENESS *Tzipporah P. Dang, Bradley D. Mattan, Tianyi Li, Jennifer T. Kubota, Jasmin Cloutier - University of Chicago* Using partial least squares analysis (PLS), we examined the degree to which person knowledge availability would impact brain networks supporting attractiveness evaluations. Participants (N=45) explicitly evaluated the attractiveness of familiar actors (person knowledge present) and novel models (not associated with person knowledge). Analyses focused on the following four conditions: attractive actors, unattractive actors, attractive models, and unattractive models. Task PLS revealed a significant latent variable (LV) ($p<.001$) that explained 79.616% of the crossblock covariance. Results indicated two separate networks preferentially responsive to attractive actors and models and to unattractive models, respectively. Notably, responses to the unattractive actor condition did not reliably contribute to the LV. For unattractive models (but not actors), we observed increased co-activation in the mentalizing network (e.g., bilateral TPJ, precuneus). For attractive models and actors, we observed increased co- activation between regions involved in face processing (e.g., fusiform) and person evaluation (e.g., rectal gyrus in the OFC). Notably, the distributed neural responses for attractive actors and models were similar despite differences in person knowledge availability between these conditions. Taken together, our results indicate that the distributed neural response during evaluations of attractiveness can differ as a function of person knowledge availability, particularly for targets low in attractiveness.

B-33 SAME, SAME BUT DIFFERENT? EVIDENCE ACCUMULATION ACROSS MORAL AND NON-MORAL DOMAINS *Philip Pärnamets - Karolinska Intstitutet, Stockholm, Sweden; Lars Hall, Petter Johansson - Lund University, Lund, Sweden* Much human decision making, including that between moral or social alternatives, can be characterized as based on gradual accumulation of evidence, formally described by neutrally plausible sequential sampling models. While this has previously been documented in experiments focusing on individual domains, less is known how the same participants' decision process can be characterized comparing across domains. Sixty participants made a total of 300 binary choices each across three decision domains– economic, social and moral. The domains differed in what alternatives where given; snack food items, charitable donations or positive moral action descriptions. The economic and social choices were additionally incentivized. Participants had free response times and their eye gaze was measured concurrently during choices. We found that participants in all three domains were highly sensitive to the underlying valuation differences, producing highly similar choice curves, and, similar but linearly shifted, response time profiles. Economic decisions were fastest and most accurate, while moral decisions slowest and least accurate when compared to initial ratings of alternatives. Computational modeling, using the drift diffusion framework, indicated that error rate increases, particularly for moral choices, derive from a combination of increased decision barriers with a greater difficulty to sample evidence per unit time (lower drift rates for similar value differences). The effects of visual fixation patterns on drift were largest for economic decisions and smallest for moral decisions. Our results suggest that the same computational process captured by a simple computational model of choice can explain the decision and response time patterns in all tasks.

B-34 A SOCIAL ANALGESIC? ACETAMINOPHEN DECREASES RESPONSIVENESS TO THE PAIN OF OTHERS *Dominik Mischkowski, Jennifer Crocker, Baldwin M. Way - The Ohio State University* For over a decade, functional magnetic resonance imaging (fMRI) showed that physical pain and the experience of others' pain activated similar brain areas in the anterior insula and the dorsal anterior cingulate cortex, suggesting that the psychological experiences of pain and empathy for pain rely on overlapping brain mechanisms. However, recent advances in fMRI data analysis based on multivoxel pattern analysis (MVPA) have questioned this conclusion: Pain and empathy for pain may share adjacent, but not overlapping neuronal representations. To advance this debate, other methodological approaches are needed to test the relation between physical pain and responsiveness to others' pain. Participants in four double-blind, placebo-controlled pharmacological studies received 1000 mg acetaminophen or a placebo and completed measures of empathy (in two of those studies) and aggression (in all four studies). Integrating findings across studies, we found that acetaminophen relative to placebo reduced perceived pain, experienced distress, and empathic concern when witnessing others in pain, both in hypothetical scenarios and actual events in the lab. Furthermore, when meta-analyzing studies acetaminophen increased the willingness to inflict painful, but harmless noise blasts on other study participants, indicating increased aggression. These findings provide additional evidence for the important role of physical pain in regulating interpersonal processes. Furthermore, they raise serious questions about the broader – and potentially harmful – societal side-effects of acetaminophen, which about a quarter of US-Americans adults consume each week. In future studies, we will use fMRI to test the effect of acetaminophen on empathy and aggression on the neuronal level.

B-35 EXPLORING THE ROLE OF THE BRAIN'S DEFENSIVE SYSTEM IN PERSONAL SPACE REGULATION *Joana B Vieira, Stephen R Pierzchajlo, Derek GV Mitchell - Brain and Mind Institute, University of Western Ontario* In social interactions, humans regulate interpersonal distance to preserve

personal space and avoid the discomfort that arises when it is breached, suggesting defensive mechanisms might be involved in personal space maintenance. This study characterized the involvement of the brain's defensive system in response to social and non-social stimuli, and its role in interpersonal distance regulation. Thirty healthy volunteers underwent fMRI scanning while viewing looming or receding faces (Social condition) and insects/arachnids (Non-social condition), and rated their level of discomfort upon watching them. Faces were either neutral (Low threat) or angry (High threat), and insects/arachnids were colourful beetles (Low threat) or tarantulas/scorpions (High threat). Preferred distance was assessed behaviourally by asking participants to adjust the size of the same stimuli on a computer screen outside the scanner. Results showed that, irrespective of threat, looming social and non-social stimuli both elicited enhanced activation in the midbrain, a region that is critically involved in defensive responses. However, functional connectivity analysis revealed midbrain activation was more strongly coupled with activity in the amygdala, ACC, thalamus, caudate and SMA in response to looming social versus non- social stimuli. Relative to non-social stimuli, and controlling for level of discomfort, looming faces also elicited greater activation in the FFA, TPJ, and dlPFC. TPJ activation correlated with preferred distance to faces (r=-.44, p=.02), but not insects/arachnids. These findings suggest the involvement of partially dissociable circuits in response to social versus non-social stimuli, as well as in the regulation of preferred distance.

B-36 PSYCHOPHYSIOLOGICAL CORRELATES OF LOW AND HIGH APPROACH MOTIVATION SADNESS. *Olga K. Kamińska, Mikołaj Magnuski - University of Social Sciences and Humanities; Cindy Harmon- Jones - University of New South Wales; Aneta Brzezicka - University of Social Sciences and Humanities; Eddie Harmon-Jones - University of New South Wales* Sadness is widely considered as a negative emotion with low arousal. But results of studies on psychophysiological and cognitive correlates of sadness exhibit inconclusive effects, which are often contradictory. In this study, we hypothesized that sadness is heterogenous affective state, which can be characterized by either low or high approach motivation. Additionally, we examined the neurophysiological underpinnings of those two states based on the frontal alpha activation, which has been found to be related to valence and motivational direction of emotions. To test these ideas, we first measured 41 participants EEG activity during 4 minutes of resting baseline EEG. Next, participants were exposed to a neutral state induction. Afterwards, depending on the randomly assigned condition, participants were exposed to stories designed to induce either low or high approach motivation sadness (3 stories in each condition). After each story, one minute of EEG signal with eyes closed was recorded. We analyzed spectra from frontal regions in alpha frequency range centered with respect to individual alpha frequency. The interaction was tested by comparing differences between pre and post-story spectra between motivation conditions. To correct for multiple comparisons, we used cluster-based permutation tests revealing significant difference between the conditions (p=0.001). For high approach motivation sadness condition after exposure to the stories frontal alpha power was elevated, while in low approach motivation sadness it was reduced both in comparison to neutral story. These results suggest that sadness can be differentiated due to the intensity of approach motivation.