

2010 Social and Affective Neuroscience Conference

Schedule-at-a-glance

Friday, October 29

3:00-5:30PM	Registration
5:30-7:00PM	Session A: Keynote Address: Richard Davidson
7:00-9:00PM	Welcome Reception

Saturday, October 30

8:00-9:00AM	Continental Breakfast
9:00-10:15AM	Session B: Reward in its social context
10:15-10:45AM	Coffee Break
10:45-12:00PM	Session C: Social Cognition
12:00-1:30PM	Break for Lunch
1:30-2:45PM	Session D: Emotion
2:45-4:15PM	Session E: Poster Session 1
4:15-5:30PM	Session F: Perspective
6:00-7:30PM	Session G: Keynote Address: Gary Berntson

Sunday, October 31

8:00-9:00AM	Continental Breakfast
9:00-10:15AM	Session H: The brain outside the scanner: Linking social neuroscience data with real-world outcomes
10:15-10:45AM	Coffee Break
10:45-12:00PM	Session I: Decision Making
12:00-1:30PM	Break for Lunch
1:30-3:00PM	Session J: Poster Session 2
3:00-4:15PM	Session K: At the frontier of cultural neuroscience

**SOCIAL AND AFFECTIVE NEUROSCIENCE SOCIETY
ANNUAL MEETING 2010**

October 29- 31, W Chicago- City Center
Chicago, IL

Organizing Committee

David Amodio, New York University
Jennifer Beer, University of Texas at Austin
Joan Chiao, Northwestern University
William Cunningham, The Ohio State University
Matthew Lieberman, University of California, Los Angeles
Jason Mitchell, Harvard University
Kevin Ochsner, Columbia University

Presentations

Session A: Keynote Address

Friday, October 29, 2010

5:30 PM - 7:30 PM

Richard Davidson, *University of Wisconsin, Madison*

Session B: Reward in its social context

Saturday, October 30, 2010

9:00 AM – 10:30 AM

Mauricio Delgado, *Rutgers University*

Jamil Zaki, *Harvard University*

Caroline Zink, *National Institute of Mental Health*

Antonio Rangel, *California Institute of Technology*

Abstracts

TRACKING REWARD-RELATED RESPONSES IN THE HUMAN STRIATUM UNDER DIFFERENT SOCIAL CONTEXTS *Mauricio R. Delgado, Rutgers University* Research in non-human animals, complemented by an array of human neuroimaging studies, has delineated a basic neurocircuitry underlying reward-related learning and motivated behaviors. Central to this circuit is the role of the striatum - a heterogeneous structure in terms of connectivity and functionality - as an interface for the processing of motor and motivational information. While the striatum has been implicated in different aspects of reward processing in basic paradigms that assess the acquisition or expression of reward contingencies (e.g., learning that a button press leads to a reward), recent research has begun to probe the involvement of the striatum in more complex motivated behaviors typically displayed in human society (e.g., learning that an individual is trustworthy and that interactions with that individual will likely lead to a reward). This talk will focus on the influence of dynamic social factors on neural mechanisms underlying reward-related processing. Specifically, we will discuss how the nature of social interactions creates a context that modulates activity in regions such as the human striatum, as well as the subjective perception or value assigned to positive and negative outcomes.

SOCIAL INFLUENCE MODULATES REWARD-RELATED NEURAL ACTIVITY *Jamil Zaki, Harvard University*- Individuals demonstrate a pronounced tendency to conform to the expectations, beliefs, and opinions of others. Although such social influence has been a topic of interest in psychology since the 1930s, it has often proven difficult to distinguish conformity based on true modification of one's attitudes (private acceptance) from mere public compliance with a group norm. The study I will describe here introduces a novel method that uses functional neuroimaging to document true private acceptance of a group norm. In the last decade, activity in two targets of the dopaminergic system—the nucleus accumbens (NAcc) and orbitofrontal cortex (OFC)—has been reliably associated with the subjective value attributed to a stimulus. Here, we took advantage of this well characterized relationship to examine the effects of group norms on the neural encoding of value. Male participants rated the attractiveness of female faces and subsequently learned how a group of peers rated those same faces. In some cases, peer ratings of individual faces were much more or much less attractive than participants' own ratings. Participants were then scanned using fMRI while they rated each face a second time. These second ratings were influenced by group norms, such that participants rated faces as more or less attractive, in line with their peers' prior ratings. More importantly, social influence altered the response of in the OFC and NAcc: both of these regions were more strongly engaged by faces peers has rated as attractive, as compared to unattractive, even though participants had initially rated these faces as equally attractive. Additional analyses demonstrated that peer ratings modulated activity in specific regions of the OFC and NAcc that respond generally to reward (including monetary rewards). These data suggest that social influence is sufficient to cause

core modifications of the value assigned to a stimulus, and elucidate one mechanism through which the beliefs and attitudes of one person come to shape the mind of another.

VENTRAL STRIATAL RESPONSES TO SOCIAL STATUS INFORMATION IN HUMANS- *Caroline Zink, National Institute of Mental Health*- Social hierarchies are ubiquitous in our environment, and they define implicit expectations that drive appropriate social behavior and impact motivation and health. Properly identifying and responding to social status cues is essential for successful social interactions, suggesting that neural mechanisms exist to process such status cues and ascribe value to them. In a series of fMRI experiments investigating human social status perception, we created an explicit social hierarchy based on incidental skill in the context of an interactive game. In both stable and unstable hierarchical settings, several brain regions—including occipitoparietal cortex and ventral striatum—demonstrated greater activity when viewing/interacting with a superior individual compared to an inferior individual. These results are indicative of greater perceptual/attentional processing and value/saliency associated with the higher ranked individual, in excellent agreement with data showing that monkeys place greater value on higher ranked conspecifics than on lower ranked. Furthermore, in the unstable hierarchical setting, the 'hierarchical value' associated with outcomes affecting social status made a highly significant and unique contribution to ventral striatal activity that is of comparable magnitude to that elicited by monetary reward. Interestingly in non-human primates, status-related value assignment is influenced by one's own hierarchical rank. Therefore, in a separate fMRI study we investigated how one's own social rank (subjective socioeconomic status) influences ventral striatal responses to social status information. Subjects were presented with photographs of two individuals, one of higher and one of lower socioeconomic status, and were required to judge to which individual a visually presented statement pertained. We found that one's own socioeconomic status was significantly correlated with the level of ventral striatal activity elicited by statements judged as pertaining to high status individuals in contrast to low status. More specifically, subjects with high subjective status elicited more ventral striatal activity when making high status judgments, and subjects with low subjective status elicited more ventral striatal activity when making low status judgments. These data suggest that the value attributed to social status information is dependent on one's own relative hierarchical rank, consistent with the non-human primate literature. Together these findings advance our understanding of the value/saliency associated with social status cues and the neural mechanisms underlying appropriate social interactions and motivation.

VALUE COMPUTATIONS DURING SOCIAL DECISION-MAKING *Antonio Rangel, California Institute of Technology* Little is known about the neural networks supporting value computation during complex social decisions. We present the results of two different human fMRI studies designed to investigate this question. In the first study subjects made real donations to different charities. We found that the BOLD signal in ventral medial prefrontal cortex (VMPFC) correlated with the subjective value of voluntary donations. Furthermore, the region of the VMPFC identified showed considerable overlap with regions that have been shown to encode for the value of basic rewards at the time of choice, suggesting that it might serve as a common valuation system during decision making. In addition, functional connectivity analyses indicated that the value signal in VMPFC might integrate inputs from networks, including the anterior insula and posterior superior temporal cortex, which are thought to be involved in social cognition. In the second study subjects made decisions about monetary transfers to other subjects that vary in their cost and benefits. Importantly, the decisions of the subjects were implemented only with 60% percent probability. We found that the BOLD signal in the VMPFC at the time of decision correlated with behavioral measures of the subject's value for the donations. Interestingly, we found that there were two types of subjects: (1) subjects with seemingly altruistic preferences, and (2) subjects with seemingly procedural preferences. The first group encoded the value of the transfers for others both at the time of choice and at the time of outcome. In contrast, the other group encoded the transfers for others only at the decision stage, and showed positive activity in the ventral striatum and the VMPFC when they were not implemented. In addition, the procedural group, but not the altruistic group, exhibited an increase in activity in an area of dorsolateral prefrontal cortex (DLPFC) that exhibited functional connectivity.

Session C: Social Cognition

Saturday October 30
10:45 AM – 12:00 PM

Tiffany Ito, University of Colorado

Mina Cikara, Princeton University

Stephen J. Read, University of Southern California

Todd Heatherton, Dartmouth College

Abstracts

NEURAL MARKERS OF INDIVIDUATED PERSON PERCEPTION- *Tiffany A. Ito, University of Colorado-* This talk will focus on evidence that the N200 ERP component is sensitive to individuating processing during person perception. Past studies show N200 differentiation between familiar and unfamiliar individuals, and racial ingroup and outgroup members, suggesting it varies with the depth of processing. To more explicitly examine this, we recorded ERPs as participants made predictions about an individual's future behavior based on past behavior. Relying more on specific past behaviors to make future predictions, rather than a salient social category distinction, can be viewed as engaging in more individuated processing. Participants varied in their use of individuating information, and the N200 was sensitive to this variation. In another study, we sought to manipulate the N200 by manipulating processing goals. Here, the N200 was increased when participants formed judgment about others while taking a first-person as compared third-person perspective. Together, these results suggest that the N200 may index processes associated with deeper, more individuated person judgments.

US VERSUS THEM: MERE SOCIAL IDENTIFICATION SHAPES NEURAL RESPONSES TO INTERGROUP COMPETITION AND HARM *Mina Cikara, Princeton University; Matthew Botvinick, Princeton University; and Susan Fiske, Princeton University-* Affective reactions to others' successes and failures are influenced by group identification, not just personal gain or loss. The failures of a fellow group member are painful, while those of a rival may engender pleasure—Schadenfreude. Pleasure at other's misfortunes may facilitate active harm against rivals. Here we show that mere social identification affects neural structures previously implicated in primary rewards and punishments. In the current fMRI study, 11 Red Sox and 7 Yankees die-hard fans watched baseball plays featuring their favored teams and rivals playing one another and a neutral third team, the Orioles. Stimuli were screenshots adapted from an internet sportscast site (ESPN Gamecast) during actual games between the relevant teams. Participants reported pleasure, anger, and pain in response to each play's outcome. Positive outcomes (favored-success, rival-failure, and the Schadenfreude condition—rival-failure against the Orioles) all elicited significantly more pleasure than the control condition (Orioles versus Blue Jays). Likewise, negative outcomes (favored-failure and rival-success) elicited significantly more anger and pain than the control condition. We threshold all fMRI data at $p < .05$, corrected for multiple comparisons. As predicted, baseball plays with positive outcomes (as compared to control) engaged ventral striatum (VS). VS activation correlated with subjective ratings of pleasure but not anger or pain. Anterior cingulate cortex (ACC), supplementary motor area (SMA), and insula—parts of a well-established pain matrix—were active during baseball plays with negative outcomes (as compared to control). ACC activation correlated with subjective ratings of pain, but not anger or pleasure. We further hypothesized that if watching a competitive group's misfortune is accompanied by the experience of pleasure (instead of empathy, for example), this pleasure might be related to a desire to harm the rival team and people associated with it (i.e., their fans). Participants completed a survey two weeks after the scan, reporting the likelihood that they would aggress towards Orioles' and rival team fans. Participants who reported a greater likelihood of aggressing against a rival team fan (i.e., insulting, threatening, and hitting, controlling for baseline aggression against Orioles' fans) also exhibited more VS activation in response to watching the favored team succeed and the rival team fail. This study demonstrates that regions that respond reliably to one's own gains and losses—VS and ACC, SMA, and insula—encode information about others' outcomes, the subjective values of which are inherently defined by the perceiver's social identification. These results suggest that evolutionarily old brain systems, which may have developed to respond to rewarding and painful stimuli in the service of reinforcing adaptive behaviors, may have evolved to encode stimuli as defined by social identity, particularly group-level rewards and punishments. Furthermore, participants who reported greater rival-specific aggression also exhibited greater VS activity in response to watching pleasurable baseball

plays, including the pure Schadenfreude condition. Social identification may be one mechanism by which aggressive behaviors spread beyond individual rivals to other individuals merely identified with a rival group. We discuss the broader implications for intergroup dynamics and conflict.

HE'S BLACK?! BUT HE'S ALSO A DOCTOR: A NEURAL NETWORK IMPLEMENTATION OF THE ITERATIVE REPROCESSING MODEL OF RACIAL STEREOTYPE EVALUATIONS- *Stephen J. Read, University of Southern California; and Philip Ehret, University of Southern California-* In 2007, Cunningham, Zelazo, Packer, and Van Bavel published the iterative reprocessing (IR) model for understanding the processing dynamics of attitudes and evaluations. They suggested a new conception of how evaluations can evolve over stages of processing. Moving away from dual-attitude and dual system models, the IR model proposes that evaluations do not progress in two distinct pathways; one automatic and one controlled, but instead evolve as information about valenced stimuli is reprocessed. A stimulus will be initially processed by lower-order evaluative processes and later, on subsequent iterations, higher-order semantic and associated evaluative processes will be recruited to recalculate and modify the initial evaluation. Using Emergent 5.0.2 neural network modeling software (Aisa, Mingus, & O'Reilly, 2008), we have constructed a neural network that successfully represents several of the key concepts of the IR model. Our model is an eight-layer localist network incorporating separate layers for stimulus inputs, basic race and sex recognition, higher-order semantic layers, and a positive and negative evaluation layer. This network is presented with visual observations about sixteen 'individuals' consisting of information about features such as skin tone, hair length, clothing, and features of their physical environment, processed by the thalamus layer. From these observations, the network quickly identifies race, either black or white, and the sex of the individual, and initially evaluates the individual based on these two characteristics. This initial evaluation of race and sex is part of the first iterations of the stimuli and likely occurs without consciousness in limbic structures such as the amygdala. As activation continues to spread, the stimuli are reprocessed in later iterations in higher-order semantic layers representing the orbitofrontal cortex, anterior cingulate cortex, and lateral prefrontal cortex that recognize higher level concepts such as physical location (e.g., office or street) and profession. Once the individual's profession is determined, this activates stereotypic attributes, such as intelligent for a doctor, or violent for a gang member. These attributes then activate associated positive or negative evaluations or attitudes, revising evaluations in the positive and negative evaluation layers representing the amygdala. This network is trained in two steps. First it undergoes initial training to establish a simple stereotype based on perceptual cues, with highly negative evaluations of black males, slightly less negative evaluations of black females, and highly positive evaluations of white males and females. Learning is then nearly reduced to zero for basic race and sex evaluations to maintain the stereotype and a later training environment is presented to the network to allow it to learn appropriate higher-level semantic representations of the stimuli and the appropriate attitudes and corresponding evaluations. The network can then be tested with specific individuals, such as a black male doctor. By monitoring the evolution of both the positive and negative evaluation, we can see clear effects of later iterations and revisions of evaluations. For example, a black male doctor will initially receive a highly negative evaluation that is completely revised to a highly positive evaluation with later iterations that activate attitudes associated with doctors.

THE NEURAL BASIS OF SELF-REGULATION FAILURE- *Todd Heatherton, Dartmouth College-* Many societal problems, from obesity to addiction to driving while intoxicated, stem from an inability to control the self. This talk will describe research that uses functional magnetic resonance imaging to identify the neural mechanisms underlying self-regulation failures. Studies focus on a cue reactivity model of diet failure.

Session D: Emotion

Saturday, October 30

1:30 PM – 2:45 PM

Thalia Wheatley, Dartmouth College

Lotte van Dillen, Leiden University

Stephanie D. Preston, University of Michigan

Adam Anderson, University of Toronto

Abstracts

CROSS-MODAL, DYNAMIC SOCIAL INTELLIGENCE- *Thalia Wheatley, Dartmouth College-* Research on social intelligence overwhelmingly relies on static stimuli, such as photographs of facial expressions. While these endeavors have been fruitful, the world is not a static place. Rather, social communication is dynamic, varying, and continuous and the human brain evolved to handle the associated computations. However, very little is understood about how social meaning is communicated dynamically (e.g., through motion and sound) and even less about how the brain accomplishes the remarkable feat of extracting social meaning from rapidly modulating sensory streams. One efficiency the brain might use to extract social meaning is to recognize similarities across different kinds of dynamic inputs. For example, angry sound and angry motion may have important similarities (irregular, fast, downward). This is intuitively appealing: sad music and sad motion are often described as slow and heavy; happy music and motion as bouncy and light, etc. To investigate this “common structure” hypothesis, we developed a computer program with the ability to sonify (music) and visualize (animation) five dynamic features (e.g., speed). Via this program, 25 subjects each created six musical clips that they felt best conveyed each of six emotions: angry, sad, happy, peaceful, scared. We asked a second set of subjects to create six animation clips that conveyed the same emotions. We found that subjects specified different dynamic configurations for different emotions. That is, the emotion being conveyed accounted for the majority of the variance in the dynamic features. These emotion-specific configurations were consistent across audiovisual modality. Modality (music vs. animation) accounted for almost none of the variance. We presented the stimuli generated from this study to a new set of subjects as they were scanned in a 3T scanner. As predicted by a large literature, we found that the musical clips activated primary and secondary auditory cortices relative to the animations and that animations activated motion-sensitive cortex relative to music. Most importantly, we found that the superior temporal sulcus (STS), a region that lies between these modality-specific areas, was equivalently and strongly activated by both music and movement. This suggests that the STS plays a key role in extracting social meaning from multiple dynamic streams, affording a representational efficiency in the service of real-time social understanding. Put succinctly, the encoding, recognition, and production of happy, sad, or angry sounds is linked to the encoding, recognition, and production, of happy, sad, or angry movements, respectively. Here we summarize the literature that suggests such a cross-modal efficiency in the brain, present preliminary research that this efficiency subserves social perception. Emotion was the strongest predictor of slider bar placement (a measure of effect size, partial $\eta^2 = .81$). Importantly, and consistent with a deep structure hypothesis, modality had little effect on where participants put the slider bars to create each emotion (partial $\eta^2 = .09$, *ns*). For example, angry was deemed “fast, irregular, and downward” for both sound and motion and this configuration was distinct from that which defined any of the other emotions

IN THE EYE OF THE BEHOLDER: CATEGORIZATION STRATEGIES MODULATE VIGILANCE FOR THREATENING FACES- *Lotte van Dillen, Leiden University, New York University; Lasana Harris, New York University, Duke University; Belle Derks, Leiden University; Daniel Lakens, Technische Universiteit; Kees van den Bos, Utrecht University; Wilco van Dijk, Leiden University-* Various attentional paradigms have demonstrated the enhanced ability of threatening faces to attract attention or to hold attention, once captured. For example, people are more easily distracted by disgusted faces than by neutral faces and people take longer to count the features of angry faces than of happy faces. To account for such findings, theorists have proposed that natural evolution has equipped people to efficiently screen the environment for potential threats. One important question is how flexibly such a vigilance mechanism operates. On a typical day, people are constantly confronted with negative cues. Yet, people are well able to perform goal-directed behavior under even the most emotionally distracting circumstances. We therefore propose that vigilance for threatening faces may be subject to contextual variations in accord with people’s current goals. More specifically, we suggest that vigilance for threatening faces is moderated by the way in which people categorize these faces. If facial expressions are part of the mental representation of a category, the attention system will be more susceptible to these features. Accordingly, people

should display vigilance for threatening faces especially when the activated category representation prompts attentional processing of facial expressions. Facial expressions play a pivotal role in social categorization processes, as they communicate information about the person's intentions. Through social learning and/or stereotyping, people may come to associate emotional expressions with certain social categories. Since facial expressions contain relevant information to perform social categorizations (i.e., gender, personality) but not for nonsocial categorizations (i.e., eye-color), we therefore hypothesized that threatening facial expressions should bias attention especially during social categorization tasks. To test this notion, in a series of five experiments, we compared people's reaction times and neurophysiological responses to threatening (angry, disgusted) and non-threatening (neutral, happy) faces during a task that required people to categorize faces on social dimensions (i.e. gender or personality), versus a task that required people to categorize faces on strictly physical features (i.e. stimulus color). Consistent with our hypothesis, we showed that participants were slower to name the gender of threatening compared to non-threatening faces, but not their color (blue or green) or eye-color (blue or brown). Furthermore, when we informed participants that different eye-colors (blue or brown) indicated a personality trait (introversion, extraversion) versus a physical trait (sensitivity to high versus low light frequency), threatening faces interfered with task performance when participants used eye-color to categorize the personality trait but not when participants used eye-color to categorize the physical trait. Finally, we found electrophysiological brain activity as well as facial muscle activity in response to threatening faces to predict reaction times to these faces, but again, only when participants had to implement a social category (gender, personality). Thus, converging evidence from both behavioral and neurophysiological measures suggests that vigilance for threatening faces is contingent on people's categorization strategies, supporting the perspective that social influences modulate even basic emotional processes.

THE DRIVE TO CONSUME IS SOCIAL AND EMOTIONAL BUT DECISIONS TO CONSUME NEED NOT BE: CONVERGENT LESSONS FROM NEUROIMAGING AND BEHAVIOR- *Stephanie D. Preston,*

University of Michigan, Ann Arbor- Background: Americans spend their weekends at the mall or organizing their ever accumulating piles of paper, clothes, and gadgets, which in extreme cases can have serious consequences not only for the environment but also for but the individual's quality of life, social relationships, health and even mortality. Despite a mainstream interest, little research has investigated the neural bases of acquiring and discarding everyday goods. Prior experiments on animal food storing, and human hoarding, shopping, and gambling points to the mesolimbocortical system, particularly the nucleus accumbens (NAcc) and orbital frontal cortex (OFC). We tested the hypothesis that this system also underlies decisions to acquire and discard mundane goods, but particularly for personally-desired items. Twenty participants (11 males) completed a block-design fMRI study using a forced-choice procedure under four nested frames to acquire or discard items, while maximizing personal preference or monetary profit. We contrasted all four conditions against a control size discrimination task and directly contrasted acquisition versus discarding and personal to monetary decisions (using response time as a nuisance covariate). BOLD signal responses were also correlated in the regions of interest with trait measures of hoarding. The orbital frontal cortex (OFC) was involved across frames, but all other regions were significantly affected by the frame, which also changed qualitative object preferences. Monetary decisions recruited executive regions, and biased choice towards valuable (but less desired) items. Personal decisions recruited midline, affective regions and caused subjects to emphasize inexpensive, immediate rewards (candy, coins). Acquisition augmented OFC activity and biased subjects towards shiny, metal objects while discarding recruited the anterior cingulate and insula, and biased subjects towards utilitarian, 'should' items. In contrast to neuroeconomic studies, acquiring such goods did not uniformly engage the NAcc, which instead was only activated during personal acquisition to the extent that the subject reported trait hoarding problems. Decisions about everyday goods may necessarily involve the OFC, but otherwise represent a complex interplay between the frame, the item, and the decider. For individuals in an acquisitive state of mind, even mundane goods may acquire the incentive salience of more hedonic items. Additional convergent work in our lab using emotional induction and social rejection manipulations confirms that emotions associated with uncertainty and a lack of security can directly increase acquisitiveness, by augmenting both the typical desire for hedonic goods as well as the usually lower desire for more mundane, future-oriented items. Research on material goods is critical because it addresses a ubiquitous behavior that affects our economy, quality of life, and the environment. Moreover, such decisions should become the purview of social psychologists because the decisions increasingly appear to reflect how secure and stable the individual feels in relation to their social and familial network. By directly addressing the human urge to consume, we are better positioned to understand and abate the problems associated with natural resources that are necessarily decreasing in a context of seemingly exponential need.

FORM AND FUNCTION IN THE EMOTIONS- *Adam Anderson, University of Toronto-* According to his modern interpreters, one of Darwin's most significant contributions to psychology and neuroscience is that emotions and their expression are independent natural kinds. Overlooked, however, was Darwin's original thesis that emotional expressions are not distinct but rather reflect structural oppositions derived from some original functional adaptation. I will present evidence that 1) emotional expression appearance and perception reflects

oppositions in global form 2) the origin of these oppositions lies in a primitive sensory regulatory function for interactions with the physical environment and 3) that these sensory regulatory functions have been behaviorally and neurally co-opted for the purposes of social regulation.

Session E: Poster Presentations Session 1

Saturday, October 30

2:45 PM – 4:15 PM

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Session F: Perspective

Saturday, October 30

4:15 PM – 5:30 PM

Naomi I. Eisenberger, *University of California, Los Angeles*

Alexa M. Tullett, *University of Toronto*

Robert G. Franklin, Jr., *The Pennsylvania State University*

Rebecca R. Saxe, *Massachusetts Institute of Technology*

Abstracts

WHY REJECTION HURTS: EXPLORING THE FUNCTIONAL CONSEQUENCES OF A PHYSICAL-SOCIAL PAIN OVERLAP- *Naomi I. Eisenberger, University of California, Los Angeles-* Numerous languages characterize ‘social pain,’ the feelings resulting from social loss or rejection, with words typically reserved for describing physical pain (“*broken hearts,*” “*hurt feelings*”) and perhaps for good reason. It has been suggested that, in mammalian species, the social attachment system borrowed the computations of the physical pain system to prevent the potentially harmful consequences of social separation. Indeed, several studies have now shown that physical pain, such as the dorsal anterior cingulate cortex (dACC) and the anterior insula (Eisenberger et al, 2003; Burklund et al., 2007; Eisenberger et al., 2007). Here, we further tested this physical-social pain overlap by examining two functional consequences of such shared neural circuitry: 1) Are individuals who are more sensitive to one kind of pain also more sensitive to the other? and 2) Do factors that alter one type of pain have a similar effect on the other? To examine the first question, Study 1 explored whether a mu-opioid receptor gene polymorphism (A118G), associated with physical pain sensitivity, also related to social pain sensitivity (Way et al., 2009). Participants (n=125) completed a self-report inventory of dispositional rejection sensitivity and a subsample (n=31) completed an fMRI session in which they were socially rejected. G-allele carriers—previously shown to be more sensitive to physical pain—evidenced greater self-reported rejection sensitivity than A-allele homozygotes. Consistent with these results, G allele carriers also showed greater dACC and anterior insula activity in response to social rejection. Next, we examined whether factors that alter social pain have similar effects on physical pain. Previously, we demonstrated that social support reduces social pain, as evidenced by reduce dACC and anterior insula activity to social rejection (Masten et al., 2010). Study 2 explored whether social support could also reduce physical pain (Master et al., 2009). Participants (n=25) in long-term relationships received painful stimuli to their forearms as they either held their partner’s hand, a stranger’s hand, or an object or as they viewed pictures of their partner, a stranger, or an object. Results demonstrated that holding the partner’s hand (vs. a stranger’s hand or object) as well as simply viewing pictures of the partner (vs. a stranger or object) reduced pain ratings. Finally, to examine whether factors that alter physical pain have similar effects on social pain, Study 3 explored whether Tylenol, a physical painkiller, could also reduce social pain (DeWall et al., in press). In two experiments, participants were randomly assigned to take either Tylenol or placebo daily for three weeks. In the first experiment (n=62), Tylenol consumption reduced daily reports of social pain over the three-week period, whereas placebo consumption led to no changes in these

self-reports. In the second experiment (n=25), Tylenol (vs. placebo) reduced dACC and anterior insula activation in response to a scanner-based episode of social rejection. Taken together, these results lend additional support to the hypothesis that physical and social pain processes overlap and support the commonsense notion that rejection “hurts.”

AMBIVALENT REACTIONS TO PHYSICAL SUFFERING- *Alexa M. Tullett, University of Toronto; and Michael Inzlicht, University of Toronto-* When portraying the plights of people around the world who experience physical suffering, the media inevitably has a decision to make: show images that vividly depict that suffering in an effort to convey the harshness of reality, or show less disturbing images as a way to humanize victims and avoid sensationalizing suffering. With this dilemma in mind, we conducted a study with the aim of better understanding the consequences of such choices, as well as teasing apart the complexities of people’s responses to human suffering. Participants viewed two sets of 10 images of African children that were ostensibly associated with two different charities. The images differed to the extent that they depicted physical suffering (e.g. visible lesions, emaciation), but participants were told that the people in each set experienced similar living conditions and daily struggles. Throughout the experiment, brain activity was recorded using electroencephalography (EEG) technology in order to assess the extent to which participants were in an approach motivational state as they viewed the images. This was accomplished by measuring activity over frontal brain regions and then computing an index of left-frontal activation (F4-F3), a pattern associated with approach motivation. In addition, participants responded to a number of questions regarding their emotional reactions to the images, as well as their willingness to help the children involved. Finally, participants were given \$5 (as 5 \$1 coins) for their participation, but had the opportunity to donate any amount of it, in any proportion, to the two charities they previously viewed. This donation served as a behavioral dependent measure similar to the type of action one might be expected to engage in to help suffering people encountered outside the experimental context. We found that suffering images elicited stronger feelings of empathy and sadness, as well as greater intentions to help and larger actual donations relative to the non-suffering images. Interestingly, however, suffering images also caused participants to display greater avoidance related brain activity and to feel more disgust, both towards the appearance of the people in the images and towards the social situation that caused the suffering to occur. For the suffering images, these feelings of disgust towards societal factors predicted feelings of anger and sadness, as well as intentions to help. Overall, then, our findings suggest that while images of suffering elicit negative reactions such as avoidance and disgust, these reactions can be overcome, and can even motivate prosocial intentions.

I FEEL YOUR PAIN: INTERPERSONAL FAMILIARITY MODULATES NEURAL RESPONSES TO EMPATHICALLY EXPERIENCED REJECTION- *Robert G. Franklin, Jr., The Pennsylvania State University; Joseph E. Beenen, The Pennsylvania State University; Kenneth N. Levy, The Pennsylvania State University; and Reginald B. Adams, Jr., The Pennsylvania State University-* Observing others in pain elicits activation in many of the same neural regions involved with feeling physical pain, especially the anterior insula (AI) and the dorsal anterior cingulate (dACC). This suggests empathy involves some similar processes as feeling pain, as the AI and dACC are involved in processing distress and vicarious feelings involved with pain (Singer et al., 2004; 2009). Social rejection evokes activation in the AI and dACC similar to physical pain (Eisenberger et al., 2003). However, empathy for social pain has not been found to evoke responses similar for those who experienced physical pain (Masten & Eisenberger, 2010). One possible reason for this is that this study examined empathy to strangers. Relationship quality is rarely a variable of interest in empathy. This is surprising as the Perception-Action Model of empathy suggests stronger relationships should lead to deeper representations of others’ mental states, and thus greater empathy (Preston & de Waal, 2002). These representations are thought to involve the putative human mirror neuron system (MNS), especially including the posterior inferior frontal gyrus (IFG; Iacoboni et al. 1999). In this examination we recruited twenty participants who brought same-sex friends with them. Participants completed two runs of 2:45, where they watched their friends complete the Cyberball ball-toss game with two other participants (Williams et al. 2000). The participants’ friends were included equally in the first round of the task and excluded in the second round. Following scanning, participants completed an adapted version of the Friendship Quality Questionnaire (Parker & Asher, 1993). Data were preprocessed, normalized to the MNI template, and analyzed using SPM5 and thresholded at $p < .005$, 41 voxels, equivalent to $p < .05$ based on Monte Carlo simulations. Watching a friend be socially excluded minus included led to activation in the dACC (12, 20, 40) and right AI (44, -10, -10). When friendship quality was used as a subject-level regressor, activation was present in the bilateral dACC (28, 62, 10; -14, 14, 42), left AI (-44, -6, 12) and bilateral IFG (66, -4, 24; -44, -10, 60). Likewise, friendship quality correlated with dACC activity using activation pulled from the dACC coordinates found by Eisenberger et al. (2003). Further, we examined whether IFG activity mediated the relationship between friendship quality and dACC activity. Using beta values pulled from the significantly active cluster in the dACC and the anatomically defined IFG (BA 45 from the Talarach Daemon; Aziz-Zadeh et al.,

2006), IFG activation fully mediated the relationship between friendship quality and dACC activation. These findings indicate empathy for social pain may have similar underlying neural correlates as social pain. Likewise, relationship quality was significantly correlated with neural responses for empathy, showing that we empathize with those we most closely associate with. This suggests relationships may lead to deeper representations of others, as suggested by the PAM, and thus lead to greater empathy. Supporting this, the premotor MNS may serve as a neural basis for these deeper representations, as premotor MNS activity mediated the relationship between friendship quality and dACC activity.

HOW BRAINS THINK ABOUT MINDS- *Rebecca R. Saxe, Massachusetts Institute of Technology*-When we look at other people, the features visible on the outside are only a small part of what we see. We are much more interested in seeing, or inferring, what's going on inside: other people's thoughts, beliefs and desires. If a person checks her watch, is she uncertain about the time, late for an appointment, or bored with the conversation? If a person shoots his friend on a hunting trip, did he intend revenge or just mistake his friend for a partridge? One of the most amazing discoveries of recent human cognitive neuroscience is that humans use a specific group of brain regions for thinking about thoughts. What do these regions do? How do they develop? I will present evidence from fMRI, developmental fMRI, and TMS studies of the neural mechanisms for Theory of Mind and moral judgment.

Session G: Keynote Address

*Saturday, October 30
6:00 PM – 7:30 PM*

Gary Bernston, *The Ohio State University*

Session H: The brain outside the scanner: Linking social neuroscience data with real-world outcomes

*Sunday, October 31, 2010
9:00 AM- 10:15 AM*

Elliot T. Berkman, *University of Oregon*
Hedy Kober, *Yale University*
Pranjal H. Mehta, *Columbia University*
Emily B. Falk, *University of Michigan*

Abstracts

NEURAL PREDICTORS OF SUCCESSFUL GOAL PURSUIT DURING SMOKING CESSATION: LINKING NEURAL AND REAL-WORLD METHODS- *Elliot T. Berkman, University of Oregon; Emily B. Falk University of Michigan; and Matthew D. Lieberman, University of California. Los Angeles-* The ability to inhibit unwanted habitual responses is critical to successful goal pursuit in humans. Neurocognitive investigations have identified the core brain systems involved in this process and, in parallel, ecological behavioral investigations have documented its real-world correlates and implications. However, there are no data linking the neurocognitive and ecological/behavioral domains because of the practical limitations of most neuroimaging environments. The present study employs a joint neuroimaging and experience sampling paradigm to begin to address that gap by integrating a neural measure of response inhibition, brain responses to a go/no-go task, with an everyday form of response inhibition: regulation of craving during cigarette smoking cessation. A sample of twenty-seven cigarette smokers completed a go/no-go task during functional magnetic resonance imaging before cessation, then their progress was tracked eight times daily for the first twenty-one days following their quit date

using experience sampling. Results demonstrated that increased activation in the right inferior frontal gyrus, presupplementary motor area, and basal ganglia during the response inhibition task at baseline were associated with an attenuated association between cravings and subsequent smoking within days. Furthermore, the extent of activation in the basal ganglia during response inhibition also predicted overall change in smoking across four weeks; this result was further verified with a cross-validation analysis. Together, these findings support the ecological validity of neurocognitive tasks to everyday response inhibition, and provide a novel methodological tool for integrating between laboratory imaging methods and real-world behavior.

UNDERSTANDING TREATMENT FOR ADDICTION: THE REGULATION OF CRAVING TASK-

Hedy Kober, Yale University, Columbia University; Peter Mende-Siedlecki, Princeton University; Ethan Kross, University of Michigan; Walter Mischel, Columbia University; Carl Hart, Columbia University; and Kevin Ochsner, Columbia University- According to the DSM-IV, drug craving is a key feature of substance dependence, which is coupled with an impaired ability to control craving despite adverse consequences. In recent years, most empirically validated cognitive/behavioral treatments for substance use disorders have come to focus on teaching strategies to regulate craving, and it is believed that the ability to regulate craving is one of the central mechanisms-of-action of such treatments. Consistently, clinical data have shown that while craving predicts relapse, the acquisition of cognitive strategies predicts treatment success and the application of such strategies both during and after treatment reduces relapse significantly. Despite this, experimental models for studying this ability are lacking, and the neural mechanisms underlying the regulation of craving were poorly understood. To address these questions directly, we developed the "ROC task" to study the Regulation Of Craving in laboratory settings. During the task, participants view images of drug-related (cigarettes) and non drug related (food) stimuli, and are asked to use a cognitive strategy to reduce their craving. The strategies were drawn from Cognitive-Behavioral treatment protocols. In study 1, cigarette-smoking participants reported significantly reduced craving when using a cognitive strategy (Kober et al, 2010). In study 2, we found that the regulation of craving was associated with activity in dorsomedial, dorsolateral, and ventrolateral prefrontal cortex (PFC). This was accompanied by decreased activity in regions previously associated with emotion in general and craving in particular, including the ventral striatum (VS), subgenual cingulate, amygdala, and ventral tegmental area. Further, decreases in craving correlated with decreases in VS activity and increases in dlPFC activity. A subsequent mediation analysis showed that VS activity fully mediated the relationship between dlPFC and reported craving (Kober, in revisions). In study 3, self-reported craving during the task predicted reduction in smoking at a two-week follow up. Taken together, these data suggest that both laboratory and fMRI studies can be used to elucidate the mechanisms of action of real-world treatment outcomes, such as smoking cessation. In so doing, the ROC task provides a methodological tool for studying the ability to regulate craving across treatment modalities and substance-using populations and for developing more effective treatments for substance use disorders.

THE BIOLOGY OF BARGAINING: DYNAMIC HORMONE CHANGES DURING NEGOTIATION PREDICT ECONOMIC PROFIT-

Pranjal H. Mehta, Columbia University; Andy Yap, Columbia University; and Shira Mor, Columbia University- Steroid hormones levels can fluctuate in social interactions, but the economic implications of these biological changes remain unclear. Here we show that rapid changes in hormones associated with dominance (testosterone) and psychological stress (cortisol) jointly explain economic profit in bargaining interactions. In a bilateral bargaining game (Study 1) and a distributive negotiation in MBA students (Study 2), testosterone rises during bargaining predicted greater economic profit only if cortisol simultaneously dropped. If cortisol rose during bargaining, testosterone rises were associated with poor economic outcomes. The findings suggest that in the absence of psychological stress (cortisol decrease), rising testosterone encourages rational decision-making and the successful pursuit of monetary reward during the bargaining process. If psychological stress is high however (cortisol increase), rising testosterone during bargaining may lead to irrational decision-making and economic losses. There is, it seems, a "dark side" and "bright side" to rising testosterone in economic social interactions that depends on activity in the neuroendocrine stress axis. Pilot fMRI data will be presented to elucidate neural mechanisms of the effects, and implications for real-world bargaining behavior will be discussed.

NEURAL FOCUS GROUPS: PREDICTING INDIVIDUAL AND POPULATION BEHAVIOR CHANGE FROM THE BRAIN-

Emily B. Falk, University of Michigan; Elliot T. Berkman, University of Oregon; and Matthew D. Lieberman, University of California, Los Angeles- Can looking to the brain help us predict how individuals or even whole populations will respond to persuasive messages? We recently found that neural responses in an *a priori* region of interest (ROI) in medial prefrontal cortex (MPFC, BA10) during persuasive messages could predict behavior change above and beyond self-reported intentions to change behavior (Falk et al., *JNeuro*). In that study, we used a health behavior of relatively low motivational relevance (sunscreens use) and predicted individual behavior change over one week. In a follow-up study, we now examine a health behavior of high motivational relevance (smokers trying to quit) over a longer period of time (one month). Critically, we were also able to

compare the objective effectiveness of advertisements at the population level by working with the American Legacy Foundation and Louisiana Public Health Institute. These organizations rolled out three different ad campaigns (here referenced as A, B and C) in comparable media markets that each had a common dependent measure – calls to the national quitline 1-800-QUIT-NOW (each ad ended by showing this phone number). Twenty-eight smokers who were planning to quit in the near future were scanned while watching smoking cessation ads from these campaigns. Objective changes in smoking from pre-scan to a month after their chosen ‘quit date’ were assessed using expired carbon monoxide (a biological indicator of smoking behavior). The neural responses in an anatomically defined MPFC ROI more than doubled the total variance accounted for in smoking change compared to a model that included standard self-reports of intentions, self-efficacy, and ability to relate to the messages (R-square from self-reports = .15, R-square from self-reports & MPFC ROI = .35). Experts in the industry also indicated that of our three ad groups (A, B, C), Groups A and B were the best and Group C was the worst. Similarly, our 28 scanned subjects also ranked the likely efficacy of the ads $A > B > C$. However, Group C actually led to the greatest proportional increase in quitline phone calls compared to a no-advertisement baseline. Our MPFC ROI predicted the actual pattern of quitline calls ($C > A > B$). These results suggest that our sample was more effective as a ‘neural focus group’ than as a traditional self-report-based focus group. Overall, our results suggest that the brain contains hidden wisdom about the impact of persuasive messages at the individual and population level that is not otherwise accounted for in our models of persuasion and behavior change.

Session I: Decision Making

Sunday, October 31

10:45 AM- 12:00 PM

Hideki Ohira, Nagoya University

Tobias Brosch, New York University

Kyung Hwa Lee, University of Pittsburgh

Jennifer Beer, University of Texas

Abstracts

FUNCTIONAL ASSOCIATION OF BRAIN AND BODY IN EMOTIONAL DECISION MAKING-

Hideki Ohira, Nagoya University- Though traditional microeconomics has supposed that human decisions are based on logical and exact computation of cost-benefit balances or efficacies, studies in behavioral economics have shown that humans sometimes make seemingly irrational decisions driven by emotions. In our everyday situations, factors related to decisions are complex and which alternative will be the most beneficial is uncertain. In such cases, emotions can be adaptive because they can quickly reduce negative alternatives and facilitate fast and effective decision making. Some theorists argued that one important source of such emotional drives affecting decision making is bodily responses which are represented in brain regions such as the insula (Damasio, 1994; Craig, 2009). In this talk, empirical evidence for the functional associations of the brain and body accompanying decision making will be shown as follows. (1) Heart rate responses can predict acceptance or rejection to an unfair offer in an economical negotiation game, the Ultimatum Game. Activation of the insula mediates this phenomenon. (2) Bodily responses reflected by cardiovascular parameters such as heart rate and blood pressure are modulated in a top-down way by the prefrontal cortex on the basis of evaluation of uncertainty in decision making situations. Suggestions of these findings in a perspective of evolution and adaptation to environments will be discussed

GENERATING VALUE(S): PSYCHOLOGICAL VALUE HIERARCHIES REFLECT CONTEXT-DEPENDENT SENSITIVITY OF THE REWARD SYSTEM-

Tobias Brosch, New York University; Geraldine Coppin, University of Geneva; Klaus R. Scherer, University of Geneva; Sophie Schwartz, University of Geneva; and David Sander, University of Geneva- Values are motivational constructs that determine what is important to us and which goals we choose to pursue. Each individual possesses a hierarchy of numerous values with varying degrees of importance. Cross-cultural research suggests that the structure of the human value system is universal and can be parsimoniously described using a value space spanned by two broad orthogonal value dimensions, with one

dimension delineating the range between “the pursuit of self-interest and survival” and “the pursuit of altruistic goals” [self-interest dimension], and a second one covering the range from “openness to change” to “conservation of traditions” [openness to change dimension]. We investigated which mechanisms might underlie the fact that for some people self-interest is an important value, but for others not, or the fact that some people are open to changing their habitual, well-established behaviors, whereas others are not. From a biological perspective, human and animal behavior is strongly driven by the search for rewards. In an attempt to bridge psychological value research and neurobiological research on reward processing, we tested the hypothesis that individual differences in basic neural reward mechanisms during value-specific situations reflect the individual psychological value hierarchy. In a donation task, participants had to distribute an amount of money between themselves and a charitable organization of their choice. In each trial, a proposition of how a part of the money could be distributed was presented. Afterwards, participants had to accept or reject the proposition. Brain activation was measured using functional magnetic resonance imaging, data analysis was conducted using SPM8. Individuals with high self-interest value sacrificed less money for charitable donations. Furthermore, they showed higher activation of the ventral striatum when receiving money, indicating that for these individuals receiving money is more rewarding than for individuals with low self-interest value. In a go/no-go task, participants had to inhibit prepotent responses to simple stimuli. They were presented with a sequence of alternating X and Y and pressed the response key after each stimulus, unless the sequence was interrupted (two X or Y presented consecutively). In this case, they tried to inhibit the response. Individuals with high openness to change value showed a greater differential response of the dorsal striatum between errors and correct responses than individuals with low openness to change value, suggesting a higher sensitivity to behavioral errors resulting from persisting in habitual prepotent responses. Our data suggests that context-dependent neural reward sensitivity biases reflect (and may even determine) differences in individual value hierarchies and underlie the effects of values on decisions and behaviors. These findings may promote the integration of theories in cognitive neuroscience and psychological value research, allowing researchers to tackle the question of how and why some things are more important for some people than for others by combining a neurophysiological and a psychological perspective.

NEURAL RESPONSES TO “GOOD” AND “BAD” INDIVIDUALS DIFFER WHEN EVALUATING ONE’S OWN EMOTIONAL RESPONSES BUT NOT THEIRS- *Kyung Hwa Lee, University of Pittsburgh; and Greg Siegle, University of Pittsburgh-* Theoretical accounts suggest that there are distinct mechanisms underlying evaluation of one’s own emotions (How do I feel?) and others’ emotions (How do others feel?). Potentially, though, failure to detect these distinctions empirically reflects a confound of empathy – feeling bad for the other. To investigate this confound, we manipulated whether a target person was perceived as a good person (likely to provoke empathy) or a bad person (ideally, less likely to provoke empathy) using scripts and video clips describing their traits and behaviors. Following this manipulation, during assessment with fMRI, participants rated their own emotions and the emotions of the target while they viewed the targets’ face and a sentence describing various negative situations befalling the target. Behavioral ratings showed that one’s own emotional responses to the bad person were decreased compared to the good person, indicating reduced empathic concern/sympathy for the bad person. In contrast, participants rated both bad and good persons’ emotions similarly. Whether the target was described as a good or bad person also modulated brain activation. The insula and rostral anterior cingulate cortex (rACC), which are involved in self-emotional processing, were more activated by evaluating one’s own emotions to the bad person compared to the good person, potentially representing more effortful processing to attain an emotional response to the bad person. However, brain regions such as the temporal parietal junction (TPJ), which is involved in emotional processing of others, did not show significant differences based on evaluation of the bad and good targets’ emotions. Our findings suggest that a context in which one is primed to empathize modulates emotional ratings and brain activation in evaluation of one’s own emotions but not that of allegedly “good” or “bad” persons’ emotions.

A ROSE BY ANOTHER NAME: THREAT DIFFERENTIATES THE NEURAL SYSTEMS UNDERLYING UNREALISTICALLY POSITIVE SOCIAL COGNITION, *Jennifer S. Beer, University of Texas; and Brent L. Hughes, University of Texas-* One of the most striking features of social evaluation is that it often tends to be unrealistically positive, at least when it comes to the self and people we care about. Although it is intuitive to think of unrealistically positive social evaluation as a defensive response designed to maintain positive beliefs about the self, researchers have recently questioned whether this is the case. Instead, some researchers take the view that unrealistically positive social evaluations may not always reflect a defensive response but instead expose the cognitive shortcuts inherent in social evaluation. Recent neural evidence supports the view that unrealistically positive social evaluation may reflect different underlying processes depending on whether it is a defensive response or not. The unrealistic nature of the positive evaluations can be operationalized as self-beliefs that are significantly different than objective indicators such as one’s task performance, one’s relative social standing, and peer-perceptions. Across these diverse operationalizations, unrealistic positivity is most often marked by a drop in orbitofrontal cortex activation. For example, our research finds that orbitofrontal cortex activation is parametrically associated

with unrealistically positive confidence in task performance (Beer, Lombardo, & Bhanji, 2010) and associated with individual differences in unrealistically positive perceptions of social standing (Beer & Hughes, 2010; Hughes & Beer, 2010a). Patients with orbitofrontal cortex damage tend to have unrealistically positive self-evaluations of their social skill (Beer et al., 2003; Beer et al., 2006). However, when self-esteem threat is the elicitor of unrealistically positive evaluations of social standing, a different neural profile is found (Hughes & Beer, 2010b). Taken together, these studies suggest that the mechanism underlying unrealistic positivity may differ as a function of whether it is a response to threat or not.

Session J: Poster Presentation Session 2

*Sunday, October 31
1:30 PM – 3:00 PM*

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Session K: At the frontier of cultural neuroscience

*Sunday, October 31
3:00 PM- 4:15 PM*

Joshua Goh, *University of Illinois*
Jonathan Freeman, *Tufts University*
Bobby K. Cheon, *Northwestern University*
Elizabeth A. Reynolds Losin, *University of California, Los Angeles*
Shinobu Kitayama, *University of Michigan*

Abstracts

CULTURAL DIFFERENCES IN DEFAULT-NETWORK ACTIVITY IN A SPATIAL JUDGMENT TASK- *Joshua Goh, University of Illinois, University of Texas; Denise Park, University of Texas-* Previous studies have shown cultural differences in functional activity in the ventral visual, frontal, and parietal regions that have been attributed to differences in visual attention and perception (Goh et al., 2007, in press; Gutchess et al., 2006; Hedden et al., 2008). The neural findings across these studies are consistent with Westerners engaging a more analytic style of visual processing with greater attention to visual features, and East Asians engaging more holistic processing with greater attention to contextual associations in visual stimuli. In this present study, we examined whether these cultural differences in visual processing would also impact processing in default-network regions, known to be sensitive to the attentional demands involved in a task. This would suggest a higher-level and more widespread effect of cultural differences in visual processing on brain function than previously thought. 50 Westerners (25 males) and 47 East Asians (25 males) participated in this blocked-design fMRI experiment involving a relative spatial judgment task. In the task blocks, participants viewed stimuli consisting of a dot located either above or below a horizontal bar. For each trial, participants decided whether the distance between the dot and the bar was farther or nearer relative to the length of a vertical reference line shown at the beginning of each block. In control blocks, dots appeared on both the left and right of the horizontal bar and participants were instructed to alternate finger presses during each trial. Trial duration=1750ms; Inter-trial interval=240ms (blank screen); 15 trials per block; 12 blocks of task as well as control; each of 2 fMRI run lasted 442s; TR=2s; 36 axial slices parallel to AC-PC plane; slice thickness=4mm, 0.4mm gap; FOV=220mm; matrix size 64x64. While there were no significant cultural differences in accuracy, East Asians were faster than

Westerners, consistent with East Asians having more affinity for the relative judgments in this visuo-spatial task. Cultural differences in task-active regions, such as lateral frontal and parietal areas, were minimal. Importantly, in default regions, we found that Westerners had significantly greater deactivation than East Asians during the task relative to the control condition in the medial frontal and right hippocampus. Taken together, these behavioral and neural findings suggest that East Asians may require less effort than Westerners when performing this task, and thus had less need to suppress default activity in between trials. Previous studies have shown that default-network activity is associated with processing social information and self-identity, and, for this reason, differences in the social and self-value systems across cultural groups may result in different default-network function (Chiao et al., 2009). Our findings add to this notion by showing cultural differences in default-network processing related to a more cognitive mechanism, and suggest a more general involvement of attention or effort for role culture plays in default-network processing. Critically, our findings show that cultural differences in visual processing have widespread neural effects involving visual, fronto-parietal, and now, default-network regions as well.

CULTURE SHAPES A MESOLIMBIC RESPONSE TO SIGNALS OF DOMINANCE AND SUBORDINATION THAT ASSOCIATES WITH BEHAVIOR

Jonathan B. Freeman, Tufts University; Nicholas O. Rule, Tufts University; Reginald B. Adams, Jr., The Pennsylvania State University; Nalini Ambady, Tufts University- It has long been understood that culture shapes individuals' behavior, but how this is accomplished in the human brain has remained largely unknown. The mesolimbic reward system likely plays an important role, yet it is unknown whether mesolimbic activity may be shaped by human culture. To examine this, we made use of a well-established cross-cultural difference in behavior: American culture tends to reinforce dominant behavior whereas Japanese culture tends to reinforce subordinate behavior. In 17 Americans and 17 Japanese, we assessed behavioral tendencies towards dominance/subordination and measured neural responses using fMRI to dominant and subordinate stimuli. In the scanner, participants passively viewed images of dominant and subordinate displays of the body. After the scan, participants completed a questionnaire indexing behavioral tendencies towards dominance/subordination (e.g., "I impose my will on others."). In Americans, dominant stimuli selectively engaged the caudate nucleus, bilaterally, and the medial prefrontal cortex (mPFC), whereas these same regions were selectively engaged by subordinate stimuli in Japanese. Correspondingly, Americans self-reported a tendency towards more dominant behavior, whereas Japanese self-reported a tendency towards more subordinate behavior. Moreover, activity in the right caudate and mPFC correlated with behavioral tendencies towards dominance/subordination, such that stronger responses in the caudate and mPFC to dominant stimuli were associated with more dominant behavior and stronger responses in the caudate and mPFC to subordinate stimuli were associated with more subordinate behavior. The findings provide a novel demonstration that culture can flexibly shape functional activity in the mesolimbic reward system, which in turn may guide social behavior.

MINDING THEIR PAIN: CULTURAL VARIATION IN MENTALIZING REGION ACTIVITY FOR THE EMOTIONAL PAIN OF INGROUP RELATIVE TO OUTGROUP MEMBERS-

Bobby K. Cheon, Northwestern University; Dong-mi Im, Korea Advanced Institute of Science and Technology, Tokiko Harada, Northwestern University; J. Park, Korea Advanced Institute of Science and Technology; Vani A. Mathur, Northwestern University; Jason Scimeca, Northwestern University; HyunWook Park, Korea Advanced Institute of Science and Technology; Joan Y. Chiao, Northwestern University, Korea Advanced Institute of Science and Technology- Empathy refers to the capacity to understand and share the emotional states of others. Though empathy is a universal human psychological process, the component processes of empathy may be distinctly modulated by cultural experience. Cultures may vary in levels of preference and tolerance for social hierarchies, with prior research suggesting that hierarchy preference may be a powerful modulator of empathy and its neural correlates. In the present experiment, we investigated the influence of cultural variations in hierarchy preference on the neural mechanisms underlying ingroup biases in empathy in native Koreans (K) and Caucasian-Americans (CA) using cross-cultural functional magnetic resonance imaging (CC-fMRI) at 3T. During scanning, participants viewed complex visual scenes of K and CA targets in emotionally painful or neutral situations and indicated how much empathy they felt for K and CA targets. Behaviorally, K participants reported greater empathy for ingroup relative to outgroup targets compared to CA participants. Neuroimaging revealed that across both cultures, mentalizing and perspective-taking regions, such as the temporo-parietal junction, medial prefrontal cortex, and posterior cingulate cortex were significantly recruited when viewing the pain of ingroup relative to outgroup members. Moreover, K participants reported stronger hierarchy preferences and ingroup biases in empathy and exhibited greater activation in the temporo-parietal junction relative to CA participants, with activity in this region mediating the relationship between hierarchy preference and reported ingroup biases in empathy. These results suggest that mentalizing regions may play a critical role in group-level biases in empathy, and cultural variations in mentalizing processes may underlie cultural variations in ingroup-favoring biases in empathy.

ANSWERING THE ‘OTHER’ QUESTION IN CULTURAL NEUROSCIENCE: THEORY AND DATA ON HOW CULTURE GETS INTO THE BRAIN- *Elizabeth A. Reynolds Losin, University of California Los Angeles; Marco Iacoboni, University of California Los Angeles; Alia Martin, University of California Los Angeles; Mirella Dapretto, University of California Los Angeles-*

Cultural neuroscience (CN) is an emerging discipline that examines two questions fundamental to understanding human culture: how cultural experience shapes the brain and how the brain allows the acquisition and transmission of cultural information. To date, the nascent field of CN has focused almost exclusively on the influence of differential cultural experience on the brain. In contrast, the even more fundamental process of cultural acquisition and transmission remains neglected by neuroscientific inquiry. Fortunately, the tools needed to study the neural basis of cultural learning–anthropological theory and cognitive neuroscience methodology–already exist; they are merely separated by disciplinary boundaries. We bring tools from both disciplines to bear on a specific question: what are the neural underpinnings of cultural imitative learning? Anthropological theories of cultural learning based on fieldwork, computational modeling, and laboratory experiments suggest that sophisticated imitation abilities are at the core of human cultural learning, and that these abilities are augmented by learning biases, mental state attribution, and flexible reinforcement learning. On the basis of current cognitive neuroscience research related to these four cognitive domains, we propose a preliminary model of the neural mechanisms underlying cultural imitative learning. Our model has the mirror neuron system (MNS) and associated imitative learning areas as its core. We further propose that the reward network may support both the motivation to imitate and the reinforcement sensitivity involved in cultural learning biases. Finally, MNS regions may support mental state attribution through motor simulation while medial fronto-parietal areas associated with mentalizing may contribute to mental state attribution through an inferential route. To test this model, we have conducted the first study aimed explicitly at exploring the neural underpinnings of cultural imitative learning. Specifically, we have used fMRI to characterize the neural machinery of one important element of cultural imitative learning: the bias to learn from self-similar individuals. Unlike typical neuroimaging studies of imitation that depict an isolated effector (e.g. a hand) performing simple actions, we have employed waist-up videos of 12 actors of 3 ethnicities (African American, European American and Chinese) and 2 genders (male and female) performing unfamiliar, complex hand signs in order to more closely mimic real-world imitative learning. Study participants were 20 European American young adults. While in the scanner, participants imitated and observed hand sign videos. Control conditions were still portraits of each actor (“identity” condition) and a fixation cross (baseline). We found more activity in the reward network during own- compared to other-gender imitation. In contrast, the MNS and other higher motor regions, higher visual regions and medial fronto-parietal regions were more active for other- than own-ethnicity imitation. These findings suggest that although the specific neural mechanisms underlying gender- and ethnic-similarity biases may differ, in both cases the neural regions coding self-similarity are components of our neural model of cultural imitative learning. While these data begin to elucidate the neural mechanisms of the acquisition and transmission of culture, future CN research will need to focus more attention on this question in order to fully characterize the neural dynamics of human culture.

NEURAL MECHANISMS OF SELF JUSTIFICATION: IMPLICATIONS FOR CULTURAL VARIATION IN DISSONANCE- *Shinobu Kitayama, University of Michigan; Hannah Faye Chua, University of Michigan; Steve Tompson, University of Michigan; Shihui Han, Peking University-*

After making a difficult decision, individuals are said to experience dissonance, which in turn motivates them to justify the decision. Yet, specific brain pathways for dissonance have yet to be fully understood. Here, we propose that the brain system is alerted when a decision is expected to be private and thus to pose a threat to their personal self. When a conflicted decision is made under this condition, the anterior cingulate cortex (ACC) will detect the conflict, which in turn produces aversive somatic experience (as indicated by an increased activation of the anterior insula [AI]), resulting in dissonance arousal. To reduce the dissonance, the individuals will reconstruct the personal self so as to justify the original decision. Importantly, because the personal self is more elaborate and significant in independent cultures (e.g., the US) than in interdependent cultures (e.g., Asia), this analysis is likely to be valid in the former, but not in the latter, cultures. We scanned 24 young healthy American participants while they rated their preferences for various popular music CDs before and after making a series of private choices. CDs were paired together such that the choices were either easy or difficult. As predicted by the proposal that choice justification is motivated by dissonance, chosen CDs were liked more and rejected CDs were liked less (i.e., choice was justified) after difficult choices, but no such preference change was observed after easy choices. Of importance, during the difficult (vs. easy) choices, both the dorsal ACC and the AI were strongly activated. Moreover, the AI activation was reliably correlated with an increased activation of the posterior cingulate cortex (PCC), which in turn predicted the post-choice increase of liking for the chosen CDs, suggesting that a conflicted (i.e., difficult) choice produces dissonance as realized in the activation of both ACC and AI, which in turn motivates the updating of self-relevant information (the PCC activation) and the associated choice justification. In addition, underscoring the central significance of the personal self in dissonance processes, the chosen (vs. rejected) CDs recruited a wide range of areas within the midline default network including ventromedial prefrontal cortex and precuneus during the post-choice (vs. pre-choice) rating

task. Curiously, the evidence here diverges substantially from the result from a similar study we conducted in China. In the China study we found that choice justification is correlated, not with the midline self-related areas, but with lateral frontal and central areas of the brain (areas associated with social and public realms). Thus, the brain operations involved in dissonance are partially distinct in independent vs. interdependent cultures. In particular, in interdependent cultures (e.g., China) dissonance is experienced as a threat to one's public self and, as a consequence, the effort to reduce dissonance might involve updating of the representations for one's public self in general and one's public actions in particular. This analysis converges with recent theorizing in cultural neuroscience to suggest that culture is an active element that shapes brain networks involved in cognitive dissonance.

Poster Session E

E1

INTERACTIVE ENCODING OF EMOTIONAL AND SOCIAL RELEVANCE WITHIN THE HUMAN AMYGDALA *Pascal Vrtička, Swiss Center for Affective Sciences, University of Geneva; David Sander, Swiss Center for Affective Sciences, University of Geneva; Patrik Vuilleumier, Department of Medicine, University of Geneva* Thanks to major advances in neuroimaging techniques during the last twenty years, our knowledge about the main functions and computational properties of the human amygdala has been constantly refined and extended. Being initially conceptualized to represent a basic “fear module” and later on described to serve as an “arousal indicator”, it has been more recently proposed to meet all the necessary prerequisites for a “relevance detector”. Recent evidence speaks in favor of the latter account, as the human amygdala has been found activated during the processing of various kinds of information – including negative, positive and even neutral stimuli –, as long as it was relevant for the goals, needs or values of the perceiver at a particular moment in time. This was either related to specific task instructions or individual differences in personality traits. Based on such an interpretation, researchers have started to ask the question whether the human amygdala would differentiate between distinct kinds of relevance, and whether the latter would be processed independently, additively, or even interactively. On the one hand, it is well known that the human amygdala preferentially encodes emotional versus non-emotional information, referred here as to emotional relevance. On the other hand, recent evidence also shows that the human amygdala is more strongly activated by social versus non-social stimuli, representing what one may call social relevance. Moreover, some investigations already suggest an interactive processing of emotional and social relevance within the human amygdala. However, as the latter studies only used emotional relevance in terms of emotional versus neutral information, they did not allow for characterizing interactive effects. In this new functional magnetic resonance imaging (fMRI) study, we used a full 2 x 2 factorial design, differentiating between emotional (negative and positive) and social (social and nonsocial) stimulus content, in addition to a neutral visual baseline condition. Moreover, we included an emotion experience and two emotion regulation conditions (re-appraisal and expressive suppression), and probed for the influence of any individual differences in general anxiety and anxious attachment style. Our data confirmed previous accounts that the human amygdala displays a basic social vs. nonsocial (social relevance) and an additive emotional vs. neutral (emotional relevance) encoding pattern. Yet, more importantly, we could show – for the first time to our knowledge – a proper interactive emotional x social relevance encoding pattern, as activity was bilaterally not significantly different during negative and positive social image perception, but higher during negative vs. positive nonsocial image processing. This pattern was not affected by the different emotion regulation strategies and thus cognitive top-down influence, but was modulated by general anxiety and therefore arousal, as it was only found in low but not high anxious subjects. Finally, the same emotional x social relevance interaction was found in three additional cortical regions including the right fusiform gyrus, right anterior superior temporal gyrus, and medial orbito-frontal cortex. Overall, these new findings reveal an interactive relevance encoding pattern within the human amygdala and three additional cortical brain areas, describing an elaborated relevance detection system in our species.

E2

SOCIAL CATEGORIES *Juan Manuel Contreras, Harvard University; Mahzarin R. Banaji, Harvard University; and Jason P. Mitchell, Harvard University*- Semantic knowledge refers to the stored information that

perceivers have about categories of objects and animals. Social psychologists have long assumed that the information that perceivers have about categories of people—i.e., *stereotypes*—is merely another domain of semantics. Here, we evaluate this assumption against recent findings regarding the neural basis of semantics, which suggest that two brain regions—left inferior frontal gyrus and inferotemporal cortex—are critical for semantic knowledge. During functional magnetic resonance imaging, participants answered questions about their knowledge of both nonsocial and social categories. Although left inferior frontal gyrus and inferotemporal cortex were activated during semantic judgments of nonsocial categories, these regions failed to respond above baseline during judgments of social categories. Instead, judgments of social groups were associated with regions frequently linked to social cognition, including medial prefrontal cortex, posterior cingulate, and temporoparietal junction. Together, these results suggest that beliefs about social groups should be considered distinct from other forms of semantic knowledge.

E3

THE EMOTIONS OF INVESTMENTS: FMRI EVIDENCE FOR THE INFLUENCE OF UNCONSCIOUS AFFECT ON FINANCIAL DECISIONS *Julie L. Hall, University of Michigan; Richard Gonzalez, University of Michigan; Chandra Sripada, University of Michigan; and Oliver C. Schultheiss, University of Michigan* - The dominant method of measuring affect in psychological research has been explicit, self-report measures. More recently, implicit and unconscious measures have been developed to assess emotions that respondents may not be able to report or that are outside of conscious awareness. The current study provides evidence for stronger unconscious than conscious affective influences on financial choices. Using fMRI, 24 participants viewed happy, angry, and neutral affective primes presented under subliminal and supraliminal conditions followed by a dynamic investment task. Our results indicate that both subliminal and supraliminal presentations of affective primes influence financial investment decisions and anticipatory neural activation in the nucleus accumbens. As predicted, participants made more risky investment decisions after happy versus neutral primes. They also showed greater nucleus accumbens activation after happy primes, an effect that was significantly stronger for subliminal versus supraliminal primes. Furthermore, financial risk-taking was positively correlated with nucleus accumbens activation during happy primes whereas financial risk-taking was negatively correlated with insula activation during angry primes. Our results demonstrate that affect influences financial investment decisions and neural markers of anticipatory arousal, particularly at an unconscious level. Our findings imply that individuals may be able to improve the quality of their financial decisions by becoming more aware of their affective states and learning to manage affective states that lead to suboptimal investment choices.

E4

ETHNIC IDENTIFICATION ASSOCIATED WITH DEFAULT NETWORK ACTIVITY WHEN PERCEIVING ETHNIC INGROUP MEMBERS *Vani A. Mathur, Northwestern University; Tokiko Harada, Northwestern University; Joan Y. Chiao, Northwestern University* - The neural default network is comprised of cortical midline structures including the medial prefrontal cortex (MPFC), anterior cingulate cortex (ACC), and posterior cingulate cortex (PCC). This network has been shown to display graded activation associated with self-referential and social cognitive processing. Despite the growing body of literature describing neural reactivity of the default network during social cognitive processing, how

intergroup factors such as group membership, identification, and preference affect default network reactivity remains unknown. In the present fMRI study, we measured neural response among African-American (AA) and Caucasian-American (CA) participants while viewing AA and CA targets either in emotional pain or not. Consistent with prior behavioral work, AA participants self-reported greater ethnic identification relative to CA participants. Neuroimaging results indicated that neural reactivity within cortical midline areas of the default network, including MPFC, ACC and PCC, was greater for AA relative to CA participants and was associated with degree of ethnic identification during the perception of ethnic ingroup members across conditions, relative to outgroup members. Moreover, regression analyses performed on independently defined regions of interest revealed that degree of ethnic identification predicted activity within cortical midline structures when viewing ingroup relative to outgroup others. These findings suggest that ethnic ingroup identification may modulate the extent to which the default network is recruited to understand ethnic ingroup members.

E5

IS THERE AN ASSOCIATION BETWEEN TRAIT ANHEDONIA AND NEURAL ACTIVITY IN RESPONSE TO EMOTIONAL PICTURES IN SCHIZOPHRENIA? AN FMRI INVESTIGATION. *Brady D. Nelson, University of Illinois – Chicago; Ellen S. Herbener, University of Illinois – Chicago; and Olivia A. Bjorkquist, University of Illinois – Chicago-* Anhedonia is a hallmark affective characteristic of schizophrenia (Bleuler, 1911; Harrow et al., 1977; Kraepelin, 1913), and is associated with significant functional impairment throughout the course of illness (Herbener et al., 2005, Blanchard et al., 1998; Fenton and McGlashan, 1994). However, it is still unclear what anhedonia actually reflects within schizophrenic illness. Multiple studies have documented that individuals with schizophrenia whom self-report anhedonia demonstrate normal responses to emotional stimuli at the moment of exposure as indexed by both self-reports of response (cf., Kring et al., 1993; 1996; Herbener et al., 2008) and emotion-potentiated startle (Curtis et al., 1999). Functional imaging studies of brain activity in response to emotional stimuli in individuals with schizophrenia have typically reported decreased activity in brain regions typically involved in emotion processing, such as the amygdala and medial prefrontal cortex (Takahashi et al., 2004; Taylor et al., 2005). Recently, Harvey et al. (2010) found that trait physical anhedonia was associated with decreased activity in emotion-related regions in both schizophrenic patients and healthy controls (although several of the associations were significantly stronger in schizophrenic patients). However, Harvey et al. did not assess online emotions ratings and only examined physical anhedonia. Therefore, we aimed to replicate and extend these findings by including additional measures of anhedonia (general and social), measures of positive/negative symptom severity, and online emotion ratings. In the present study, participants with schizophrenia or schizoaffective disorder ($N = 12$) and healthy controls ($N = 12$) underwent a functional Magnetic Resonance Imaging (fMRI) paradigm where they viewed and rated the intensity of their emotional responses to positive, negative, and neutral images. Groups were matched in age, sex, ethnicity, IQ, and parental socioeconomic status. Prior to the scan, participants completed self-report measures of general, social, and physical anhedonia (Chapman et al., 1976), and symptom severity was rated with the Positive and Negative Syndrome Scale (Kay, Fiszbein, & Opler, 1987). Structural and functional scans were acquired on a 3 Tesla scanner (Signa, General Electric Medical System, Milwaukee, Wisconsin) at the University of Illinois at Chicago Medical Center. Data was processed using Analysis of Functional NeuroImages software (AFNI; Cox, 1996). Preliminary results indicate that the measures of anhedonia and positive/negative symptoms are

associated with different patterns of activity in emotion-related regions in healthy and schizophrenia subjects. Overall, we aim to further elucidate the role anhedonia plays in schizophrenic illness.

E6

PHYSIOLOGICAL RESPONSE TO EMOTIONAL FACES IN PATIENTS WITH TEMPORAL LOBE EPILEPSY *Sarah Banks, Montreal Neurological Institute; Jenny Bellerose, Montreal Neurological Institute; and Marilyn Jones-Gotman, Montreal Neurological Institute-* In various neurological and psychiatric disorders, deficits in emotional response are associated with abnormalities in amygdala functioning. Although emotion recognition itself is often performed well, individuals with neurological or psychiatric conditions are often found to have abnormal autonomic response to emotional stimuli, however this has rarely been assessed as a function of amygdala atrophy. The purpose of this study was to examine the relationship between skin conductance responses and amygdala volume to emotional stimuli in patients with medial temporal lobe damage compared with healthy volunteers. The study involved two tasks: an implicit and an explicit task. The implicit task was presented first and involved viewing a series of 24 faces that expressed one of six emotions (happiness, fear, sadness, anger, disgust, and neutral). Each face was presented with a choice of two ages and the subject had to decide which number best represented how old they thought the person in the picture was. In the explicit task, the subjects were presented with similar pictures but for this task they had to choose which of two emotion labels best represented the face on the screen. During both tasks, electrodes were attached to the subjects' fingers on both hands to measure skin conductance while responses were spoken. Bilateral recordings are not the norm in this field, but our earlier research revealed important differences between the left and right hands in skin conductance in healthy volunteers. In patients with unilateral temporal lobe pathology, these lateralization findings may become even more relevant. Following completion of the tasks, subjects underwent a high resolution structural MRI scan in a 3 Tesla magnet. After appropriate preprocessing of the scans, amygdalae were segmented manually and volumes calculated using inhouse software. Contrasting with the classic view that skin conductance only distinguishes valenced stimuli from neutral, the response profile to different emotions in our healthy volunteers showed an interesting pattern, specifically with the right hand. We found higher responses to "fight or flight" emotions such as fear and disgust, especially when the data was presented explicitly. In comparison, patients with epilepsy primarily affecting their left hemisphere showed atypical responses: Compared with their healthy counterparts they showed relatively greater response to faces depicting sadness in our implicit task, and reduced response to faces depicting disgust in the explicit task. As would be expected, amygdala volume in healthy control subjects was unrelated to skin conductance response to emotional faces. These initial results point to differences in reaction to certain emotions in patients with subtle damage to the medial temporal lobe. The differences most likely reflect structural and functional changes in the temporal lobe emotion circuitry. The nature of the differences, specifically heightened reaction to sad faces in patients with left sided pathology, may underpin the exaggerated prevalence of depression in this patient population.

E7

THE DOWNWARD V IS AN EMOTIONALLY MEANINGFUL ENVIRONMENTAL CUE: AN EVENT-RELATED POTENTIAL STUDY *Emily Belleau, University of*

Wisconsin-Milwaukee; Elizabeth L. Steuer, University of Wisconsin-Milwaukee; Michael W. Duke, University of Wisconsin-Milwaukee, Lindsay M. Kaad, University of Wisconsin-Milwaukee & Christine L. Larson, University of Wisconsin-Milwaukee- Efficient recognition of salient stimuli that signal threat to the individual is crucial for survival. In parallel, research has shown that very simple stimulus properties can convey meaningful information about biologically relevant stimuli. For example, angular geometric patterns tend to be associated with threat and curvilinear forms with pleasantness (Bar & Neta, 2006). The downward-pointing V shape is embedded in the configuration of a number of common contextually laden cues of threat, including the eyebrows in an angry face, fangs, and knives. To clarify the underlying features that are perceived in these configural affective stimuli, in a set of studies we stripped away all contextual information and presented the simple geometric forms (e.g., literally a “V” or a circle) that appeared to convey emotion in natural environments. In brief, semantic differential ratings revealed that downward V forms were rated as more “bad” and circles and curvilinear forms were rated as more “good” (Aronoff et al., 1992; Larson, 2007). The current study adds to this literature by using event-related potentials (ERPs) to examine whether the downward V would be more emotionally salient, compared to the passive viewing of other simple geometric shapes as measured by the P300 and the Late Positive Potential (LPP). We hypothesized that the downward V would produce higher P300 and LPP waves, compared to circle and upward V shapes. Twenty-five participants passively viewed downward V, upward V, and circle stimuli on a computer screen for 200 ms each while 64 channels of EEG were recorded. The geometric stimuli were randomized with a total of 180 trials. Separate within subjects ANOVAs and post-hoc comparisons were conducted for P3 (280-450 ms) and LPP (350-750 ms) at channel POz. P3 and LPP amplitudes were significantly influenced by geometric shape, such that amplitudes for both components were significantly higher for the downward V compared to the upward V ($p=.02$ for P3, $p=.01$ for LPP). Additionally, significant differences in P3 were found between the downward V and the circle ($p=.05$), with higher P3 amplitudes for the downward V. The findings suggest that the downward V is more emotionally salient than other common geometric shapes found in the environment. Although the passive viewing of the circle shape did not produce significantly higher P3 or LPP amplitudes compared to the upward or downward V, circles may convey emotional meaning as they are associated with infant faces and elicit caregiving behaviors (Lorenz, 1943; Zebrowitz, 1992). This study further informs research establishing the downward V as a meaningful environmental cue.

E8

PRONENESS TO THE GAZE OF POLITICIANS AND IMPLICIT ATTITUDE PREDICT VOTING INTENTION

M.T. Liuzza, Università di Roma, Istituto di Ricovero e Cura a Carattere Scientifico Fondazione Santa Lucia; M. Vecchione, Università di Roma; F. Dentale, Università di Roma; F. Crostella, Università di Roma; G.V. Caprara, Università di Roma; S.M. Aglioti, Università di Roma, Istituto di Ricovero e Cura a Carattere Scientifico Fondazione Santa Lucia- Gaze is one of the most powerful social signals used to manipulate others' attention. Indeed, humans automatically attend where others are attending to and gaze following may be a reflexive behaviour that, in some circumstances, occurs independently from a follower's will. The attention catching power of others' gaze may be underpinned by subcortical neural pathways that mediate coarse but fast orienting to salient stimuli. Yet, evidence in monkeys indicates that this behaviour is not impervious to higher order variables such as indexes of social rank and hierarchy in humans. For example, we have demonstrated that human observers are more attracted by the distracting gaze of in-group rather than out-group politicians. Moreover, we found that perceived similarity

between the observer and the model played a role in mediating social attention. To assess whether the modulation of this automatic behaviour by political affiliation can be used as a predictor in elections, we tested 48 subjects during a local election campaign in Italy in which competed two candidates of the two main coalitions (centre-left-wing and centre-right-wing). We used these two candidates as distracting gaze models in a variation of a Posner's spatial cuing paradigm in which participants had to perform the task using their own gaze. Distracters gaze direction could be equi-probably congruent or incongruent with the one cued by the imperative signal that shortly (75 msec) followed them. Gaze-following behaviour was computed as the difference between accuracy in spatially incongruent trials and spatially congruent ones. Participants rated themselves on the Five Factors of personality using a list of 25 adjectives and provided their perceptions of the two candidates using the same list. We used these measures in order to compute the perceived similarity between the experimental subjects and each of the models. Finally, we collected also their implicit attitude by using the Implicit association test (IAT), a reliable measure of implicit attitudes that has been shown to predict election outcomes in undecided voters. We expected that both IAT and gaze-following strength uniquely predict voting intention. We entered the vote intention as dependent variable and the gaze-following behaviour and IAT scores as predictors. Multiple regression reached significance and both IAT and Gaze-following predict intention vote. Moreover, perceived similarity correlated with the gaze-following at least for the most known candidate. No such correlation with IAT was found. The results suggest that the social attention catching power exerted by the gaze of a politician on the gaze of an observer is a predictor of voting intentions. Data also suggest that gaze following deals with perceived similarity both in terms of personality and political affiliation.

E9

SOCIAL STATUS MODULATES NEURAL ACTIVITY IN THE MENTALIZING NETWORK

Keely A. Muscatell, UNIVERSITY OF CALIFORNIA, LOS ANGELES; Emily Falk, UNIVERSITY OF CALIFORNIA, LOS ANGELES; Sylvia A. Morelli, UNIVERSITY OF CALIFORNIA, LOS ANGELES; Baldwin M. Way, UNIVERSITY OF CALIFORNIA, LOS ANGELES; Jennifer H. Pfeifer, University of Oregon; Matthew D. Lieberman, UNIVERSITY OF CALIFORNIA, LOS ANGELES Naomi I. Eisenberger, UNIVERSITY OF CALIFORNIA, LOS ANGELES; and Mirella Dapretto, UNIVERSITY OF CALIFORNIA, LOS ANGELES- Previous research has suggested that social status may influence an individual's tendency to think about the minds of others (mentalize) or to take their perspective. Specifically, individuals who are low in status are more likely to adopt the perspective of another person, and perform better on mentalizing tasks, compared to high status individuals (Galinsky, 2006; Rutherford, 2004). To the extent that low status individuals are more dependent on high status individuals for resources, it may be adaptive for those low in status to pay more attention to and care more about understanding how others are likely to think and behave. However, no known studies have investigated whether social status modulates neural activity in brain regions involved in perspective-taking and mentalizing. In Study 1, 17 young adults completed a measure of social status, and were scanned using fMRI while they viewed a photo of a person and read a passage supposedly written by the individual in the photo. Results revealed that individuals with lower social status showed greater neural activity in a network of neural regions known to be involved in perspective-taking and mentalizing—including the dorsomedial PFC (dmPFC), medial PFC (mPFC), precuneus/posterior cingulate, posterior superior temporal sulcus (pSTS) and temporoparietal junction (TPJ) ($p < .001$, 20 voxels). In Study 2, we sought to replicate this effect in an adolescent sample, using a less circumscribed task. Twenty-seven

adolescents (age = 13 years) were scanned while they passively viewed emotional facial expressions; participants' parents also completed measures of social status. Again, results revealed a negative correlation between social status and neural activity in mentalizing regions—such as the dmPFC and precuneus—as well as the amygdala ($p < .001$, 10 voxels). Results from Study 2 replicate and extend the results of Study 1, together suggesting that, across developmental periods and during distinct tasks, individuals who are lower in social status show greater activity in brain regions involved in understanding the minds of others.

E10

FUNCTIONAL MRI INVESTIGATION OF THE ROLE OF PROCESSING LOAD, EMOTIONAL CONTENT, DISTRACTION TIME, AND INDIVIDUAL DIFFERENCES IN THE IMPACT OF DISTRACTION ON A VISUAL PERCEPTUAL TASK *Andrea T. Shafer, University of Alberta; and Florin Dolcos, University of Alberta* According to Lavie (2005), task-irrelevant distractors in perceptual tasks have differential impact on task-relevant processing depending on the processing load (PL) of the main task – i.e., low PL is susceptible to distraction whereas high PL eliminates distraction. Previous research with emotional distraction has shown that high PL eliminates or significantly diminishes emotional distraction, suggesting that selective attention resources are necessary for the processing of emotional stimuli (Pessoa et al, 2002, 2005, 2007). While it effectively manipulated PL, this research failed to consider the degree of emotional content (EC) of the distractors. Thus, it is possible that high PL may have less of an effect on task-irrelevant distraction when the distractors are highly emotional. Furthermore, although previous research with non-emotional distractors has found high PL eliminates individual differences in distractibility (Forster & Lavie, 2007), this effect was not observed in individuals with high social anxiety (Moriya & Tanno, 2010), suggesting that the effect of PL on task-irrelevant distraction depends on certain individual differences affecting emotion processing. These ideas were investigated using a shape discrimination (SD) task in which PL, EC, and distraction time (DT) were manipulated, and personality traits affecting general distractibility (i.e. attentional control) and emotion processing (i.e. neuroticism, social anxiety) were also assessed. Event-related fMRI data were collected from 18 participants. Repeated measures ANOVAs with three factors (PL, EC, DT), performed on reaction time (RT) data, revealed main effects of PL (longer RT for high PL) and EC (longer RT for emotional distractors). Also, when examining distractors with the most dissimilar EC an EC x DT interaction was found when PL was low, showing that the impact of distraction was the strongest when EC was highest, and resources were the least taxed by the main task. Paralleling these findings, analysis of fMRI data showed that activity in the anterior cingulate cortex (ACC) was the strongest when EC was the highest and resources were the least taxed. This finding suggests that when more resources were available for distraction, more conflict between task-relevant (cognitive) and task-irrelevant (emotion) processing occurred. These results are consistent with the ACC role in conflict monitoring and in emotion-cognition integration. Together these results show that PL affects the amount of emotional distraction, in that when PL is minimal emotional distraction is maximal. Moreover, investigation of the role of individual differences showed that various personality traits affect distraction differentially depending on the amount of resources present at the time of distraction. Specifically, lack of attentional control was linked to worse performance when the largest amount of resources were available, whereas heightened social anxiety and neuroticism were linked to worse performance when minimal resources were available. Collectively, these findings reconcile opposing views of emotional distraction on perception and point to the role of individual differences in general distractibility and

emotion processing in the response to emotional distraction. These findings shed light on the impact of emotional distraction on perception and have relevance for clinical conditions characterised by increased susceptibility to emotional distraction.

E11

AN FMRI STUDY OF ANTICIPATION: IS THE JOURNEY MORE IMPORTANT THAN THE DESTINATION? *Sarah E. Henderson, Dartmouth College; and Catherine J. Norris, Dartmouth College*- Previous research has investigated the neural substrates of cued anticipation and experienced monetary outcomes (Knutson & Greer, 2008); however, a study exploring how multiple competing gain or loss outcomes might impact anticipation and expectancy has yet to be conducted. In the current experiment, we sought to bridge the literatures on (a) anticipation of monetary outcomes and (b) violations in outcome expectancy by investigating the difference between the anticipation of receiving a monetary reward or loss and the experience of actually obtaining the greatest possible reward or loss when multiple outcomes were possible. Using an event-related functional magnetic resonance imaging (fMRI) design, participants (N = 30) were presented with two facedown cards and the stakes (i.e., monetary gains or losses) associated with the cards. The stakes were either two possible gain outcomes (win \$5 vs. win \$25) or two possible loss outcomes (lose \$25 vs. lose \$5). Upon choosing a card, participants learned the outcome and its impact on their starting endowment of \$10. A whole brain analysis comparing neural responses during anticipation of a win to those following the attainment of the greatest possible reward (e.g., win \$25 instead of win \$5) revealed that anticipation produced greater activation of primary and secondary visual areas as well as premotor, motor, and somatovisceral areas than did actual experience. This pattern suggests that during anticipation, participants are engaging in increased mobilization of resources to attend to stimuli and prepare to make decisions. The pattern for losses was very similar. However, a comparison of anticipation of loss versus receiving the worst possible monetary outcome also revealed increased activation in BA 39 and dorsolateral prefrontal cortex. BA 39 has previously been associated with experiencing unpleasant stimuli and with a negativity bias, such that losses receive more attention and elicit stronger emotional responses than do wins; while dorsolateral prefrontal cortex has been implicated in self regulation and behavioral inhibition. In addition, anticipation of reward produced more activation of bilateral orbitofrontal cortex (OFC) than did receiving the best possible monetary outcome, consistent with this region's role in reward anticipation. These findings suggest that, in addition to replicating previous findings on anticipation of monetary outcomes, anticipation may have stronger effects on the mobilization of resources than does actual experience. Further research investigating how an individual's expectations to win or lose when reward or punishment are imminent may better explain the differences between anticipation and experience.

E12

TRAIT ALEXITHYMIA IS RELATED TO DECREASED ACTIVITY IN A COGNITIVE CONTROL/LANGUAGE NETWORK BUT INCREASED ACTIVITY IN A COGNITIVE CONTROL/INHIBITORY NETWORK WHEN MAKING MORE GRANULAR JUDGMENTS OF EMOTIONAL STATES. *J. Shu, Columbia University; A. B. Stapute, Columbia University; j. Weber, Columbia University; and K. Ochsner, Columbia University*- Alexithymia is a trait reflecting the degree to which individuals have difficulty expressing emotions through language. Recent research indicates that alexithymics may use the same number of words in describing their emotional experiences, but are less nuanced in their descriptions. This suggests that alexithymics may be particularly impaired when having to express themselves in a nuanced and granular fashion. To test this experimentally, we manipulated the degree to which individuals varying in their level of alexithymia could use a more or less

granular method of assessing their emotions. Participants viewed evocative images and judged their emotional response in either a categorical way, choosing among options of “good”, “neutral”, and “bad”, or in a continuous way, by sliding a marker to any location on a scale ranging from “good” to “bad”. Because the poles of the scale were identical in both conditions, they differed only in the degree of granularity required in judging one’s emotional response. Behaviorally, trait alexithymia was related to longer response times in the continuous condition, but not in the category condition. Neurally, in the continuous condition alexithymia was negatively related to activity in left ventrolateral prefrontal cortex and superior frontal sulcus - regions related to controlled retrieval of information from semantic memory and cognitive control more generally. Alexithymia also was positively related to activity in right ventrolateral prefrontal cortex, a region also involved in cognitive control but more associated with inhibitory processes. Together, these results suggest that the emotional difficulties alexithymics face specifically depend on the granularity of the response modality and that expressing one’s self using simple verbal categories may actually reduce the difficulty of indicating emotional feelings in alexithymics.

E13

PREDICTION-ERROR IN THE CONTEXT OF REAL SOCIAL RELATIONSHIPS MODULATES THE REWARD SYSTEM- Joshua C. Poore, *University of California, Los Angeles*; Jennifer H. Pfeifer, *University of Oregon*; Elliot T. Berkman, *University of Oregon*; Tristen K. Inagaki, *University of California, Los Angeles*; B. Locke Welborn, *University of California, Los Angeles*; Matthew D. Lieberman, *University of California, Los Angeles*- Mounting evidence demonstrates that the human reward system is sensitive to social rewards. Given the link between the systems’ associative learning functions and reward processing, these findings imply a central role for it in the development of social attachments. Yet, it remains unclear whether the reward system processes social rewards in the same way that it does primary rewards (e.g., food and sex) and whether its activity is meaningfully related to representations (e.g., attachment security, trust) and affect (e.g., romantic passion) associated with social attachments. This study examined whether the reward system evidences a characteristic prediction-error signal that is selective to reward gains/losses in the context of social reward and whether such activity is also related to representations of attachment security and trust. Seventeen subjects in romantic relationships were scanned (fMRI) while their expectations for their partners’ positive regard of them and their relationships were either confirmed or violated, in both positive and negative directions, trial-by-trial. Social reward findings here are consistent with prediction-error research; analyses revealed significant ventral tegmental area activity in positive violation trials relative to confirmatory trials, and diminished activity in negative violation trials relative to confirmatory trials. Also, the latter revealed posterior ventral striatum activation consistent with previous research on financial loss. Finally, postscan reports of attachment security and trust were associated with non-confirmatory responses in reward system regions; activations during positive violation trials were associated with increased attachment anxiety and decreased trust.

E14

NEURAL RESPONSES TO ANTICIPATED SOCIAL ISOLATION Katherine E. Powers, *Dartmouth College*; Catherine J. Norris, *Dartmouth College*; and Todd F. Heatherton, *Dartmouth College*- Previous research has suggested that humans have a fundamental need for interpersonal relationships, and that this need to belong evolved as an adaptive mechanism to promote survival. This theory proposes that the brain is especially sensitive

to situations involving social threat, and therefore responds differentially to external stimuli based on the presence or absence of such a threat. We used event-related functional magnetic resonance imaging (fMRI) to examine how emotional and social responses are affected by anticipated future social acceptance. In a between-subjects design, we manipulated affective state by providing participants with fictitious feedback indicating that their futures would be filled with long-lasting, stable relationships (future belonging) or that they would be isolated and lonely (future isolation). Twenty-eight participants (14 in each affective state) were then imaged while they viewed pictures selected from the International Affective Picture System (IAPS) that varied on dimensions of sociality (social or non-social) and emotional valence (negative, neutral, positive). Compared to anticipated future belonging, anticipated future isolation resulted in (1) lower left amygdala activity to negative pictures and (2) higher left medial PFC (BA10) activity to positive pictures. Taken together, these results provide evidence of a shift in the neural response to external stimuli following an exclusionary social threat.

E15

BRAIN MECHANISMS FOR PROCESSING SOCIAL EXCLUSION AND RULE VIOLATION IN CHILDREN WITH AUTISM SPECTRUM DISORDER Danielle Z. Bolling, *Yale University*; Naomi B. Pitskel, *Yale University*; Ben Deen, *Yale University*; Michael J. Crowley, *Yale University*; James C. McPartland, *Yale University*; Kevin A. Pelphrey, *Yale University*- Social exclusion inherently involves an element of expectancy violation, in that we expect other people to follow the unwritten rule to include us in social interactions. In this functional magnetic resonance imaging (fMRI) study, we employed a unique modification of an interactive virtual ball-tossing game called “Cyberball” (Williams, Cheung, & Choi, 2000) and a novel paradigm called “Cybershape”, in which rules are broken in the absence of social exclusion, to dissociate brain regions that process social exclusion from rule violations more generally. In typical adults, we replicated prior findings of ventral anterior cingulate cortex (vACC), insula, and posterior cingulate cortex activity evoked by social exclusion relative to inclusion. Comparing social exclusion and rule violation revealed a functional dissociation in the active neural systems as well as differential functional connectivity with vACC. Some structural overlap was observed in regions differentially modulated by social exclusion and rule violation, including the vACC and lateral parietal cortex. Looking at social exclusion and rule violation in children with and without autism spectrum disorder (ASD), we found regional differences in brain responses to exclusion between groups in the vACC. Again comparing between groups in brain responses to rule violation, we found differential activation in the insula. In a whole brain comparison of activation to social exclusion versus rule violation, typically developing children showed extensive amounts of significantly different activation, while children with ASD showed vastly fewer differences. Compared to behavioral data collected showing that self-reported distress following exclusion was comparable between children with and without ASD, our data suggest that children with ASD respond to social exclusion in a way that is more similar to their response to rule violation, compared to typical children and adults. From this we draw the conclusion that children with ASD are disproportionately affected by the expectancy violation inherent in the experience of exclusion compared to typically developing children and adults.

E16

DON’T SWEAT THE SMALL STUFF: AGE DIFFERENCES IN THE POSITIVITY OFFSET-Kristin W. Flanary, *Dartmouth College*; and Catherine J. Norris, *Dartmouth College*-The positivity

offset refers to the tendency for responses to mildly pleasant stimuli to be stronger than responses to mildly unpleasant. This offset may increase with age, as older adults attend to and remember more positive information than younger adults. We investigated age differences in the positivity offset and its underlying behavioral and neural mechanisms. We collected functional magnetic resonance imaging (fMRI) as older (age 65-80) and younger (age 18-25) women viewed pleasant and unpleasant IAPS images. Participants viewed the images again outside of the fMRI scanner and made positive and negative ratings of each. Reaction times for these ratings were also recorded. Compared to younger adults, older adults' ratings showed an increased positivity offset. We then conducted a whole-brain voxelwise regression analysis using this behavioral positivity offset to predict brain regions associated with a neural positivity offset (greater activation to mildly pleasant than mildly unpleasant images). This analysis revealed significant activation of left superior frontal gyrus (BA 10) across all subjects. Older adults showed greater activation of BA 10 and slower response times to mildly unpleasant images than mildly pleasant; they also showed greater activation and slower response times to mildly unpleasant images than younger adults. Results suggest that regulation of negative responses to mildly emotional stimuli underlies older adults' increased positivity offset. This may have adaptive implications, preventing them from "sweating the small stuff" in life.

E17

FRONTO-LIMBIC FUNCTIONAL CONNECTIVITY IN BIPOLAR II DEPRESSION DURING EMOTION LABELING

Salvatore Torrisi, UNIVERSITY OF CALIFORNIA, LOS ANGELES; Nathalie Vizueta, UNIVERSITY OF CALIFORNIA, LOS ANGELES; Elliot Berkman, University of Oregon; Lara Foland-Ross, University of California, Los Angeles; Jennifer D. Townsend, University of California, Los Angeles; Teena D. Moody, University of California, Los Angeles; Jeffrey Fischer, University of California, Los Angeles Susan Y. Bookheimer, University of California, Los Angeles; and Lori L. Altshuler, University of California, Los Angeles, VA Greater Los Angeles Healthcare System

Bipolar disorder (BD) is a serious psychiatric illness characterized by chronic mood episodes, from depression to either mania (BD I) or hypomania (BD II), that causes marked impairment in functioning. Such pathological mood states suggest dysfunction in a regulatory circuit. The current study examined implicit emotion regulation in BD II depressed and control subjects using the affect labeling paradigm. We used a psychophysiological interaction (PPI) analysis to investigate patterns of functional connectivity during the psychological task conditions. Previous work using PPI analysis in healthy subjects has shown that, during the condition of linguistic emotion face labeling, the ventral lateral prefrontal cortex (VLPFC) becomes active and negatively functionally correlated with amygdala activation (Hariri, et al., 2000). A negative correlation is thought to represent a top-down modulatory influence of VLPFC on this limbic region, and comprise a form of implicit emotion regulation. In previous studies by our group, manic, depressed and also euthymic BD I subjects had reductions in OFC activation, suggesting a trait-related deficit. A PPI analysis demonstrated that this fronto-limbic inhibitory connection was reduced in mania relative to controls (Foland-Ross, et al., 2008). Here, we hypothesized that BD depressed subjects would demonstrate reduced VLPFC-amygdala connectivity, similar to the pattern seen in manic subjects. 3T fMRI data were collected on 17 medication-free BD II depressed subjects (7F, 36.0 ± 8.7 years) and 17 control subjects (7F, 38.5 ± 9.7 years). During scanning, subjects were presented with 3 experimental blocks named "match emotion," "identify emotion," and "match forms" (Hariri, et al., 2000). We functionally defined a left amygdala seed ROI from the group average of all 34 subjects in the match emotion vs. match forms conditions (a contrast known to show robust amygdala activation), and used activity in this seed to generate a PPI. We derived the interaction between this variable and the time series of the psychological blocks from their product. We then

examined areas that were negatively connected with the left amygdala using the identify emotion vs. match emotion contrast to assess which brain regions' connections are differentially affected by linguistic categorization ("labeling") of emotional stimuli vs. perceptually matching ("affective match") such stimuli. All image preprocessing and statistical analyses were performed in SPM8 (results thresholded at $p < .005$ uncorrected, cluster size (k) = 5 voxels). Between-group results revealed greater negative functional connectivity between the left amygdala and right VLPFC in control subjects vs. BD II depressed subjects during labeling versus matching of emotional faces (BA47, MNI: [51 44 -10], peak-level $p < .001$, $k = 14$). In the reverse comparison, between-group results also revealed greater negative functional connectivity between amygdala and ventral anterior cingulate (BA24: [-9 32 -1], peak-level $p < .001$, $k = 8$) in the BD II group relative to controls. These findings are consistent in direction with the functional connectivity results previously seen by our group in mania and suggest a trait-related dysfunction of this frontolimbic circuit in BD II depression.

E18

THE INTRINSIC REWARD VALUE OF COMMUNICATING ABOUT THE SELF-

Diana Tamir, Harvard University; and Jason Mitchell, Harvard University

Humans communicate about themselves quite often, and to a wide range of audiences. Why do humans so readily reveal information about their own thoughts and feelings? Here we used functional neuroimaging to test the prediction that people communicate about the self because doing so provides intrinsic rewards. During fMRI scanning, participants shared information about the personality characteristics ($n = 117$) or preferences ($n = 78$) of either themselves (Self trials), or another person (Other trials). To test whether participants experienced greater reward when answering questions about the self than about others, we compared neural activity for *Self* > *Other* trials in regions associated previously with coding reward and value. Using both whole-brain random effects analyses and independently localized regions, we identified significantly more activity during Self than Other trials in a set of neural regions previously implicated in reward processing: the nucleus accumbens, ventral tegmental area, and orbitofrontal cortex. This activity accompanied self-sharing about both personality characteristics and preferences and did not change based on positivity associated with either the response or the stimulus. These findings suggest that the human tendency to communicate about their thoughts and feelings may arise, in part, from the intrinsic value of thinking and talking about the self.

E19

SOCIAL WORKING MEMORY

M.L. Meyer, University of California, Los Angeles; R. P. Spunt, University of Oregon; L.T. Rameson, University of California, Los Angeles; M.D. Lieberman, University of California, Los Angeles-

This investigation examined whether neurocognitive evidence exists for social working memory. Previous research has shown that a set of neural regions, notably the medial prefrontal cortex (MPFC), tempoparietal junction (TPJ), posterior superior temporal sulcus (pSTS) and temporal poles (TP), consistently engage when people think about the characteristics and beliefs of other people (e.g. Frith & Frith, 2003; 2006). However, to date, no studies have examined whether these neural structures involved in social cognition generally function like a working memory system such that their responses are modulated by social working memory load. We developed a new paradigm based on previous working memory delay response tasks (D'Esposito et al., 1999) to test the neural basis of social working memory. While undergoing functional magnetic resonance imaging (fMRI), participants completed trials in which they considered two, three, or four of their friends' traits, such as 'funny,' during a delay

period. Parametric analyses showed a linear increase in activation in social cognition (DMPFC, TP, pSTS, rTPJ) and traditional working memory regions (DLPFC, SPL)(D'Esposito et al., 1999; Wager & Smith, 2003) during the delay period as participants considered traits for an increasing amount of friends. The findings suggest that regions previously implicated in social cognitive processing seem to be sensitive to the amount of social working memory load involved in a task. Taken together, these data suggest that social working memory relies on both domain-specific social cognitive neural regions as well as domain-general regions previously implicated in working memory.

E20

CONTEXTUAL EFFECTS ON MEMORY FOR IMPRESSIONS IN YOUNG AND OLDER ADULTS

Brittany S. Cassidy, Brandeis University; and Angela H. Gutchess, Brandeis University- Previous aging related memory research has largely concentrated on items lacking socioemotional context, and evidence for age related cognitive decline pervades this body of work. Although fMRI research has implicated hippocampal dysfunction in preventing older adults from successful binding of many types of features, recent research suggests that the hippocampus might not be critical in forming trait associations, and that there exists a specialized neural mechanism for social information that differs from well-established memory systems. These findings allow for the possibility that memory for social information may show less age related decline than memory for non-social information. The current study investigated how task intentionality (explicit or implicit) and presenting information in a personally meaningful or irrelevant way modulated memory for impressions in young and older adults. Participants viewed faces paired with trait inferring behavioral sentences, and were instructed to both form and state their impression out loud (explicit) or to read the sentence out loud (implicit). After each face-behavior pair, participants responded to a prompt that was either personally meaningful or not. Participants completed a retrieval task where they viewed all previously seen faces with two behavioral traits listed below, and chose which trait was associated with the face. Both age groups remembered trait associations to the same extent. However, older adults had enhanced memory for trait information presented in a personally meaningful relative to a personally irrelevant way, whereas young adults were unaffected by this manipulation. These results provide evidence that older adults retain the capacity to remember trait associations at the level of young adults, but the context in which this information is presented modulates the extent of successful recollection. The findings additionally suggest that the neural correlates of impression formation may be relatively spared with age, and that a specialized social memory system might serve to increase successful feature binding under conditions where the task at hand is personally engaging.

E21

COUNTERFACTUAL THINKING: THE INTERPLAY BETWEEN AFFECT, MEMORY, AND SOCIAL COGNITION

Nicole Van Hoeck, Vrije Universiteit Brussel; Frank Van Overwalle, Vrije Universiteit Brussel; Ning Ma, Vrije Universiteit Brussel; and Daan Bauwens, Vrije Universiteit Brussel- Recent studies suggest that a brain network mainly associated with episodic memory and default processing (frontal and medial temporal-parietal systems) has a more general function in imagining oneself in another time, place or perspective (e.g., episodic future thought, theory of mind,...). If this is correct, counterfactual thinking (e.g., "If I had left the office earlier, I wouldn't have missed my train.") should also activate this network. Until today neurological evidence on the localization of

counterfactual processes in the brain is limited. The present fMRI study explores these processes by directly comparing the imagining of upward counterfactuals (creating better outcomes for negative past events) with the recall of negative past events and the imagining of positive future events. Results show a large overlap with episodic past and future thinking in the medial temporal-parietal regions (e.g., precuneus, posterior cingulate cortex, parahippocampal gyrus,...), and the anterior and ventral medial prefrontal cortex. These regions, according to e.g. Andrews-Hanna (2010), are related to 'self-relevant, affective decisions' and the 'construction of a mental scene based on memory'. Counterfactual thinking shows greater activation (whole brain threshold of $p < .001$; corrected for multiple comparison, $p < .05$ FDR, number of voxels ≥ 10), compared to past and future thinking, in the temporo-parietal junction and dorsomedial prefrontal cortex (parts of the mentalizing system; regions activated by affective, self-referential and social cognitive processes), and the anterior intraparietal sulcus and premotor cortex (parts of the mirror system). These areas comprise two systems reflecting the understanding of human intentional behavior. Hence, activation of these areas in the present study is consistent with the idea that counterfactuals involve imagining what would have happened if the participant or someone else willingly had undertaken remedial action. In addition, counterfactual thinking also activates the right temporal pole and the orbitofrontal cortex stronger, indicating the importance of its emotional component.

E22

BRAIN RESPONSE REVEALS A CULTURAL DIFFERENCE IN SPONTANEOUS TRAIT INFERENCE

Jinkyung Na, University of Michigan; and Shinobu Kitayama, University of Michigan- Previous work suggests that lay people automatically infer an observed behavior to be strongly expressive of the actor's underlying personality. Importantly, however, this effect is likely to be greater in more independently oriented cultures. We showed, for the first time, the corresponding cross-cultural pattern in brain response. Seventeen European and sixteen Asian Americans were first asked to memorize 60 pairs of a facial photo and a behavior. Each face was paired with two behaviors that implied the same trait. Subsequently, the participants performed a lexical judgment task, with their electroencephalogram monitored on line. Each of the 30 photos used in the first phase served as a prime and a word that was either congruent or incongruent with the trait implied by the paired behavior served a target. Of particular interest is an ERP component called N400, a negative deflection peaking approximately 400 ms after stimulus presentation that is most prominently observed in posterior electrodes. N400 is thought to index the detection of semantic incongruity. Thus, Spontaneous trait inference would be demonstrated by a more prominent N400 for the incongruent traits relative to the congruent traits. Mean amplitude was computed in two relevant time intervals (350-450 ms and 450-550 ms) for each participant. As predicted, European Americans showed a significantly greater negativity at Cz, Cpz, and Pz both during the 350-450 ms and the 450-550 ms post target when the target was incongruous with the implied trait than when the two were congruous. No incongruity-based negativity was evident for Asian Americans. The cultural difference in the incongruity-based negativity was mediated by self-reported levels of independent social orientation.

E23

SEROTONIN TRANSPORTER GENOTYPE PREDICTS INDIVIDUAL DIFFERENCES IN EXTINCTION RETENTION

Catherine A. Hartley, New York University; Elizabeth A. Phelps, New York University; B. J. Casey, Weill Cornell Medical College; and Charles Glatt, Weill Cornell Medical College- The persistence of fear in the absence of any imminent threat is a hallmark of anxiety disorders. During Pavlovian fear conditioning, a neutral stimulus acquires emotional significance after being paired with an aversive stimulus. Extinction refers to the gradual reduction in fear expression that occurs when the conditioned stimulus is presented repeatedly with no reinforcement. However, extinguished fear responses are not erased, as fear may reemerge after a delay. This spontaneous recovery of fear following extinction is associated with pathological anxiety. Thus, a better understanding of the mechanisms underlying individual variation in extinction retention may help to elucidate the origins of psychological resilience and vulnerability in humans. A recent study (Wellman et al., 2007) reported elevated levels of spontaneous recovery in serotonin transporter (5-HTT) knockout mice, suggesting that that 5-HTT expression plays an important role in the retention of extinction learning. In this study, we explore whether two common polymorphisms that are thought to influence 5-HTT expression are associated with individual differences in extinction retention. We used a two-day Pavlovian fear conditioning paradigm, in which visual stimuli were paired with mild electric shock. On day one, participants underwent acquisition followed immediately by an unsignaled initial extinction phase. On day two, a second extinction phase enabled the evaluation of how well participants retained initial extinction learning. Participants provided saliva samples for genetic analysis, and completed questionnaires assessing anxiety and depressive symptoms. We found that a polyadenylation polymorphism in the serotonin transporter (rs3813034) was associated with individual variation in extinction retention. Participants carrying increasing numbers of the allele associated with lower 5-HTT expression exhibited greater spontaneous recovery. Furthermore, this allele was associated with increased trait anxiety and depressive symptoms in a dose-dependent manner. In contrast, the serotonin transporter-linked promoter region polymorphism (5HTTLPR) was not associated with individual differences in any of these measures. These results identify a behavioral phenotype associated with the rs3813034 polymorphism and suggest that genetically-mediated differences in extinction retention may confer an increased risk of developing anxiety disorders.

E24

DIFFERENT PATHS TO MEMORY: NEURAL CORRELATES OF MEMORY FOR BOTTOM-UP AND TOP-DOWN EMOTIONAL STIMULI- *Kateri McRae,¹ University of Denver; Ama Thrasher, Stanford University; Stephen Allison, University of California, San Francisco; Supriya Misra, Stanford University; Sean C. Pereira, Stanford University; & James J. Gross, Stanford University.* Memory can be enhanced in several ways, for example by varying the emotional intensity or the cognitive complexity of the stimulus to be remembered. These routes to enhanced memory are thought to rely upon different neural systems. To date, no one has investigated the neural mechanisms of enhanced memory for emotional stimuli that vary in terms of their cognitive complexity. The present study induced emotion in two ways: bottom-up and top-down. Bottom-up emotion generation involved the perception of low-level features of an emotional stimulus (e.g., a fearful emotional face). Top-down emotion generation involved the appraisal of the meaning of a stimulus considering the larger context within which an individual is operating (e.g., captions with negative contextual information paired with a neutral face). The present study tested the hypothesis that subsequently remembered bottom-up stimuli would engage

the amygdala, while subsequently remembered top-down stimuli would engage the medial prefrontal cortex. Sixteen women were scanned on a 3-Tesla GE magnet while viewing bottom-up and top-down emotional stimuli (fearful faces and negative captions that were presented, followed by a neutral face). Immediately after scanning, participants were given a forced-choice cued memory test, in which they were asked to indicate whether a face or a caption had been presented before each neutral face. Memory performance did not differ between bottom-up and top-down emotion generation conditions ($p = .34$). An interaction contrast [(Bottom-Up Correct – Bottom-Up Incorrect) – (Top-Down Correct – Top-Down Incorrect)] revealed that amygdala activation at encoding was associated with subsequent memory for bottom-up stimuli (but not top-down stimuli). The reverse interaction revealed that medial prefrontal cortex at encoding was associated with subsequent memory for top-down stimuli (but not bottom-up stimuli). The present results indicate that emotionally-enhanced memory does not always rely upon the same neural regions. Rather, the cognitive complexity of the emotional stimuli impacts whether subsequent memory is associated with the activation of amygdala or prefrontal systems.

E25

AMYGDALA-PREFRONTAL CONNECTIVITY DURING PROCESSING OF SURPRISED FACES PREDICTS INDIVIDUAL DIFFERENCES IN SUSCEPTIBILITY TO CONTEXT-

M. Justin Kim, Dartmouth College; Randi H. Bennett, Dartmouth College; Kimberly M. Solomon, Dartmouth College; & Paul J. Whalen, Dartmouth College- Surprised faces are ambiguous since they can be interpreted as either positively or negatively valenced. The amygdala and medial prefrontal cortex exhibit inverse activity patterns in response to surprise that predict these interpretations, showing high amygdala – low prefrontal activation to negative interpretations and the opposite pattern to positive interpretations. While these data document the importance of subjective interpretations of surprise, not all standardized photographs of surprised expressions are ambiguous in this way. The expressions of some individual surprise stimulus faces are consistently rated as negative or positive, demonstrating the concurrent importance of stimulus driven facial features on subjective ratings of surprise. Finally, one can explicitly influence the interpretation of surprised faces via contextual information. For example, Kim et al (2004) provided contextual sentences describing positive (e.g., “He just won \$500”) or negative (e.g., “He just lost \$500”) scenarios that influenced the interpretation of and neural responses to presented surprised faces. Specifically, amygdala activity was increased to surprised faces presented in a negative context, while an area of rostral anterior cingulate cortex (rACC) was correlated with this amygdala activity. Critically, rACC was the only region active to both the face and sentence information – suggesting a role in top-down control (Kim et al., 2004). Based on these findings, we reasoned that the degree to which one is influenced by explicit contextual cues would be associated with greater interaction between the amygdala and rACC during implicit processing. Prior to functional magnetic resonance imaging (fMRI), 22 healthy subjects were instructed to rate the valence of each surprised face, based on the preceding sentence that was either positively or negatively valenced. Each surprised face was presented twice, paired with contrasting sentences that have been matched for arousal and content (e.g., “He just won \$500” vs. “He just lost \$500”). The propensity for using contextual cues (Contextual Susceptibility Index, or CSI score) was calculated by subtracting valence ratings of faces associated with positive sentences from those with negative sentences. The idea here was that the larger the CSI score, the more influenced the subject was by the contextual cues. During a subsequent fMRI session, each subject passively viewed surprised faces presented in blocks according to their

stimulus driven valence (i.e., negative, ambiguous, positive). Results showed significantly increased amygdala activity to negative compared to positive surprised faces. Next, functional connectivity of this region of the amygdala during this passive viewing fMRI session was assessed in conjunction with the previous behavioral CSI scores. We found a significant positive correlation between CSI scores and functional connectivity between the amygdala and rACC. In other words, individuals who were more influenced by contextual cues to make valence judgments also showed tighter coupling of amygdala-rACC activity when passively viewing surprised faces. Taken together, our results demonstrate a range of individual differences in the propensity to use explicit contextual cues to determine the valence of surprised faces, and this propensity is predicted by greater coupling between the amygdala and prefrontal cortex during implicit processing of surprise.

E26

UNDERSTANDING THE MENTAL AND MECHANICAL ASPECTS OF OTHERS: TOWARDS A RECONCILIATION OF MIRROR NEURON AND MENTAL STATE INFERENCE ACCOUNTS OF SOCIAL COGNITION- *Robert P. Spunt, University of California, Los Angeles; and Matthew D. Lieberman, University of California, Los Angeles-* When we observe others, we rarely understand their movements as mere mechanical interactions with the physical world. Conceiving the act of writing a manuscript as “typing on a keyboard” conceals the complicated mental life (“wanting to publish”) and social context (“avoiding perishing”) that imbues with act with meaning. Social neuroscience has made considerable progress identifying the neural systems that enable people to understand *what* other people are doing with their bodies, but there is debate over the neural systems that support the ability to infer the mental states that explain *why* people are moving their bodies in the first place. More specifically, two non-overlapping systems have been identified as candidates for carrying out mental state inferences (MSIs) from observed actions: the mirror neuron system (MNS), which is reliably activated by the perception of bodily actions and which has been shown to be sensitive to features of an action’s physical context that cue the actor’s goals and intentions; and the “mentalizing” or “theory-of-mind” system, which is reliably activated as individuals are induced to explicitly make MSIs. Why has neuroimaging revealed two neural systems for social cognition? One reason may be that these systems have been investigated using dramatically different methods, with MNS researchers using concrete social stimuli such as video clips of actions, and theory-of-mind researchers using relatively abstract social stimuli such as verbal vignettes. In the present studies, we used an action identification theory (AIT; Vallacher & Wegner, 1987) framework to control encoding strategies during action understanding that varied in the extent to which they induced mentalizing about the target action. AIT is predicated on the insight that the same action can be identified in numerous ways, with higher levels identifying *why* an action is performed and lower levels identifying *how* an action is performed. In the first study (in press, *Journal of Cognitive Neuroscience*), participants watched video clips of human actions; for each clip, MSI demand was manipulated by asking participants to identify *how* the actor is doing it (low MSI demand), *what* the actor is doing (intermediate MSI demand), and *why* they are doing it (high MSI demand). MNS activity was not modulated by level of MSI demand; however, several regions of the mentalizing system were associated with increasing MSI demand. In a second study (in press, *Psychological Science*) featuring verbal descriptions of actions, identifying *how* increased engagement of premotor areas believed to be part of the human MNS, while identifying *why* once again engaged regions of the mentalizing system. Overall, these studies demonstrate that

whenever mental state inference is required, whether actions are visible or not, the mentalizing system is involved. Conversely, MNS activity either stays constant (when action is visible) or actually decreases (when action is described by text). This suggests that in the presence of visible actions the MNS may serve in a social perceptual role, organizing information along intentional lines before passing the information to the mentalizing system for actual MSI.

E27

SOCIAL NORM PROCESSING IN SOCIAL PHOBIA: ATYPICALLY INCREASED VENTROMEDIAL FRONTAL CORTEX RESPONSIVENESS TO UNINTENTIONAL (EMBARRASSING) TRANSGRESSIONS-

Karina Blair, National Institute of Mental Health- Generalized social phobia (GSP) is defined by a persistent fear of social disapproval. However, the neural underpinnings of this increased fear and its mediating factors are unclear. Using event-related fMRI, we examined whether the intent of an event, which mediates the neural response to social disapproval in healthy individuals, differentially affects response in GSP. Specifically, would patients with GSP show particularly increased response to (embarrassment-mediated) unintentional transgressions? Method: Sixteen patients with GSP and sixteen age, IQ, and gender matched healthy individuals read stories that either involved neutral social events, intentional (e.g., choking on food at party, and coughing it up), or unintentional transgressions (e.g., disliking food at party, and spitting it out). In addition, following the scan subjects rated the stories according to embarrassment and inappropriateness. The BOLD response data was analyzed using a 2 (Group: GSP, HC) by 3 (Transgression: Intentional, Unintentional, None) ANOVA to produce statistical maps of the main effect of group and valence and group by valence interaction ($p < 0.005$; corrected for multiple comparison). Results: Significant group-by-transgression interactions were observed within ventral regions of medial prefrontal cortex (MPFC). Whereas the healthy individuals showed significantly increased BOLD responses to intentional, relative to unintentional transgressions, the patients with GSP showed significantly increased responses to the unintentional transgressions. In addition, they rated the unintentional transgressions as significantly more embarrassing than the comparison individuals, although the two groups did not differ in their ratings of neutral social events. We also observed significant group main effects within the amygdala and bilateral insula; patients with GSP showed elevated responses within these regions to both intentional and unintentional transgressions. Conclusions: These results further underscore the importance of MPFC as part of the pathophysiology of GSP, and MPFC’s relation to distorted self-referential processing in this disorder. In addition, the current results further underscore the extended role of the amygdala and insula in the processing of social stimuli more generally in GSP.

E28

MOTOR PRIMING AND THE CHAMELEON EFFECT-

Jeremy Hogeveen, Wilfrid Laurier University In cognitive neuroscience, *motor resonance* refers to the activation of similar brain regions during both action execution and action observation. Social psychologists have proposed that motor resonance is a viable mechanism underlying the *chameleon effect* - the automatic mimicry of an interaction partner’s behaviour (Chartrand & Bargh, 1999). Previous work in social psychology has shown that priming interdependent self construal enhances the degree of mimicry during an interaction (van Baaren et al., 2003). Here, we asked whether priming interdependent self-construal also increases the degree of motor priming in an action observation task, similar to

those reported in the cognitive neuroscience literature. Participants held a rubber ball under an occluder and made hard or soft squeezes in response to colour cues super-imposed on videos depicting hard or soft squeezes of an identical rubber ball. Although the cue-response mapping was between the colour of the text and hard or soft squeezes, the type of word also acted as an interdependent self-construal (i.e. together, integrate) or an independent self construal (i.e. alone, mine) prime. When the observed squeeze was incongruent with the cued squeeze, response time was slowed and EMG activity in the abductor pollicis brevis was influenced in the direction of the incongruence between the video and the instructional cue. Importantly, this effect was significantly greater when the word type was an interdependent self construal prime. The fact that this self-construal manipulation which is known to modulate the *chameleon effect* also affects basic action priming lends support to the idea that the two behavioural phenomena may be mediated by the same motor resonant mechanisms.

E29

DYNAMIC CULTURAL INFLUENCES ON AMYGDALA RESPONSE TO EMOTIONAL SCENES *Lisa Hechtman, North Western University; Ahmad Hariri, Duke University; Tokiko Harada, Nagoya University; Yoko Mano, Tohoku University; Norihiro Sadato, National Institute for Physiological Sciences; Todd B. Parrish, Northwestern University; Tetsuya Iidaka, Nagoya University; and Joan Y. Chiao, Northwestern University-* In Western populations, carriers of the short (S) allele of the serotonin transporter gene show heightened amygdala response to emotional stimuli, as well as increased risk for anxiety and depression. In East Asian populations, by contrast, prevalence rates of anxiety and depression are surprisingly low, given that Asians are almost twice as likely to carry the S allele (Chiao & Blizinsky, 2010). One theory holds that emotional vigilance is adaptive in collectivistic nations, such as in East Asia, where emphasis on group membership and hierarchical distinctions among members creates a need for sensitivity to social surroundings. Here we examine the neural mechanisms by which culture, in addition to genetic factors, influences sensitivity to emotional stimuli. Bicultural Asian Americans completed an individualistic or collectivistic essay prime, and subsequently matched a series of emotional scenes and geometric shapes during fMRI scanning. ROI analysis within bilateral amygdala revealed that participants' degree of primed individualism negatively predicts signal change in left amygdala to emotional scenes. Behavioral results furthermore indicate that collectivistic priming increased task accuracy without an RT tradeoff. Taken together, these findings demonstrate that even temporarily heightening awareness of collectivistic cultural values enhances emotional vigilance, likely due to culture-gene coevolution of individualism-collectivism and the serotonin transporter gene (5-HTTLPR).

E30

ELABORATING THE TIME COURSE OF THE EMOTION-MODULATED STARTLE REFLEX IN DYSPHORIA- *Lauren E. Taubitz, University of Wisconsin – Milwaukee; Jordan S. Robinson, University of Wisconsin – Milwaukee; and Christine L. Larson, University of Wisconsin – Milwaukee* Recent work indicates that individuals with depression show longer-lasting responses to negatively-valent stimuli than individuals without depression (Caseras, Garner, Bradley, & Mogg, 2007; Larson, Nitschke, & Davidson, 2007). The startle reflex provides a measure for characterizing differences in emotion regulation between individuals with and without affective disorders. The purpose of this study was to better understand the time course of the startle reflex in individuals high and low on a measure of depression while they process positive, negative, and neutral pictorial stimuli. As part of a larger psychophysiological study, 208 undergraduates

completed an affective startle paradigm and responded to the Beck Depression Inventory (BDI). Individuals with BDI scores greater than or equal to 15 were classified as dysphoric (N=24) while individuals scoring less than or equal to 9 were classified as non-dysphoric (N=187). Emotion-modulation of the startle blink response was measured during and after the presentation of affective pictures. Forty-two pictures of three valences (unpleasant, pleasant, and neutral) were presented to each subject while EMG was recorded. The acoustic startle probe was a 50 ms 100 dB burst of white noise presented binaurally. Probes were presented for each condition at one of the following four probe times: 1.5, 4.5, 7, or 9 seconds post-stimulus onset. Blink magnitude was z-transformed within-subject due to large individual differences in blink magnitude. Data was analyzed using binary logistic regression with dysphoria group serving as the dependent variable and mean blink magnitude for each picture valence serving as predictors for each time point. This analysis indicated that decreased mean blink magnitude for positive pictures significantly predicted dysphoric group membership at 1.5 s post-stimulus onset ($B = -1.963$, $SE = 0.834$, $p = 0.019$, $\exp(B) = 0.140$) while increased blink magnitude for negative pictures significantly predicted dysphoric group membership 9 s post-stimulus onset ($B = 1.428$, $SE = 0.677$, $p = 0.035$, $\exp(B) = 4.171$). There were no group differences at the 4.5 s or 7 s probe times (all $p > 0.05$). This data has implications for how we conceptualize emotional information processing in depression. It suggests that individuals with high levels of depression are more reactive to pleasant information more immediately after receiving it, and they continue to exhibit heightened reactivity to unpleasant information longer than individuals with low levels of depression. Greater startle magnitude has been found for negative affective stimuli in individuals with heightened levels of depression in previous studies (Cook, Hawk, Davis, & Stevenson, 1991; Larson, Nitschke, & Davidson, 2007), but attenuated responses to unpleasant stimuli in depressed individuals have not been reported in the literature. While our findings for the 9 s probe time are consistent with previous literature on both startle magnitude and patterns of sustained negative affect in general for depression, our findings at the 1.5 s probe time are unexpected. However, prior studies have not broken down the time course of startle magnitude as this study has, so these findings represent an advance of prior literature.

E31

SOCIAL IDENTITY MODULATES AUTOMATIC FACE PERCEPTION: GROUP MEMBERSHIP OVERRIDES THE EFFECTS OF RACE ON EARLY EVENT-RELATED POTENTIALS- *Jay J. Van Bavel, New York University; and William A. Cunningham, The Ohio State University-* Humans are remarkably sensitive to changes in the social context, especially the relationships that bind them to some people and align them against others. At the flip of a coin, people divide the social world into *us* and *them*, using seemingly trivial social categories to coordinate evaluation and behavior. Dozens of studies have documented this bias in facial recognition, finding superior recognition memory for own-race faces compared to other-race faces. More recently, several studies have used electroencephalography (EEG) to help identify exactly how quickly social categories like race alter perceptual processing. These studies have provided evidence that people differentially process Black and White faces within a few hundred milliseconds of stimulus presentation and these racial biases persist when participants are attending to another dimension of social categorization or attempt to individuate the faces. These results have led researchers to conclude that racial biases in early perceptual processing are automatic and cannot be inhibited. However, recent research has shown that assigning people to mixed-race minimal groups can eliminate racial biases in perception and evaluation by leading people to categorize others on

the basis of their minimal group membership rather than their race. We therefore predicted that group membership might override the effects of race on early event-related potentials if participants categorized Black and White targets as in-group members. We randomly assigned participants to one of two mixed-race minimal groups and had them visually identify Black and White in-group and out-group members during EEG. As predicted, participants assigned to a mixed-race group had own-group bias on a positive event-related potential occurring approximately 100 milliseconds following stimulus presentation (P100). The P100 was greater following in-group than out-group faces, regardless of race. This in-group bias was evident despite the fact that the intergroup distinction was random, there were no visual cues to distinguish group membership, and exposure to the faces was equivalent, recent and relatively brief. The current study suggests that very early effects of race are *not* inevitable, but are sensitive to current motivational states and perceptual goals. While social categories clearly affect the earliest phases of social perception, the particular social categorization is sensitive to changes in the social context – top-down influences like social identity can influence automatic face perception in a dynamic fashion.

E32

I WANT IT NOW: THE EFFECTS OF EMOTION AND TIME HORIZON ON THE QUANTITY AND QUALITY OF CONSUMPTION DECISIONS *Brian D. Vickers, University of Michigan; and Stephanie D. Preston, University of Michigan*- The effects of emotion on decision making have been extensively studied for risk taking and recently consumer choice. In particular, anxiety causes risk aversion as well as a preference for functional items while sadness causes risk seeking as well as a preference for hedonic items (e.g., Raghunathan, Pham, & Corfman, 2007). Similarly, sadness contributes to compulsive shopping (particularly for new, rewarding goods) while anxiety contributes to compulsive hoarding (particularly of items that could be useful later). Implicit in these findings, but heretofore untested, is that sadness and anxiety entail different time horizons and affect the quality and quantity of items acquired. We hypothesized that sadness-reducing decisions are devoted to repairing the current self by increasing overall acquisition of rewarding items, but only for the present while anxiety-reducing decisions are aimed at preparing for a future ambiguous threat, which increases acquisition of particularly functional goods, persisting into the future. Subjects were induced to feel incidental sadness, anxiety, or a control state (as in Raghunathan et al., 2007) before choosing as many items as they wanted, from a wide variety of functional and hedonic goods, framed as being delivered immediately or 8 weeks into the future (in a blocked version the Object Decision Task (ODT; Preston, Muroff, & Wengrovitz, 2009). Affect was measured by self report (PANAS; Watson, Clark, & Tellegen, 1988) before and after the induction and skin conductance (SCR) measured throughout the ODT. Analysis employed a 2x2 repeated-measures ANOVA for object type and time horizon with induction group as a between-subjects factor followed by confirmatory post-hoc tests. The induction caused sad subjects to feel more negative overall, specifically more irritable and less joyful and pleased than control or anxious subjects. Anxious subjects felt more active and troubled compared to control subjects, and more excited than sad subjects. Sad subjects also responded slower on the task, supporting a generalized reduction in behavioral activation. Overall, responses were unique to hedonic items acquired for now. All subjects took more hedonic-now items, and tended to respond faster and have a stronger SCR response to them than to the functional-now or hedonic- or functional-future items. These effects interacted with emotion because the hedonic-now preference was particularly prominent in control subjects, present but less pronounced in the sad subjects, and absent in the anxious subjects, who did pick more

hedonic-now items on average, but with highly similar numbers of items and SCR responses to the other categories (functional-now and all future-oriented).

E33

INVESTIGATING CONFORMITY IN EEG- *Sina Alexa Trautmann-Lengsfeld, Carl von Ossietzky University Oldenburg; and Christoph Herrmann, Carl von Ossietzky University Oldenburg*- Solomon Asch (1951) demonstrated that group pressure has tremendous influence on individual's judgement of a perceptually simple task. Subjects conformed to the group's incorrect judgement in 33% of the time although the group was obviously wrong. The latter so-called Asch-effect has been shown to be enhanced by different factors, e.g., high task difficulty, uncertainty, and strong group cohesion. The question is: do participants conform because they decide to do so or because their perception is altered by the opinion of the group? In a recent fMRI study, Berns and colleagues (2005) applied a difficult mental rotation task embedded in an adapted Asch-paradigm. Enhanced occipito-parietal activation during conformity was interpreted as altered perception rather than active decision processes. However, early visual cortex could be modulated by later processing stages in a reentrant way. Up to now, there has been no study investigating the neuronal time course of conformity. In the present study, our goal was (1) to develop difficult stimuli for a visual discrimination task, and (2) to replicate the Asch-effect with these stimuli. First, we developed stimuli consisting of squares including randomly distributed black dots which were presented left and right of a fixation point. Subjects were instructed to press a button on the side where the stimulus with the larger amount of black dots appeared. We determined the individual visual discrimination threshold for ten subjects (23.2±1.7ys, 5 females). On the following day, we presented the stimuli close to this individual threshold and stimuli that were easier to distinguish while simultaneously recording 64-channel EEG. Results showed that stimuli close to the threshold showed the same ERP-components (e.g., P1, N1, P2, and P3 over posterior regions) but with a smaller amplitude than easier stimuli. Hence, we validated the stimuli for replicating the Asch-effect. Second, on day one, ten women (21.6±1.8ys) were asked to accomplish the visual discrimination task and a personality questionnaire. We pretended to analyze the data in order to be able to find a group of four other people for them who were matched according to their accuracy in the visual task and to their personality to enhance group cohesion. On day two, participants accomplished an adapted Asch-paradigm. Prior to the presentation of a trial of the visual discrimination task - including only stimuli close to the individual visual threshold to enhance uncertainty during the task - faces on the left or right represented the decision of the fake group which could either be correct or incorrect with respect to the actual stimuli. Although subjects reported that they thought the decision of their group was sometimes incorrect and that they often decided against the group, they conformed to the erroneous group decision in 49.9% which is about 17% more often than in the original Asch experiment. In conclusion, we designed an experimental paradigm suited to replicate the Asch-effect in a modern EEG lab without the necessity to record multiple participants simultaneously and achieved an even larger effect of conformity than in the original Asch experiment.

E34

NUCLEUS ACCUMBENS AND PREFRONTAL ACTIVITY ARE RECRUITED WHEN MEN VIEW SEXUALLY ATTRACTIVE FACES- *Kristina L. Caudle, Dartmouth College; Todd F. Heatherton, Dartmouth College; and William M. Kelley, Dartmouth College*- It has been previously demonstrated that attractive

members of the opposite sex recruit domain-independent midbrain dopaminergic reward circuitry. Of particular interest is how contextual or goal-related information might modulate the activity of this midbrain reward circuitry, including frontal regions that receive efferent dopaminergic fibers from the midbrain, such as the ventral medial prefrontal cortex. To examine this contextual modulation of reward activity, 33 undergraduates (13 men) viewed and rated pictures of the opposite sex on two scales: an aesthetic attractiveness dimension (i.e., How attractive is this person), and a separate sexual desirability scale (i.e., How likely is it that you would have a sexual encounter with this person?). Each participant rated each photograph twice, once on each scale. Stimuli were then sorted based on each subject's individual ratings, and these were used as subject-specific regressors. Beta weights were extracted for spherical regions of interest in *a priori* defined regions of the nucleus accumbens (NAcc), and the ventral and dorsal medial prefrontal cortex (vmPFC, dmPFC), and offline statistical analyses were conducted. Global contextual differences in reward processing were addressed by examining differences in the task-dependent neural activity evoked while making sexual desirability versus aesthetic attractiveness judgments. The vmPFC and right NAcc were more active while making sexual desirability ratings than while making aesthetic attractiveness ratings. No regions were more active for aesthetic attractiveness judgments than sexual desirability judgments. Next, to examine context-driven differences in processing face stimuli, differences in brain activity for individuals rated as the most aesthetically attractive and the most sexually desirable were compared. Here we found that the NAcc (bilateral) increased linearly with both rated attractiveness and sexual desirability. In contrast, the dorsal medial prefrontal cortex (dmPFC) increased with increasing ratings only for sexual desirability and not for aesthetic attractiveness. These results suggest dorsal and ventral areas of the prefrontal cortex may differentially work to modulate goal-related differences for rewarding stimuli, providing contextual information to supplement the obligatory and perhaps less flexible activation of the NAcc to rewarding stimuli.

E35

NEURAL REGIONS INVOLVED IN THE CONTROLLED RETRIEVAL AND SELECTION OF SOCIAL INFORMATION. *Ajay B. Satpute, Columbia University; David Badre, Columbia University; and Kevin N. Ochsner, Columbia University.* Several studies have suggested that distinct neural systems underlie the processing of social information. However, precisely what these regions are doing is still unknown. Drawing on research in semantic memory, we investigated the neural regions involved in the controlled retrieval and selection of social information. Controlled retrieval is the process of bringing more mnemonic information to mind than might be spontaneously provided from a stimulus. Selection is the process of picking out specific bits of information from what's been retrieved based on the goals of the perceiver. To examine the neural correlates underlying these processes for social information, we modified a task used in studies of semantic memory to involve the names of famous people and characters. Individuals ($n = 20$) were presented with triads consisting of a cue (e.g. "Darth Vader") and two targets (e.g. "Luke Skywalker" and "Joseph Stalin") on the screen. They were instructed to match the cue with one of the two targets. Prior to each triad, an instruction was shown that indicated the basis on which to match the cue with one of the targets. For assessing neural regions involved in controlled retrieval, the instruction "Associated" was shown, which indicated that they should match the cue to the target that would come to mind more readily in general. For some trials, the cue-target association was weaker than for others, thereby increasing retrieval demands to indicate the

correct choice. Hence, parametric regressors for reaction time under the "Associated" instruction revealed regions that were sensitive to controlled retrieval. For assessing neural regions involved in selection, an instruction corresponding to a specific dimension was shown (e.g. "Authority", "Intelligence", "Healthiness", "Gender", etc.). For some trials, selecting along the given dimension required greater specificity (i.e. selecting for the relevant dimension and against irrelevant dimensions), thereby increasing selection demands to make the correct choice. Hence parametric regressors for reaction time under a specific dimension instruction revealed regions that were sensitive to selection. Parametric regressors were then directly compared with each other to uncover neural regions that were particularly sensitive to controlled retrieval or selection. This comparison cancels out activity that is commonly related to difficulty. Neural regions that showed greater activity to controlled retrieval than to selection included subgenual cingulate cortex (~BA 25), middle temporal cortex, temporal pole, and anterior frontal operculum. Neural regions that showed greater activity to selection than to controlled retrieval included the anterior VMPFC (~BA 10/32) and mid-VLPC (~BA 45).

E36

EXAMINING THE ROLE OF EXECUTIVE FUNCTIONING IN IMPLICIT ASSOCIATION TEST PERFORMANCE- *Lesia K.*

Ellis, Westminster College; and Raquel Gabbitas, Westminster College, University of Minnesota- Racism is clearly a problem in the United States, but racist attitudes are often difficult to measure. A variety of psychological measurements have sought to empirically assess the central issues of racism, such as stereotypical behavior and negative implicit feelings. Such measurements have shown that many individuals display unconscious bias towards perceived outgroups or minorities. This lack of awareness may influence individuals' decisions with both simple cognitive tasks, as well as critical social decisions. An individual's ability to engage or disengage from such potentially harmful implicit feelings may be dependent on his/her executive functioning ability; therefore, it is important to understand the role of executive functioning in implicit bias and how this may influence external actions. Executive functioning refers to a person's ability to resolve conflict among several potential actions. Individuals that exhibit poor executive functioning may have difficulty controlling negative unconscious or implicit feelings which can result in harmful actions. The current study examined the possible relationship between performance on an implicit measure of bias and a measure of executive attention. Forty nine undergraduate students completed a version of the Implicit Association Test (IAT), in which they were asked to pair pleasant and unpleasant words with both European American and Latina/o American last names. The IAT uses reaction time differences during the pairing exercises as a measure of implicit bias. Relatively longer reaction times when attempting to pair pleasant words with Latina/o American last names vs pairing pleasant words with European American last names would indicate a level of implicit bias favoring the pairing of pleasant stimuli with European American names. Completing the IAT presumably requires executive functioning ability. A participant must pay attention to the presented stimuli, and make decisions about conflicting information. To measure Executive Attention, participants completed the Attention Network Task (ANT). While the ANT also provides measures of attentional orienting and alerting, we were interested in analyzing reaction times during conflict resolution, which requires the participant to determine which direction a center arrow is pointing amidst either congruent or incongruent arrows. While we hypothesized that individuals with relatively better scores on the ANT would show relatively

lower levels of implicit bias on the IAT, Pearson's correlation revealed virtually no relationship between the two measures ($r=-.066$). This finding suggests that the implicit bias revealed by the IAT influences actions (pairing of words and names) outside of regulation imposed by executive control. It would be useful in future studies to examine, within participants, neural networks involved in each task to better understand the apparent dissociation between the two.

E37

CHOKING UNDER PRESSURE IN MATHEMATICAL PROBLEM SOLVING: NEURAL REGIONS SENSITIVE TO WORKING MEMORY DEMAND PREDICT HIGH-STAKES PERFORMANCE-

Andrew Mattarella-Micke, University of Chicago; Jay Todd, University of Chicago; and Sian Beilock, University of Chicago- In a high-stakes situation like a standardized math test, there are strong incentives for high-level performance. Even though individuals are motivated to succeed, overwhelming incentives can have the *opposite* effect – causing performance to drop below levels seen in low-stakes situations. This phenomenon is referred to as choking under pressure (Baumeister, 1984). Distraction theories (Beilock, Kulp, Holt, & Carr, 2004; Eysenck & Calvo, 1992) propose that choking is caused by an online disruption of working memory (WM), the limited-capacity system responsible for the active maintenance and manipulation of task content. There is substantial behavioral evidence to support this claim. WM demanding tasks are vulnerable to a high stakes situation, while less demanding tasks are spared (DeCaro, Wieth, & Beilock, 2007). Further, individual differences in WM capacity are correlated with individuals' likelihood of choking (Beilock & Carr, 2005). Despite this behavioral evidence, neural support for distraction theories is sparse. In the current study, we used fMRI to explore the neural correlates of performance under pressure. Participants completed math problems before (low-pressure) and after (high-pressure) the introduction of a high-stakes incentive. Math problems varied in the demands they placed on WM, based on previous research demonstrating that problem features such as large operands and a borrow operation place the greatest demands on WM (DeStefano & LeFevre, 2004). A 2 (pressure: low, high) x 2 WM (demand: high, low) ANOVA on math problem solving accuracy revealed a main effect of demand [$F(1,11)=56.06, p=.00001$] and a main effect of pressure [$F(1,11)=6.19, p<.05$]. The demand x pressure interaction was also significant [$F(1,11)=11.23, p=.006$]. High WM demand problem performance significantly dropped from the low-pressure ($M=0.71, SE=.02$) to high-pressure ($M=0.61, SE=.03$) situation [$t(12)=3.78, p=.003$]. Low WM demand problem accuracy was not affected by pressure (Low-pressure: $M=0.87, SE=.03$; High-pressure: $M=0.89, SE=.02$) [$t(12)=0.67, p=.52, ns$]. To test the claim that pressure alters performance via its effects on WM, low and high demand problems were first contrasted to localize regions sensitive to WM-related differences in the arithmetic problems. This contrast yielded regions common to the working memory network, including the lateral prefrontal cortex and the intraparietal sulcus (IPS). For each region identified in this contrast, we then regressed high WM demanding performance under the high-pressure condition on average regional activity under pressure, controlling for low-pressure performance. This regression allowed us to determine whether activation in neural regions sensitive to WM-related differences in the arithmetic problems could account for the degree of choking (i.e., worse performance on the high demand problems under high as compared to low pressure conditions) across individuals. Two regions showed a negative relation between choking and BOLD response for the high-pressure trials: the inferior frontal junction, in the posterior lateral prefrontal cortex, and the IPS. The more an individual choked under pressure, the less activity they showed in these regions. This result is highly consistent with the claim that

choking under pressure is caused by a disruption of the ability to devote sufficient WM resources to the task at hand.

E38

OF CROSSROADS, JUNCTIONS, AND PATHWAYS: TOM, TPJ, AND AUTISM-

Rajesh K. Kana, University of Alabama at Birmingham; Lauren L. Libero, University of Alabama at Birmingham; and Hrishikesh Deshpande, University of Alabama at Birmingham- As social beings, humans constantly engage in attributing intentions to one's own and others' actions. Attribution of intentions to others is a key element theory-of-mind (ToM). Although children learn causal attribution early in development, individuals with autism are known to have impairments in the development of intentional causality (Baron-Cohen, 1995). The main study reported here investigated the dichotomy in physical and intentional causal attribution and its neural correlates in autism. In addition, we did a meta-analysis of fourteen fMRI studies of ToM, morality, and attentional reorienting to locate a common focal point of activation, the temporoparietal junction (TPJ), and further relate it to the current study in autism in terms of location, and connections. Sixteen high-functioning adolescents with autism and sixteen age- and IQ-matched neurotypical controls participated in this fMRI study. Non-verbal comic strip vignettes involving physical and intentional causal scenarios (adapted from Brunet et al., 2000) were presented randomly in an event-related design, and the participants had to choose the most logical ending to each vignette (from alternatives A, B or C with a button press). The data acquired from the Siemens 3T Allegra head-only scanner housed at University of Alabama, Birmingham were analyzed using SPM2. Besides the activation analysis, we computed the functional connectivity (separately for each participant) by correlating the average time course of the signal extracted from all the activated voxels in functional ROIs defined on group data. The data obtained from individual ROIs were grouped based on lobes to further examine network connectivity. The main results were: 1) The autism group showed reduced activation, relative to controls, in right posterior superior temporal sulcus at TPJ, and increased activation in bilateral inferior parietal lobule while attributing intentional causality ($p < 0.005$); 2) Based on the meta-analysis, the closest match to our RTPJ activation ($x=56, y=-54, z=16$) was the Young and Saxe (2009) study ($x=54, y=-52, z=16$) which investigated spontaneous mental state inference for moral judgments; 3) Participants with autism showed weaker long distance connectivity, in frontal-temporal [$t(30)=2.11, p= 0.04$], and frontal-occipital [$t(30)=2.46, p=0.02$] networks, relative to controls during intentional causal attribution; 4) Participants with autism showed stronger short-distance connectivity, between the ToM and Attentional reorienting coordinates (from the studies reviewed) of the TPJ [$t(30)=2.30, p= 0.03$], relative to controls in intentional causal attribution; and 5) There was no statistically significant behavioral difference (reaction time and performance accuracy) between the two groups. The findings suggest possible compensatory neural routes in people with autism in accomplishing intentional causal attribution. The finding of long-distance underconnectivity adds to the converging evidence for cortical underconnectivity in autism (Just et al., 2004; Kana et al., 2006). While TPJ may form the locus of ToM in the brain, its precise location in different tasks as well as its functional and anatomical connections needs to be explored further.

E39

SELF-REPORTS OF TENDENCIES TO USE REAPPRAISAL PREDICT PREFRONTAL ASYMMETRY DURING AN EMOTION REGULATION TASK-

Elizabeth A. Bendycki, University of Virginia, Indiana University; Amanda R.W. Steiner, University of Virginia; and James A. Coan, University of Virginia-

Previous literature suggests that asymmetries in frontal brain activity are the product of both individual differences in emotion regulation strategies and the emotional demands of experimental conditions under which EEG is recorded (Coan et al., 2006; Coan & Allen, 2004). For the present study, EEG activity was recorded from 47 college-age participants both at rest and while participants watched emotionally salient video clips. Participants completed the Emotion Regulation Questionnaire (Gross & John, 2003), followed by an emotion regulation task where they were instructed to increase, decrease or maintain their natural emotion response while watching a series of 3-5 minute video clips. More left-frontal activity recorded during the films significantly corresponded with greater reliance on the emotion regulation strategy of cognitive reappraisal. To the extent that a pattern of relatively greater left prefrontal activity indexes an approach oriented regulation strategy, these observations suggest that cognitive reappraisal is itself partly an approach or engagement oriented regulatory strategy. Moreover, to the extent that relatively greater left prefrontal activity is associated with positive affect and decreased risk of affective disorders, these observations support strategies of cognitive reappraisal as a more effective regulatory strategy than strategies emphasizing behavioral suppression.

E40

ASPECTS OF NEUROTICISM AND THE AMYGDALA: CHRONIC TUNING FROM MOTIVATIONAL STYLES- *N.L.*

Arbuckle, The Ohio State University; A.A. Jahn, The Ohio State University; S.M. Mowrer, The Ohio State University; A.M. Abduljallil, The Ohio State University; W.A. Cunningham, The Ohio State University- Recent research and theory has highlighted the dynamic nature of amygdala activation. Rather than simply being sensitive to a few limited stimulus categories, amygdala activation appears to be dependent on the goals of the perceiver. In this study, we extend this line of work by demonstrating that the means by which a person seeks to accomplish a goal also modulates the amygdala response. Specifically, we examine the modulatory effects of the aspects of neuroticism (volatility/withdrawal), a personality variable that has been linked to both generalized anxiety and differences in amygdala sensitivity. Whereas neuroticism-volatility is proposed to be associated with the fight-flight-freeze system (FFFS) and a sensitivity for any cues of negativity, neuroticism-withdrawal is proposed to be associated with the behavioral inhibition system (BIS) and a generalized tendency toward passive avoidance. During fMRI scanning, participants were presented with positive, negative, and neutral images and were required to approach (move perceptually closer) or avoid (move perceptually farther away) stimuli in different blocks of trials. Consistent with hypotheses proposing a dissociation between these two aspects of neuroticism, participants higher in neuroticism-volatility had increased amygdala activation to negative stimuli (regardless of whether they were approached or avoided), whereas participants higher in neuroticism-withdrawal had increased amygdala activation to all approached stimuli (regardless of stimulus valence). These data provide further support for the motivational salience hypothesis of amygdala function, and demonstrate that both the ends and means of goal pursuit are important for shaping a response.

E41

ERP AMPLITUDE DIFFERENCES TO AMBIGUOUS FACE IMAGES AS A FUNCTION OF FEMALES' REJECTION SENSITIVITY- *Katherine B. Ehrlich, University of Maryland, College Park; Sarah Gerson, University of Maryland, College Park; Erin Cannon, University of Maryland, College Park; Ross Vanderwert, University of*

Maryland, College Park; and Nathan Fox, University of Maryland, College Park- Social rejection is an inevitable and distressing experience for everyone at some point in life. For adolescents in particular, social rejection is a common occurrence, with less than half of friendships surviving over a year (Connolly, Furman, & Konarski, 2000). Individuals vary, however, in their fear of encountering social rejection. Those who are high in *rejection sensitivity* (Downey & Feldman, 1996) are thought to "anxiously expect, readily perceive, and overreact to rejection" (p. 1327). Numerous studies have identified connections between rejection sensitivity and problems in romantic and peer relationships. Less is known, however, about the claim that rejection-sensitive individuals demonstrate a heightened attention to rejection in their environment (Downey et al., 2004). Moreover, to date, no study has examined underlying neurological evidence of heightened attention to rejection using event-related potential (ERP) methodology, despite numerous calls to do so (e.g., Kross et al., 2007). Thus, the objective of the current study was to examine whether individual differences in attention exist during the processing of social stimuli (i.e., images of faces). Participants in this study included 22 late-adolescent females (mean age = 19 years) recruited based on their scores on the Rejection Sensitivity Questionnaire (RSQ; Downey & Feldman, 1996), a 36-item questionnaire measuring expectations and fears of social rejection. Participants were divided into two groups: average ($M = 8.36$; $N = 12$) and high sensitivity ($M = 13.59$; $N = 10$). Participants completed a standard dot-probe task in which pairs of faces were presented briefly on a computer screen, followed by a probe (arrow), located behind one of the faces. For each pair, one face was "neutral" (the gaze in the picture was straight ahead). The second face in each pair depicted an averted gaze (the face pointed straight ahead with the eyes focused to the right or left). Participants pressed a button indicating the direction of the arrow (up or down). On a "congruent" trial, the arrow appeared on the same side as the gaze-averted face, whereas on an "incongruent" trial it appeared on the side of the neutral face. EEG was collected throughout the task, time-locked to stimuli presentation, and transformed into ERP. We examined group differences in the N1 (the ERP component related to spatial attention; Luck, 2005) from the two occipital sites. We hypothesized that if attention to rejection (rejection sensitivity) has a neurological basis, then we would find evidence of heightened activation in the N1 component for high rejection-sensitive adolescents. We conducted a 2 (Trial Type: Congruent/Incongruent) X 2 (Site Location: O1/O2) x 2 (Group: average/high) mixed ANOVA to examine group differences in the amplitude of the N1 component. Analyses supported our hypothesis, revealing a main effect of Group for N1 mean amplitude, $F(1, 20) = 7.09, p = .015$ and a Trial Type x Site Location interaction, $F(1, 20) = 6.26, p = .021$. The findings suggest a neural basis for individual differences in face processing as a function of rejection sensitivity. We will discuss implications and opportunities for future research.

E42

THE INFLUENCE OF COGNITIVE REGULATION ON THE ANTICIPATION OF MONETARY LOSSES- *Laura N. Martin, Rutgers University; and Mauricio R. Delgado, Rutgers University-*

Aversive experiences are unpleasant and at times unavoidable. One method that has been shown to be effective in reducing the anxiety associated with an aversive stimulus, such as an emotionally disturbing image, is the application of cognitive emotion regulation strategies (e.g., Ochsner & Gross, 2005). Such cognitive regulation strategies have also been shown to be beneficial in diminishing conditioned fear associated with the anticipation of primary aversive stimuli (electric shock) via cortical modulation of subcortical targets such as the amygdala and striatum (Delgado et al., 2008). It is unclear, however, if cognitive regulation can also

influence anticipatory responses to negative consequences more common in daily life, for instance the loss of money. The current fMRI study examined the effect of an imagery-focused cognitive regulation strategy on subjective and neural responses associated with the anticipation or expectation of monetary losses. After earning a bank of money playing a gambling game, participants encountered different colored squares, which were paired with one of the following outcomes: always losing money (punish cue), never losing money (safe cue) and a chance of losing money (variable cue). Each cue had three distinct phases: 1) presentation, in which the colored square appeared; 2) anticipation, in which a question mark appeared inside the square designating that the outcome would be revealed in about 5s; and 3) outcome, in which participants saw the financial outcome of the square. Prior to the presentation of the squares, participants were instructed to either look at the squares and respond naturally (look condition) or to regulate by imagining a relaxing scene in their mind during the anticipation period (relax condition). The instruction words "Look" and "Relax" were given in a pseudo-blocked fashion, every six square trials. Subjective ratings acquired after individual trials suggested that cognitive regulation was effective in diminishing the negative affect associated with the aversive cues (punish and variable). Successful cognitive regulation also modulated BOLD signals in the striatum, a region typically implicated in affective learning and reward-related processing, with preliminary results showing decreased responses during anticipation of predictable and variable losses. This finding has important implications for decision-making, as research continues to probe how negative emotions evoked by the expectation of losses contribute to risky decision-making.

E43

EXAMINATION OF THE BRAIN PROCESSES UNDERLYING EMOTION REGULATION WITHIN A STRESS RESILIENT POPULATION- *Michelle Costanzo, University of Maryland, College Park; John VanMeter, Georgetown University; Matt Miller, University of Maryland, College Park; Jessica Oldham, University of Maryland, College Park; Bart Russell, University of Maryland, College Park; Brad Hatfield, University of Maryland, College Park-* Emotion robustly affects the quality of cognitive-motor performance under conditions of mental stress. As such, the regulation of emotion is critical to successful execution of motor skills during competition. Previous investigations of the arousal-performance relationship have typically focused on behavioral outcomes but it is unclear if those who have demonstrated superior performance under stress exhibit brain responses characterized by an adaptive emotion regulatory strategy (cognitive reappraisal). Using functional magnetic resonance imaging (fMRI) this study seeks to determine if cognitive reappraisal is spontaneously recruited during emotional challenge in individuals who have demonstrated superior cognitive-motor performance under stress (12 intercollegiate football players). This emotion regulatory response is characterized by a pattern such that, the lateral prefrontal cortex will be inversely related to amygdala. This study will test two competing models of emotion regulation; one that predicts a specificity of the endogenous regulatory response to emotion challenge (domain specific model of emotion regulation) while the other predicts a ubiquitous stress resilience independent of experience (domain general model of emotion regulation). Following the approach developed by Goldin et al. (2008) and Ochsner et al. (2004) this fMRI investigation will evaluate the BOLD response during negative and neutral visually presented images. Non sport-specific negative and neutral images were selected from the International Affective Picture System (Lang et al., 1999). In addition, sport-specific negative images will be used representing unpleasant events and experiences during competition (negative images matched for valence and arousal). A

with-in subjects 2x2 design of Emotional Challenge (sport-specific and non sport-specific) x Appraisal Strategy (cognitive reappraisal and passive viewing) will be executed. The General Linear Model (boxcar models representing the picture-viewing period of each condition) will be used to create subtraction contrasts for each subject: 1) Cognitive Reappraisal > Passive Viewing Neutral and 2) Passive Viewing Negative > Passive Viewing Neutral for both sport-specific and non sport-specific conditions. These contrasts will be then entered into a one-sample t test to perform a random-effects group analysis. Conjunction analysis will be used to test the two competing models. In the event of a domain specific model, the predicted high degree of similarity between the endogenous response to sport-specific negative images and cued cognitive reappraisal will be tested by a conjunction between (a) Sport-Specific Cognitive Reappraisal > Passive Neutral and (b) Sport-Specific Passive Negative > Passive Neutral (the subtraction contrasts will be jointly significantly active and undifferentiated). Conjunction analysis will also be applied to the non sports-specific images. Similar findings as that observed in the sports-specific images will support a domain general model of emotion regulation in this population. The results of the study could inform the nature of interventions to promote optimal emotion regulation under challenge.

E44

PSYCHOPHYSIOLOGICAL AND NEURAL CORRELATES OF RISK-SENSITIVE DECISION-MAKING- *Bettina Studer, University of Cambridge; Annemieke Apergis-Schoute, University of Cambridge; Trevor W. Robbins, University of Cambridge; and Luke Clark, University of Cambridge-* Economic models of decision-making propose that humans integrate the information about the magnitude and probabilities of all outcomes, in order to select the option with the highest utility. However, recent neuroscience research suggests that these models may underestimate the role of emotions in guiding human choice. Two studies using a novel gambling task were conducted. In the first study we examined how behavioural responses and psychophysiological arousal were differentially affected by a) the requirement to make an active choice, b) the chances of winning and c) the bet magnitude. In the second study we tested how neural activity during decision-making was modulated by the aforementioned factors. Healthy university students completed the Roulette Betting Task (study 1: n = 30, study 2: n = 18). Two trial types were contrasted: "active-choice-trials", in which the subject was required to select a bet, and fixed-bet "no-choice-trials" (matched for monetary gain). Probability of winning/losing and bet magnitude were manipulated across both trial types. In study 1, psychophysiological responses were assessed by measuring heart rate (HR) and skin conductance responses (SCR). In study 2, functional images were acquired (3-T, TR= 2s) using a standard echo-planar imaging sequence with an event-related design. Data analysis was conducted using Statistical Parametric Mapping (SPM5) software, with a canonical hemodynamic response function modeled to the onsets of the selection phase. Whole-brain analyses were thresholded at $p < .001$ uncorrected. The results of this study showed that behavioural, psychophysiological and neural responses were modulated by a) the requirement for active choice, b) the winning chances and c) the bet magnitude. First, active-choice-trials were associated with faster decisions, stronger psychophysiological responses (HR and SCRs) and increased activation of the anterior cingulate cortex, striatum, midbrain, frontal areas and parietal regions compared to no-choice-trials. Second, participants adjusted their bets to the winning chances on active-choice-trials, placing higher bets on trials with higher chances of winning. Higher winning chances were also associated with increased neural activity in the ventromedial prefrontal cortex and parietal cortex during selection of a risky

option. Cardiac deceleration was greater in trials with smaller winning chances. Third, high-bet-trials were associated with stronger selection-related skin conductance responses and a greater neural response in medial prefrontal and frontal areas, anterior cingulate cortex and parietal regions compared to low-bet-trials. The results of this work highlight close coupling of peripheral arousal (as a marker of emotional responding) and cognitive factors linked to risky choice, during a simulated gambling task. Gambling decisions were accompanied by phasic changes in psychophysiological arousal and these psychophysiological responses were sensitive to the riskiness of a decision. Psychophysiological arousal during decision-making was sensitive to the requirement for active choice, despite balancing for monetary gain, and this may relate to illusory control phenomena in gambling. Finally the results of this study indicate that the requirement for active choice, the chances of winning and the bet magnitude all differentially modulate neural activity in areas involved in conflict, reward processing and quantity estimation, during the selection of risky options.

E45

EXPERIENCED YOGA PRACTITIONERS EXHIBIT BOTH INCREASED FRONTAL AND DECREASED LIMBIC ACTIVATION DURING EMOTIONAL INFORMATION PROCESSING.

Leslie A. Modlin, Duke University Medical Center; Rachel V. Kozink, Duke University Medical Center; F. Joseph McClernon, Duke University Medical Center; and Brett Froeliger, Duke University Medical Center- Yoga meditation has been reported to enhance cognition and improve mood. In addition, the extant literature suggests that yoga may reduce negative affect in populations prone to mood disturbances. However, the effects of yoga on the neural substrates of affective and executive function are not well known. The current pilot study used fMRI to evaluate the neural correlates of emotional information processing in experienced practitioners of Hatha Yoga. BOLD-fMRI images were acquired in a sample of yogis ($n = 7$) and matched yoga-naïve controls ($n = 7$) while performing an affective Stroop Task (aST). The aST presented neutral and negative emotional distractor images while participants were engaged in either a demanding judgment task or a passive viewing trial. Statistical threshold was set at $p < .05$, FWE corrected. Yogis, as compared to controls, exhibited greater task-related activation in regions subserving executive function (e.g., dorsal anterior cingulate gyrus, dorsomedial prefrontal cortex) and less activation in regions underlying emotional processes (e.g., amygdala, posterior insula and cingulate gyrus [PCG]). These results may be summarized by two novel findings. Yogis, as compared to controls, exhibited relative greater activation in circuitry involved in executive function, a finding consistent with the cognitive enhancement reported by experienced yoga practitioners. In addition, yogis exhibited relative decreased activation in regions underlying emotional processes. These findings may provide a neural marker for the mood-enhancing effects of yoga. Taken together, these patterns of activation suggest that long-term yoga practice may reduce affective interference with ongoing cognitive demands. The results from this pilot study will be discussed within the context of the putative beneficial effects of yoga on emotional information processing.

E46

REWARD LEARNING AND REWARD-RELATED

NEURAL ACTIVATION.-*Ryan Bogdan, Harvard University, University of Mississippi, Duke University; Avram J Holmes, Harvard University; Daniel G Dillon, Harvard University; and Diego A Pizzagalli, Harvard University-* The midbrain, striatum, orbitofrontal cortex (OFC)

and medial prefrontal cortex (mPFC) are critical for reward processing. Research suggests these structures are differentially involved in distinct phases (e.g., anticipatory and consummatory) of reward processing; striatal and mPFC regions have been linked to anticipatory and consummatory phases, respectively. However, emerging conditioning research suggests that reward-related regions are differentially recruited based upon predictability and reward learning. Specifically, this research suggests that unexpected reward predictors and unexpected reward delivery elicit activation in striatal and OFC regions while completely expected rewards are not associated with striatal activation. This functional magnetic resonance imaging (fMRI) study evaluated brain activation in response to (1) stimuli predicting frequent/infrequent rewards and (2) expected/unexpected reward delivery, after reward contingencies were learned. Additionally, this study examined how reward-related neural activation is associated with behavioral strategies to maximize reward. We hypothesized that reward predictors as well as unexpected reward delivery would elicit elevated activation in the striatum and OFC/mPFC once stimulus-reward contingencies were learned. Furthermore we hypothesized that behavioral strategies to maximize reward would be positively associated with activation in the striatum and OFC in response to both stimuli predicting frequent reward and unexpected reward delivery. Twenty-nine psychiatrically healthy participants completed a probabilistic reward learning task while fMRI data were acquired. A finite impulse response (FIR) model was used to analyze activation elicited by stimuli predicting a high or low probability of reward as well as reward delivery following these different stimuli. Reward learning was associated with elevated OFC activation in response to stimuli predicting frequent rewards. After reward learning had occurred, stimuli predicting frequent rewards were associated with elevated activation in the bilateral putamen and medial OFC, while unexpected reward delivery was associated with elevated activation in the bilateral caudate and medial prefrontal cortex. These results suggest that similar structures are involved in anticipatory and consummatory phases of reward processing contingent upon prior learning and predictability, and that OFC activation is associated with behavioral strategies to maximize reward. Reduced OFC activation to reward predictors may reflect dysfunctional formation of stimulus-reward outcome associations that may promote the development of anhedonia.

E47

SOCIAL CUES INFLUENCE ELEMENTARY SOUND

PERCEPTION- *Jeremy I. Borjon, Princeton University; Stephen V. Shepherd, Princeton University; Alexander Todorov, Princeton University, Asif A. Ghazanfar, Princeton University-* Most research into the interaction between perceived social cues and multisensory integration focuses on audiovisual speech and emotions, but neglects other potential influences of social cues on sensory perception. We report a novel demonstration of multimodal social processing, which gives rise to a form of perceptual contagion: seeing another individual looking left or right changes the way we perceive sound. Subjects first saw a face stimulus and then heard a sound originate from one of six locations. When faces appeared looking to the subject's left or right, sound localization near the midline were biased in the direction of observed gaze. This perceptual shift was robust to changes in facial expression and was neither suppressed nor enhanced by facial expressivity. These findings suggest that our perceptions are distorted toward congruence with others' orientating behavior, and imply that like motor behaviors, facial expressions, emotional states, and attention, perceptions can be "contagious"

EMOTIONAL AND SOCIAL PERCEPTION IN A RARE CASE OF DEVELOPMENTAL VISUAL AGNOSIA-

Hillel Aviezer, Princeton University; Yaacov Trope, New York University; Ran R. Hassin, Hebrew University of Jerusalem; Shlomo Bentin, Hebrew University of Jerusalem; Anat Perry, Hebrew University of Jerusalem; and Alexander Todorov, Princeton University- Developmental visual agnosia is a rare and poorly understood condition. Unlike developmental prosopagnosics who display specific difficulties with face identity, developmental visual agnosia may present with deficient visual integration, object recognition, and face processing. Although recent investigations have explored the visual and neural processing in developmental visual agnosia, little is known about how these individuals visually process social and affective information. In the current set of studies we examined emotional and social perception in case LG, a 21 year old individual with developmental visual agnosia characterized by profoundly impaired visual integration. In study 1 we examined LG's recognition of isolated and contextualized basic emotions. LG was found to be impaired at recognizing isolated facial expressions. In contrast he was able to recognize emotions expressed by highly distinctive and prototypical emotional bodies when the face was removed. Nevertheless, his ability to detect the emotion expressed by a face did not improve even if it was embedded in an emotionally-congruent body context. Furthermore, in contrast to controls, LG displayed an abnormal pattern of contextual influence from emotionally-incongruent bodies. These findings suggest that the general integration deficit in developmental visual agnosia extends to the level of the full person unit. In study 2 we examined LG's recognition of social, non-emotional facial information. To this end, we presented him with a set of 300 faces normed for dominance, trustworthiness, and attractiveness. LG's performance was examined by comparing his face ratings of extremely high (> 90th Percentile) vs. extremely low (< 10th percentile) norm rated stimuli. The results showed that LG did not differentiate highly trustworthy from highly untrustworthy faces, and he did not differentiate highly dominant from highly non-dominant faces. By contrast, he was capable of differentiating highly attractive from highly unattractive faces. Furthermore, LG's ratio of male-female faces within the attractive and unattractive face groups was similar to that of controls. These findings suggest that the perception of attractiveness may be more basic and functionally dissociated from the perception of social dimensions of trustworthiness and dominance. Put together, our results indicate that unlike the more common developmental prosopagnosics who typically display intact recognition of emotion and social traits, individuals with developmental visual agnosia may manifest with profound deficits in social and emotional perception.

Poster Session J

J1

EEG RESPONSES TO EMOTIONAL IMAGES: EXAMINATION OF THE EFFECTS OF RUMINATION AND DISTRACTION IN DEPRESSION-

Michael W. Duke, University of Wisconsin-Milwaukee; Elizabeth L. Steuer, University of Wisconsin-Milwaukee; Lauren E. Taubitz, University of Wisconsin-Milwaukee; Emily L. Belleau, University of Wisconsin-Milwaukee; and Christine L. Larson, University of Wisconsin-Milwaukee- Recent studies have shown a positive correlation between rumination and intensification of depressive episodes, whereas tendencies towards distraction have been shown to mitigate negative affect. The current study aims to assess the causal relationship between rumination, distraction, and prolonged reactions to discrete unpleasant events, by examining the degree to which rumination prolongs and distraction abbreviates responses to unpleasant affective stimuli using EEG. 66 participants each completed an 8-minute rumination/distraction paradigm modeled on the one developed by Lyubomirsky and Nolen-Hoeksema. Participants each read a series of 45 items: for the rumination induction group, the items encouraged them to focus on themselves, their own emotions, and cognitions; for the distraction induction group, the items asked them to focus their attention externally. Immediately following the rumination/distraction induction each participant completed a picture viewing paradigm during which EEG data was recorded. Visual stimuli were each presented for 5 seconds and consisted of 120 IAPS pictures, 40 each of unpleasant, neutral, and pleasant images. Event-related potentials in reaction to the images were analyzed in terms of Late Positive Potential (LPP) (550-1000 ms) amplitudes at electrode site CPz. After concluding the picture presentation participants completed a series of questionnaires. Scores from the Mood and Anxiety Symptom Questionnaire's subscale for anhedonic depression (MASQ-ADP) were used to classify participants into depressed and control groups. Participants who scored above the median of the observed distribution on the MASQ-ADP (sum>58) were deemed depressed (n=28), whereas those scoring in the lower half (sum<58) were deemed controls (n=27). Subjects who scored exactly at the median (n=11) were excluded from analyses. A significant interaction occurred for mood induction by image valence ($F=3.57, p=.032$), with distraction resulting in bigger LPPs for unpleasant images and rumination bigger LPPs for neutral and pleasant images. Level of depression did not significantly contribute to this effect, as evidenced by the observation that both depressed and control groups elicited significantly greater LPPs for unpleasant images compared to neutral ones ($t=2.62, p=.014$ and $t=2.17, p=.039$, respectively). These findings contradict the hypothesis that rumination would prolong and distraction abbreviate responses to unpleasant images.

J2

NEURAL CORRELATES OF IMPLICIT ATTITUDES TOWARDS POSITIVE AND NEGATIVE EMOTIONS-

Chi-Kuang Sun, National Yang-Ming University; Yu-Ying Chou, National Yang-Ming University; and Li-Fen Chen, National Yang-Ming University- Many studies have investigated that how emotion influenced our cognition, including attention, preferences, judgments, memories, and etc. In sum, the different contexts could result in the various emotion-cognition interactions. However, very little is known about the impact of implicit emotions or predispositional attitudes on our reactions to emotional challenges. In the current study, we aimed to explore the neural bases underpinning the optimistic and pessimistic attitudes towards the positive and negative emotions. We used the unconsciously emotional priming task and

simultaneously recorded the participants' brain potentials. During the negative pictures processing, the participants under the happy-prime condition showed the smaller N2 magnitude at the centroparietal cortex compared to the sad-prime condition. This result may indicate that optimistic people automatically pay less attention to the negative events. Furthermore, during the positive pictures processing, the participants under the happy-prime condition showed larger late positive potentials compared to the sad-prime condition suggesting that the optimistic people may have more sustained positive emotion intrinsically. Collectively, our results manifested that "the attitude determines the altitude," when encountering emotional challenges.

J3

NEURAL DYNAMICS OF RISKY DECISION AND THEIR CONSEQUENCES IN A SEQUENTIAL TASK

Benoit Bediou, University of Geneva, Laboratory for the Study of Emotion Elicitation and Expression; Lorenz Goette, University of Lausanne; and David Sander, University of Geneva, Laboratory for the Study of Emotion Elicitation and Expression- Converging evidence shows that there are multiple representations of reward and risk in the brain. Yet, how these representations relate to distinct mechanisms underlying action selection remains unclear. Moreover, the role of individual differences in neural representation reward and risk sensitivity is also poorly understood. We recorded EEG while participants performed a sequential risk-taking task and used a model-based approach to investigate the impact of reward-related computations (expected outcome, prediction error) and risk-related computations (expected return, variance) Medial Frontal Negativities (MFNs). Response-related ERPs showed that an early MFN generated in the primary sensorimotor cortex and orbitofrontal cortex correlated with the Expected-Outcome of each decision, suggesting that these regions are sensitive to the reward value or utility of an option. By contrast, a late MFN with sources in the ACC correlated with Expected-Return and was enhanced on decisions with negative compared to positive expected return, consistent with a role in the anticipation of potentially negative consequences. Feedback-related (loss-minus-win) ERPs showed an early and a late MFN which correlated positively with variance and negatively with prediction error. The early ERN was additionally sensitive to individual differences in risk-sensitivity as measured during the task; the greater the risk-aversion the greater the early-MFN. Both components were generated in the ACC, suggesting that this regions performs a rapid subjective ("emotional") evaluation of outcomes which is sensitive to individual differences in risk-sensitivity, followed by a slower but more objective ("rational") evaluation of outcomes on the basis of economics parameters (e.g. magnitude and probability of reward). Our findings support a role for the ACC in both reinforcement learning and in the anticipation of negative consequences of one's actions and suggest that the appraisal of risk may actually comprise several spatially and temporally dissociable processes, some of which reflect a more subjective representation of risk than others.

J4

NOTHING COMPARED TO COMPARISONS! AN FMRI STUDY ON THE NEURAL CORRELATES OF PERSON COMPARISON.

Gayannee Kedia, University of Cologne, Bangor University; Thomas Mussweiler, University of Cologne; Paul Mullins, Bangor University; David Linden, Bangor University- The horizontal part of the intraparietal sulcus (HIPS) seems to be specifically dedicated to quantity assessment. It is activated by comparisons of numbers and of simple characteristics such as the size and luminance of a stimulus. Its activity depends on a distance effect: the closer two quantities, the more difficult to compare and the greater the HIPS activity. The present experiment extended this

research to person comparison, one of the most ubiquitous social cognitive processes. We hypothesized that comparing two persons' body height or beauty involves similar processes as comparing numbers and thus also recruits the HIPS. 25 women underwent fMRI scanning. Stimuli were full-length pictures of women or dogs displayed in pairs (i.e. two women or two dogs at once). Participants had to compare the height (*Which woman – or dog – is taller?*) or beauty (*Which woman – or dog – is more beautiful?*) of these targets. For half of the comparisons, the targets were close concerning the characteristic to compare, i.e. were similarly tall or beautiful (low distance conditions); whereas for the other half, one target was markedly taller or more beautiful than the other (high distance conditions). These comparative conditions were contrasted to non-comparative control conditions, in which participants had to indicate whether both targets had their mouth open or not. fMRI results are presented with a threshold of $p < .001$ (uncorrected for multiple comparisons), and a correction for spatial extent ($p < .05$ uncorrected for multiple comparisons). Participants were faster for high distance comparisons than low distance comparisons for height and beauty judgments of women and of dogs. Low distance comparisons lead to greater activity than high distance comparisons in bilateral superior parietal areas including the HIPS as well as in occipital and fusiform areas, for height and beauty comparisons of women and of dogs. Height comparisons of dogs and women were associated with greater activity in bilateral superior parietal clusters including the HIPS than the control conditions. The contrasts between the two beauty comparisons conditions and the control conditions did not reveal any activated cluster neither for the dogs nor for the women. Height comparisons triggered more activity than beauty comparisons in a right parietal cluster including the HIPS. This was true both when the targets were dogs and women. Conversely, beauty comparisons were associated with increased BOLD response in the fusiform gyrus. The behavioral distance effects and the HIPS recruitment for the height and beauty comparisons suggest that social judgments involve similar mechanisms as number processing. In addition, results indicate that body height comparisons recruit more the HIPS, and beauty judgments elicit more activity in the fusiform gyrus. Thus comparative judgments of height and beauty seem also to be supported by distinct processes that take place in brain areas specifically related to the dimension to be compared: in regions involved in spatial representation for height judgments and in regions involved in face perception for beauty comparisons.

J5

OUTCOME DEPENDENCY AND IMPRESSION FORMATION

Daniel L. Ames, Princeton University; and Susan T. Fiske, Princeton University- People have a basic psychological need to maintain coherent representations of others. But how do human beings maintain consistent impressions of other people when other people are often inconsistent? Behavioral research suggests that one frequently employed strategy is to simplify impressions by ignoring or discounting information that does not cohere with expectations about the target person. Sometimes, however, people engage in the opposite pattern of behavior, paying special attention to novel or unexpected social information. The present research explores when expectancy-inconsistent information is and is not used in forming impressions of others. This poster argues that one key determinant is outcome-dependency, that is, whether or not the perceiver depends on the person perceived in order to obtain a desired outcome. Prior to fMRI scanning, participants met two confederates. Participants learned that they depended on one of these confederates for a desired outcome (\$50.00 prize), and were also led to form respectively positive or negative expectations about the two targets. During scanning, participants viewed 60 pieces of information about each confederate, half of which were

consistent with their expectations about each individual, and half of which were inconsistent with those expectations. A separate functional localizer was used to identify regions of cortex preferentially involved in social impression-formation. Consistent with prior research on the neural bases of impression formation, a region of dorsomedial prefrontal cortex emerged from this analysis. As hypothesized, interrogating this region of interest revealed that when participants did *not* depend on the target for a desired outcome, regions involved in impression-formation were more heavily recruited for expectancy-consistent information than for expectancy-inconsistent information; however, the opposite pattern emerged when participants did depend on the target for a desired outcome—with greater engagement of impression-formation processes being recruited for expectancy-inconsistent information than for expectancy-consistent information. Outcome dependency thus focused neural activations on the more diagnostic cues. This study points to the flexibility of social perception and people's adaptive ability to alter their impression formation strategies as a function of their goals.

J6

MAKING SENSE BY MAKING SENTIENT: NEURAL AND BEHAVIORAL EVIDENCE FOR PREFERENTIAL ANTHROPOMORPHISM OF UNPREDICTABLE AGENTS-

Adam Waytz, Harvard University; Carey Morewedge, Carnegie Mellon University; Nicholas Epley, University of Chicago; George Monteleone, University of Chicago; Jia-Hong Gao, University of Chicago; and John Cacioppo, University of Chicago- People commonly anthropomorphize nonhuman agents, imbuing everything from computers to pets to gods with humanlike capacities and mental experiences. Although widely observed, the determinants of anthropomorphism remain poorly understood. We propose that people anthropomorphize, in part, to satisfy effectance motivation—the basic and chronic motivation to attain mastery of one's environment (what Dennett, 1987, called *the intentional stance*). We conducted two studies to test this hypothesis. Because the primary factor that elicits effectance motivation is the experience of unpredictability, we tested whether people would preferentially anthropomorphize technological gadgets that operated unpredictably compared to gadgets that operated predictably. In an initial behavioral study, participants evaluated 30 gadgets, half of which were described as operating unpredictably and half that were described as predictable. We randomly assigned participants to one of two replicate conditions, in which we counterbalanced the description type of each gadget—the 15 gadgets described as predictable in replicate A were described as unpredictable in replicate B, and vice versa. All participants rated the extent to which each gadget possessed mental, anthropomorphic qualities (e.g., intention, emotion, consciousness) as well as nonmental, nonanthropomorphic qualities (e.g., attractiveness, strength, efficiency). Results showed that participants rated unpredictable gadgets significantly higher than predictable gadgets on anthropomorphic attributes but not on nonanthropomorphic attributes. In a second neuroimaging study, participants read descriptions of the gadgets as in the behavioral study and then underwent scanning while rating how much each gadget had a mind (as a measure of anthropomorphism). Replicating the behavioral results of the first study, participants preferentially anthropomorphized unpredictable gadgets compared to predictable gadgets. In addition, an unpredictable > predictable gadgets contrast revealed increased activity in the ventral medial prefrontal cortex (vmPFC)—a region commonly involved in mentalizing—during evaluations of unpredictable gadgets compared to predictable gadgets. In addition, a connectivity analysis revealed this vmPFC region to be correlated with a network of regions (including the precuneus and posterior cingulate) implicated in mentalizing. Finally, a weighted analysis

that incorporated participants' explicit ratings of mind into the fMRI model to produce a comparable unpredictable > predictable gadgets contrast revealed activation in the same vMPFC region. This analysis demonstrated a correspondence between explicit attribution of mind and vMPFC activation, consistent with previous findings on the role of this region in mentalizing. Together, these studies demonstrate that unpredictability increases anthropomorphism both in terms of explicit ratings of anthropomorphic qualities and activity in brain regions commonly involved in mental state attribution.

J7

NONCONSCIOUS STIMULUS DIFFERENTIATION IS REFLECTED IN THE P300 EEG/ERP COMPONENT

Joshua A. Tabak, University of Washington; Vivian Zayas, Cornell University; and Warasinee Chaisangmongkon, Yale University- The P300 event-related brain potential (EEG/ERP) is arguably the most-studied ERP component, and is widely accepted as an index of stimulus novelty or surprise, depending on the eliciting event. Until now, the P300 has only been shown to be sensitive to differences in stimulus category (e.g., circle vs. square; man vs. woman) of which participants are consciously aware. Here, we show that the P300 component of the ERP waveform provides neurophysiological evidence of category differentiation among social stimuli even when participants are not consciously aware that they are viewing stimuli from two different categories. Sexual orientation can be read from briefly presented faces of unknown men with above-chance accuracy in tasks that explicitly instruct participants to make gay-straight judgments (Tabak & Zayas, under review; Rule & Ambady, 2008). We proposed that judgments of sexual orientation occur nonconsciously – i.e., in the absence of instructions to do so. To test this hypothesis, we recorded event-related brain potentials (EEG/ERPs) as participants performed a three-stimulus oddball task (Jeon & Polich, 2001). Participants were presented photographs of straight men (70% of targets), gay men (15%), and straight women (15%) for 200 ms, and instructed to tap the spacebar in response to women's faces and to not respond to men's faces. Replicating past research showing that infrequent stimuli elicit greater P300 than frequent stimuli, straight women's faces elicited greater P300 (P3b) "context-updating" ERP deflections than did straight men's faces. Critically, even though participants were never asked to make a gay-straight judgment, gay men's faces also elicited larger P300 (P3a) deflections than did straight men's faces. Neurophysiological evidence for differentiation of the categories "straight men" vs. "gay men" was also found in the N170, P200, N100, and P100 ERP components, suggesting that nonconscious differentiation of complex social stimuli (e.g., faces) may begin in very early processing. Stimulus-bound artifactual explanations of the results (e.g., group differences in photo luminance) were ruled-out, and no participant reported any suspicion that faces differed in sexual orientation during the funneled debriefing procedure. These findings demonstrate that sexual orientation is inferred from faces even when individuals are not explicitly instructed to judge sexual orientation and raise questions about the common assumption that bias cannot occur if marginalized identities, such as sexual orientation, are not explicitly revealed. Moreover, these results show that EEG/ERP methodology may be used to study processes underlying nonconscious stimulus differentiation.

J8

HOW YOUR MOOD CAN CHANGE YOUR MIND: INCIDENTAL AFFECT IMPARTS LONG-TERM CHANGES IN ECONOMIC DECISION MAKING-

Steven J. Stanton, Duke University; Crystal C. Reeck, Duke University; Scott A. Huettel, Duke University; Kevin S. LaBar, Duke University- While anecdotal accounts of stock market swings and personal purchases often acknowledge

the influence of affect on individuals' economic behavior, little experimental work has manipulated and measured the impact of incidental affect on individuals' economic risk preferences. In addition, even less is known about the extent to which behavioral patterns learned while in a particular mood are carried forward into the future, even in new contexts and mood states. The present study examined the short-term and long-term influence of experimentally-induced happiness and sadness on individuals' economic risk preferences. Happy and sad moods were induced in participants via film clips on two separate, sequential days. Thus, all participants experienced both mood inductions, with the order counterbalanced across participants. Subsequent to the mood inductions, participants completed an incentive-compatible version of the well-validated framing task. On each trial, participants start with a monetary endowment ranging between \$20 and \$100. They must then choose between a gamble of winning all or none of the endowment versus a guaranteed payment that is a percentage of the endowment - the expected value of the gamble is equal to the value of the guaranteed payment. Critically, this guaranteed option can be presented as either a gain or a loss of a portion of the endowment. Thus, on every trial subjects chose to either gamble or walk away with a certain amount of money. Previous studies have established that participants have a tendency to choose the gamble more frequently when the guaranteed option is framed as a loss and to select the guaranteed payment more often when framed as a gain. Using a between-subjects analysis, we found that on the first experimental day those participants exposed to a happy mood induction accepted gambles significantly more often than individuals in the sad condition. In addition, those in the happy condition also exhibited a significantly greater framing effect, in which they gambled more often in the "loss" frame than the "gain" frame, compared to participants in the sad condition. Strikingly, participants' behavior on their second day of participation was highly consistent with their behavior on day 1, despite experiencing mood induction in the opposite-valence direction on day 2. Thus, participants in the happy condition on day 1 were still more likely to accept gambles and exhibited a greater framing effect on day 2, despite having sad mood induction on day 2. The present results suggest that incidental mood has a significant impact on individuals' economic risk preferences, in which happy mood is related to greater willingness to accept gambles and a greater magnitude framing effect as compared to sad mood. Moreover, the economic risk preference patterns established under an initial mood carry forward into the future. In conjunction, these data suggest that incidental mood may have the ability to shape immediate economic behavior in a manner that subsequently predicts long-term economic behavior.

J9

VENTROMEDIAL PREFRONTAL DAMAGE REDUCES INTERPERSONAL DISGUST-

Elisa Ciaramelli, Centro Studi e Ricerche di Neuroscienze Cognitive; Rebecca Sperotto, Centro Studi e Ricerche di Neuroscienze Cognitive; and Giuseppe di Pellegrino, Centro Studi e Ricerche di Neuroscienze Cognitive, Universita' di Bologna- Disgust is an emotion that motivates withdrawal from offensive stimuli (Rozin et al., 2000). Elicitors of disgust are manifold. Across cultures, humans experience disgust for rotten food, and animal and body products, such as feces, vomit and saliva (i.e., core disgust). Core disgust is functional to food selection and to the protection of the body from potentially harmful substances. Humans, however, also report feeling disgusted in situations where social or moral boundaries appear to be violated. For example, disgust is reported when other demonstrate racism, hypocrisy, and unfairness (i.e. moral disgust), and at the thought of unwanted intimacy with unsavory human beings, such as homeless people or drug addicts (i.e., interpersonal disgust) (Rozin et al., 2000; Harris & Fiske, 2006). One important question is whether the same neural

mechanisms mediate disgust for elicitors from different domains (Schaich-Borg et al., 2008; Chapman et al., 2009). Here, we investigated whether the ventromedial prefrontal cortex (VMPFC) plays a crucial role in mediating emotional reactions of disgust to core, interpersonal, and moral elicitors. Patients with lesions in VMPFC (VMPFC patients), control patients with lesions outside the frontal lobe (non-PFC patients) and healthy individuals considered vignettes requiring to decide whether or not to choose a behavioral option that elicited disgust but resulted in a material gain. Vignettes could elicit core disgust (e.g., whether to eat a pizza with some ants on it if you are starving), interpersonal disgust (e.g., whether to use the sweater of a drug addict if you are cold), moral disgust (e.g., whether to work for a corrupted politician if it will improve your career). For comparison purposes, we also included vignettes that elicited anger (e.g., whether to sit beside a noisy person if that is the only free seat left). We found that VMPFC patients were more likely to endorse behavioral options eliciting interpersonal disgust than non-PFC patients and normal controls. In contrast, VMPFC behavior in scenarios eliciting core disgust, moral disgust, and anger was not different from that of the controls. These results indicate that VMPFC patients had reduced sensitivity to interpersonal disgust, in the face of retained sensitivity to core disgust, moral disgust, and anger. This finding suggests that disgust is not a unitary emotion, and that the mechanisms responsible for mediating different types of disgust may differ. In particular, the VMPFC seems to be crucial to mediate interpersonal disgust, but not other aspects of disgust.

J10

MINDFUL AND AWARE: MEDITATION PRACTICE INCREASES NEUROPHYSIOLOGICAL RESPONSE TO ERRORS

Rimma Teper, University of Toronto; and Michael Inzlicht, University of Toronto-Eastern cultures have long emphasized the importance of meditation practice, citing its numerous benefits. Although the emergence of meditation practice in the Western was initially met with skepticism by scientists and academics, its growing popularity has caused psychologists to look deeper. This, in turn has fuelled numerous studies that have demonstrated the various positive outcomes of meditation, such as improved attentional control (Jha, Krompinger, & Baime, 2007), and reduced stress levels (Tang et al., 2007). Although several experiments have tried to pin down the biological processes underlying meditation, it seems as if a crucial piece of the neural puzzle is missing. The goal of the current research program was to investigate the role of the error-related negativity (ERN) in meditation practice, and how this event-related potential links meditation expertise to behavioural outcomes, such as improved self-control. The ERN has been localized to the anterior cingulate cortex, a brain region that is responsible for executive control (Botvinick, Cohen & Carter, 2004), and is generally thought to reflect the preconscious monitoring of errors or uncertainty (Ridderinkhof, Ulsperger, Crone, & Nieuwenhuis, 2004). Specifically, the ERN is thought to reflect an affective response to errors, and occurs approximately 100 ms after an error is made. Higher trait ERN has been linked to a higher GPA (Hirsh & Inzlicht, 2009), and better Stroop task performance (Inzlicht & Gutsell, 2007). For the current study, meditators with at least one year of meditation experience, as well as age-matched controls were recruited to participate in an electroencephalogram (EEG) study. All participants completed a colour-naming Stroop task while we recorded EEG activity in the ACC. Meditators exhibited a higher ERN in response to errors on the Stroop task and actually made fewer errors than their non-meditating counterparts. Further analyses revealed that the amount of meditation experience, as well as number hours spent meditating per week were both significantly correlated to a higher ERN in response to errors, even when controlling for level of education, and religiosity. These results suggest that meditators are better able to attend to

the errors they make, resulting in improved performance on tasks of self-control.

J11

THE NEURAL CORRELATES OF INDIVIDUATED JUDGMENTS

Jennifer Kubota, New York University; and Tiffany A. Ito, University of Colorado at Boulder- N200s have been conceptualized as reflecting deeper encoding of familiar stimuli. We hypothesized that this deeper encoding might serve as a precursor to more individuated processing. To assess the neural correlates of individuation, participants were presented with photos of Black and White males along with four pieces of aggressive or non-aggressive information from 4 different scenarios. Participants judged the likelihood that the individual behaved aggressively in a fifth scenario. In a second task, participants viewed pictures of different Black and White faces while ERPs were recorded. We calculated the correlations between N200s and use of individuating information (i.e. use of the four pieces of aggressive information given about each target) and use of race (i.e. use of visual category information over and above individuating information) in the aggression task. Participants relied on the aggressive information and reliance on this information did not differ for Black and White targets. In terms of ERPs, at the mean level participants differentiated targets by racial category. However, the more attention that was paid early on, as indexed by overall N200 amplitudes, the more individuals relied on individuating information for both Black and White targets. In addition, individuals who explicitly report that African Americans are more aggressive than White Americans use race over and above individuating information and this effect is in part mediated by ingroup favored encoding at the N200. These findings suggest that there exists a relationship between N200s (early attention) and individuation and that this effect is tempered by the stereotypes brought into the encounter. Thus, if N200s serve a catalytic function in individuation, then increasing neural encoding to outgroup members at the N200 might increase individuation of outgroup members who are typically individuated to a lesser degree than ingroup members. Under certain circumstances, impression formation goals can alter the impressions formed of outgroup targets. In a second study, deeper encoding of outgroup targets was encouraged by use of a perspective-taking manipulation. In this study, participants viewed pictures of different Black and White faces while ERPs were recorded. Taking a first-person perspective of a target is thought to trigger referential thought and should encourage greater perceived similarity. For participants who wrote an essay in the first person about a Black and a White individual, there was no difference in attention to targets as a function of race at the N200. For participants who wrote an essay in the third person about a Black and a White individual, participants differentiated targets by racial category at the N200. These two studies suggest that early attention that occurs within 200 ms of viewing a person relates to the application of individualized information. In addition, differentiation by racial category that is typically observed at these early ERP components can be changed through impression goal manipulations.

J12

NEURAL BASES OF TRUST FOR INGROUP AND OUTGROUP MEMBERS

Katie Rotella, Northwestern University; Jennifer A. Richeson, Northwestern University; Jason M. Scimeca, Northwestern University; and Joan Y. Chiao, Northwestern University- Much social psychological work has found that ingroup members are favored over outgroup members, and accorded a greater degree of trust, although these differences are often based in ingroup "love" rather than outgroup "hate." It is possible that group membership leads to preconceived notions of how likely a partner is to reciprocate one's

goodwill. Prior neuroimaging research has found greater activity in the ventral striatum (VS) when learning whether or not to trust people of high, low, or unknown moral character. By contrast, greater activity within anterior cingulate cortex (ACC) is observed when people chose to trust partners perceived as of low relative to high moral character.

Here we examine the psychological and neural basis of economic trust with religious ingroup and outgroup members, using functional magnetic resonance imaging (fMRI). Twelve Jewish, male participants played 24 rounds of an economic trust game with partners of Jewish, Christian and unknown religious identity (control partner). Importantly, each partner practiced a 50% reciprocation rate when participants chose to trust. Before playing the economic game, participants rated each partner as equally likely to play in a trustworthy manner, and following play rated each partner as equally trustworthy. Indeed, although participants accurately estimated that each partner had reciprocated to an equal degree (and at the 50% rate), a repeated-measures ANOVA revealed that participants trusted ingroup members significantly more than outgroup and control partners. When deciding whether or not to trust the outgroup (but not ingroup) partner, participants showed greater ACC activation on trials in which they ultimately decided to trust (the stereotype-inconsistent decision), suggesting that the decision to trust outgroup members engenders more cognitive conflict, a further signal that individuals are reluctant to trust the outgroup. After learning whether the partner decided to reciprocate their trust or, rather, to defect, differential activation was observed in the caudate nucleus (CN), but, interestingly, only for the behavior of the ingroup partner. These results suggest that although neural feedback mechanisms more adequately track the trust behavior of ingroup members, it is cognitively “easier” to trust such partners, and this may result in trust biases favoring ingroup members.

J13

NEURAL UNDERPINNINGS OF THE PROVISION OF SOCIAL SUPPORT- *Tristen K. Inagaki, University of California, Los Angeles; and Naomi I. Eisenberger, University of California, Los Angeles*

-Although research has demonstrated a robust relationship between social support and improved health outcomes, most have assumed that these benefits stem from the receiver of support. However, new research suggests that the act of giving support may be just as important as receiving support (Brown et al., 2003). Still, little is known about the processes associated with support giving that contribute to beneficial health outcomes. One possibility is that giving support is both emotionally rewarding for the support giver and reduces the giver's own distress from knowing another is in pain. Based, in part, on work displaying activity in the ventral striatum (VS), a reward-related neural region, in response to voluntarily giving money to charity (Moll et al., 2006), we hypothesized that support giving would also be associated with increased VS activity. Additionally, animal research suggests caregiving type behavior, including grooming and huddling over newborns dampens activity in regions associated with negative affect and threat detection (Wartella et al., 2003) and this pattern may be similar for humans providing support to others. To this end, couples were recruited to participate in an fMRI session in which the female partner underwent a scan while her partner stood just outside of the scanner and received unpleasant electric shocks. During the scan, females were told that their partners were about to be shocked and were then directed to either hold his arm (support giving) or to hold a ball (no support-giving). In two control conditions, females were told that her partner would not be receiving any shocks and were asked to simply hold her partner's arm (arm alone) or hold the ball (ball alone). ROI analyses evidenced increased VS activity during support giving compared to not support giving and perhaps surprisingly, the arm alone condition. Moreover, regions associated with negative, threatening stimuli showed decreased activity in support giving compared to no support. These results highlight the uniquely beneficial nature of providing support to another and suggest another possible

contributor to the support-health link stems from the giver.

J14

SOCIAL MENTALIZING AND GENERAL REASONING HAVE LITTLE IN COMMON- *Frank Van Overwalle, Vrije Universiteit Brussel-*

It has recently been suggested that brain areas crucial for mentalizing, including the medial prefrontal cortex (mPFC), are not activated exclusively during mentalizing about the intentions, beliefs, morals or traits of the self or others, but also more generally during cognitive reasoning including relational processing about objects. Contrary to this notion, a meta-analysis of over 40 cognitive reasoning tasks demonstrates that the core mentalizing areas are not systematically recruited during reasoning, but mostly when these tasks describe some human agency or general evaluative and enduring traits about humans, and much less so when these social evaluations are absent. There is a gradient showing less mPFC activation as less mentalizing content is contained in the stimulus material used in reasoning tasks. Hence, it is more likely that cognitive reasoning activates the mPFC because inferences about social agency and mind are involved.

J15

SOCIAL REASONING IN PSYCHOPATHY- *Elsa Ermer, University of New Mexico; and Kent A. Kiehl, University of New Mexico-*

Psychopaths show a profound lack of morality and behavioral controls in the presence of intact general intellectual functioning. Two hallmarks of psychopathy are the persistent violation of social contracts (i.e., cheating) and chronic, impulsive risk-taking. These behaviors present a puzzle: can psychopaths understand and reason about what counts as cheating or risky behavior in a particular situation? We tested incarcerated psychopaths and non-psychopaths reasoning about conditional rules using the Wason selection task. Subjects read stories describing a social exchange, precautionary, or descriptive rule and responded yes or no to whether various instances were possible violations of that rule. Consistent with hypotheses, psychopaths, compared to matched non-psychopaths, showed significant impairment on social exchange and precautionary rules, but not descriptive rules. Incarcerated non-psychopaths performance on social exchange and precautionary rules was comparable to performance in undergraduates. These results cannot be accounted for by differences in intelligence, motivation, or general antisocial tendency. These findings suggest that examination of evolutionarily-identified reasoning processes can be a fruitful research approach for identifying which specific mechanisms are impaired in psychopathy.

J16

NEURAL CORRELATES OF MORAL JUDGMENT IN ADOLESCENTS AND ADULTS- *Carla L. Harenski, The MIND Research Network; Keith A. Harenski, The MIND Research Network; Matthew Shane, The MIND Research Network; and Kent A. Kiehl, The MIND Research Network-*

The neural mechanisms underlying moral judgment have been extensively studied in healthy adults. How these mechanisms evolve from childhood to adulthood has received less attention. Brain regions that have been consistently implicated in moral judgment in adults, such as the prefrontal cortex, undergo extensive developmental changes during adolescence. Thus, their role in moral judgment may change from adolescence to adulthood. In the present study, 51 healthy male participants age 12-53 were scanned with functional magnetic resonance imaging (fMRI) while they viewed pictures that did or did not depict actions considered by most individuals to be ‘morally wrong’, and rated their degree of moral violation severity. Consistent with prior studies, adults age

27 and older (N = 15) showed greater activity in ventromedial prefrontal cortex, temporo-parietal junction, and posterior cingulate when viewing moral vs. non-moral pictures. These activations were significantly greater in the adults compared to adolescents age 18 and younger (N = 15). Adolescents showed increased activity relative to adults in the caudal anterior cingulate. A correlation analysis with all 51 participants showed a robust positive correlation between age and activity in the temporo-parietal junction during the evaluation of moral pictures, and a negative correlation in the caudal anterior cingulate. These results suggest that brain regions utilized in moral judgment change across development.

J17

IT HURTS MORE LOSING TO ANOTHER PERSON THAN TO A MACHINE- *David Liu, University of California, San Diego*
People think and reason about the social world in somewhat different ways than how they think and reason about the physical, mechanical world. There are dissociations in how the brain processes social versus non-social information. However, what exactly are the differences between social and non-social cognition? The domain specificity of social cognition is particularly striking in cases of individuals with autism spectrum disorder who are world-class mathematicians or physicists highly skilled at solving physical and mechanical problems, but fail at solving simple folk psychological problems (Baron-Cohen et al., 1999). What prevents these individuals from harnessing their physical and mechanical problem-solving skills to solve folk psychological problems? We propose that part of what differentiates social from non-social cognition is that the affective stakes are much greater for cognition in the social context. To test this hypothesis, we compared participants' neural responses in matched social versus non-social conditions. We examined participants' error-related negativity/feedback-related negativity (ERN/FRN), a fronto-central component of the human event-related brain potential (ERP) associated with detection of errors or with feedback stimuli indicating negative outcomes; the FRN reflects a monitor/evaluation neural system's detection of negatively-valenced events. For example, Gehring and Willoughby (2004) observed a negative deflection following feedback of monetary loss. In the current study, ERP data were recorded while participants played multiple trials of a competitive game (rock paper-scissors) on the computer (gaining money on win trials, losing money on lose trials, and gaining/losing nothing on tie trials). On half of the trials, the participants were told that they were playing against another person on another computer next door, and on the other half of the trials, the participants were told that they were playing against the computer. In reality, participants played against the computer in both conditions, thus completely controlling away any differences between the conditions, other than the participants' belief that they were interacting with a social versus non-social system. We predicted that we would observe larger FRN amplitude in the person condition compared to the computer condition. That is, losing to a person produces a greater negativity than losing the same monetary amount to the computer. We collected and analyzed ERP data from 17 adult participants. All participants were right-handed with normal or corrected-to-normal vision. The observed FRN to the loss condition compared to the gain condition was observed over the fronto-central scalp region, following previous ERN/FRN studies. As predicted, the amplitude of the FRN was significantly greater when losing in the person condition than when losing in the computer condition. The results suggest that a critical difference between social and non-social cognition is that the affective stakes are greater when interacting with people and processing social information. Further studies are needed to determine why the affective stakes are greater when interacting with people. Possibilities include greater shame and

embarrassment losing in front of others than along with a computer or a greater sense of competition against people versus machines.

J18

REWARD SALIENCE OF FOOD TYPES DURING A CATEGORICAL STROOP TASK-A PRELIMINARY INVESTIGATION- *Gayathri Pandey, Columbia University; William Hinkle, Columbia University; Paul Trowbridge, Columbia University; and Joy Hirsch, Columbia University-* Food choice and eating behavior in humans are not merely influenced by internal states to maintain homeostasis, but are also driven by external variables such as physical properties of food that can be rewarding. Palatability itself is proportional to the pleasure experienced when eating a particular food. In comparison to low-caloric, high-caloric foods have been shown to be more rewarding, thus leading to these foods being consumed more for the pleasure value they impart rather than merely for nourishment. The influence of palatability on appetite and food intake in humans has been investigated in several studies, leading to conclusions that different food types are processed differently in the brain. The present study aims at understanding the effect on selective attention of two primary reward categories: high-caloric foods (sweets) and low-caloric foods (vegetables). Given the differential processing of high-calorie and low-calorie foods, based on their reward salience, this study investigates the processing bias, if any, of such food types within a categorical Stroop paradigm. The study employs picture-word compounds of the two food categories ('sweets' and 'veggies'), with 4-food images/words from each category. An example of a category congruent picture-word compound is a picture of a vegetable with the name of another vegetable superimposed on the image. A category incongruent compound example, on the other hand, is a vegetable image with a sweet desert-like food superimposed. There were two target conditions in this Stroop task. In the first condition, the images were the target and the superimposed words were distracters while the second condition reversed target and distracter. Based on the condition, the subject had to categorize images/words as either 'sweets' or 'veggies'. The experiment was built and presented using Matlab/PsychToolBox. Only the behavioral investigations are reported here. A pilot was run on 8 healthy normals. Subjects were trained and then completed the two study conditions in a counter-balance order. Reaction times were analyzed using a hierarchical regression model, within and between subjects, for (1) a target condition effect (target = word or image) (2) category congruency effect and (3) reward category effect (sweets v. vegetables). (1) Pilot results showed that the two target conditions differed significantly ($P < .01$) in their reaction times with image targets eliciting faster reaction times. (2) In the word target condition, reaction times from incongruent stimuli were significantly slower than congruent stimuli ($P < .01$). When word was the target, the overall mean reaction time was substantially slower for all subjects. (3) In the word target condition, reaction times to incongruent sweet distracter images were slower than to the vegetable distracter images, though this difference did not reach significance. Final results will be reported with a minimum sample of 20 subjects. If selective attention is a natural phenomenon that occurs based on individual priorities, then trying to understand how preferred rewards may be instrumental in such an adjustment of selective attention is also very crucial. Rewards drive behavior whether they are internal or external. Understanding how external food rewards influence selective attention can help explain why some people find it difficult to avoid junk foods and struggle with obesity issues, while some are able to ward off these temptations.

J19

IS OBTAINING A REWARD DIFFERENT FROM AVOIDING AN AVERSIVE OUTCOME? SEPARABLE EFFECTS OF STIMULUS AND OUTCOME EVALUATION AND THEIR INTERACTION-

Samantha M. Mowrer, The Ohio State University; Andrew A. Jahn, The Ohio State University; Amir M. Abduljalil, The Ohio State University; and William A. Cunningham, The Ohio State University- Processing and evaluating information in one's environment is crucial for guiding decisions and actions. Much research has been dedicated to decomposing various aspects of evaluation and determining how these sub-processes are carried out at the neural level. The current literature suggests evaluations of stimuli and one's actions with respect to these stimuli are carried out in distinct areas of orbitofrontal cortex (OFC; Cunningham, Kesek, & Mowrer, 2009). Further, the area of OFC representing outcomes of actions does so in a stimulus-independent manner. That is, this region responds generally to positive outcomes, both receiving rewards and avoiding punishments (Kim, Shimojo, & O'Doherty, 2006). Although the processing of stimuli and outcomes can be considered independently, we investigated whether representations of outcomes could also be dependent on the specific type of outcome received. Might additional, more abstracted processes be recruited to differentiate receiving a reward versus successfully avoiding a punishment? During fMRI scanning, participants completed a task in which they could experience gains, losses, non-gains, and non-losses. Participants responded with a specific button press to shapes representing potential gains and losses, each of which carried successful (i.e., gains and non-losses) or unsuccessful (i.e., losses and non-gains) monetary outcomes. Consistent with previous findings, results showed a posterior region of OFC was involved in stimulus evaluation, showing the greatest activation to potential gains, whereas an anterior region of OFC was involved in outcome evaluation, differentiating successful and unsuccessful outcomes regardless of stimulus type. Thus, distinct regions appear to differentiate between potential and actual rewards. While posterior OFC may signal a potentially rewarding stimulus, anterior OFC may encode any rewarding outcome. Further, the stimulus x outcome interaction revealed that an anterior portion of dorsal anterior cingulate (ACC) responded to rewards and punishments in a more nuanced, stimulus-dependent manner. This region responded with the greatest activity to successful gains, thus differentiating a very specific type of success. Although some neural regions such as anterior OFC may process gains and non-losses similarly, others such as dorsal ACC may not. This suggests that some neural regions may simply discriminate between rewards and non-rewards, whereas other regions further differentiate this signal with respect to particular types of rewards. Thus, a reward can be experienced differently depending on the kind of reward it is.

J20

AMYGDALA AND ORBITOFRONTAL CORTEX ACTIVATION TO EMOTIONAL FACIAL EXPRESSIONS IN BIPOLAR II DEPRESSION-

Nathalie Vizueta, University of California, Los Angeles; Jennifer D. Townsend, University of California, Los Angeles; Teena D. Moody, University of California, Los Angeles; Jeffrey Fischer, University of California, Los Angeles; Salvatore Torrisi, University of California, Los Angeles; Roxanne E. Vasquez, University of California, Los Angeles; Catherine Hegarty, University of California, Los Angeles; Susan Y. Bookheimer, University of California, Los Angeles; Lori L. Altshuler, University of California, Los Angeles, VA Greater Los Angeles Healthcare System- Bipolar II Disorder (BD II) is a sub-type of Bipolar Disorder in which abnormally low mood states (depression) create significant impairment, while at least one abnormally elevated mood episode (hypomania) is present but not severe enough to cause impairment. Despite the associated morbidity, BD II depression remains understudied. Here, we examined differences in neural activation between medication-free

BD II depressed subjects and control subjects using an fMRI face matching task that has been shown to engage the corticolimbic network (Hariri et al., 2000). We hypothesized that, relative to controls, BD II depressed subjects would show reduced amygdala activity and heightened orbitofrontal cortex (OFC) activity, opposite to the direction found in mania. 3T fMRI data were collected for 17 BD II depressed subjects (7F, age=36.0 ± 8.7) and 17 controls (7F, age=38.5 ± 9.7) during performance of an emotionally stimulating test condition (matching affectively charged faces) and a control condition (matching geometric forms). The match emotion blocks were contrasted against the match forms blocks within groups, because this contrast has been shown to reliably activate the amygdala (Hariri et al., 2000; Altshuler et al., 2008). Whole brain statistical analyses for within- and between-group were carried out using FSL's FEAT. Functionally-defined regions of interest (ROIs) in the right and left amygdala and in the right and left BA47 region of the OFC were created by dilating a 5mm sphere around the maximally activated voxels from the random-effects analyses in the control group. For each subject, the time course from each ROI was extracted separately and used to calculate the mean percent signal change using FEATQuery. Correlational analyses were performed between these ROIs and clinical measures (e.g., HAMD scores, illness duration, and number of months in current depressive episode). Significant bilateral amygdala and bilateral inferior frontal cortex (BA47) activation was found within patient and control groups during the match emotion condition. Within-group analyses further revealed that control subjects activated other typical emotion and face processing regions including bilateral fusiform gyrus, bilateral medial frontal gyrus (BA6), cingulate, bilateral parietal regions (BA40), and bilateral hippocampus. Bipolar depressed subjects activated similar regions in bilateral fusiform gyrus, left MFG (BA6), right BA40, and bilateral hippocampus ($z > 2.3$, $p < .05$, corrected). Random effects between-group analyses revealed a significant reduction in right BA47 and bilateral amygdala in BD II depressed subjects compared to controls ($z > 2.0$, $p < .05$, corrected). In the reverse comparison, we did not find areas of significantly greater activation in BD II depressed subjects relative to controls. Furthermore, we did not find significant associations between any of our clinical symptom severity measures and activations in the amygdala or BA47. These findings suggest that BD II depressed subjects exhibit dysfunction of the frontolimbic circuit, a network of regions important in emotion processing and emotion regulation. While the reduction in amygdala activity observed in BD II depression is opposite to the direction seen in mania and may be state-dependent, the hypoactivation of BA47 is consistent with results seen in hypomania/mania and may represent a trait-related finding.

J21

THE EFFECT OF SOCIAL EXCLUSION ON THE SENSITIVITY TO VOCAL TONE: AN ERP STUDY

Asuka Murata, University of Michigan; Sam Boas, University of Michigan; Sasha Kimel, University of Michigan; and Shinobu Kitayama, University of Michigan- In conversations, vocal tone reveals the speaker's relational attitudes. Perceiver spontaneously allocates more attention to vocal tone, resulting in sensitivity to any incongruities between verbal contents and vocal tone. N400, which is one of ERP component and reflects semantic incongruity, is an effective brain index to examine this vocal sensitivity in the vocal Stroop task. Previous research has shown that larger N400 like negative potential appeared when the word meaning was incongruous with the background vocal tone, relative to when the two were congruous. People have an inherent need to belong, and it is theorized to be a need secondary only to those of health and safety. Accordingly, social exclusion alters our emotional and cognitive states. At present, however, not much is known how the social exclusion modulates individuals' vocal sensitivity to incongruities

of word meaning and vocal tone. To investigate whether the experience of social exclusion increases or decreases vocal sensitivity, we examined the effect of social exclusion on N400 in the vocal Stroop task. The participants went through a cyber ball paradigm as a social exclusion manipulation. In the cyber ball paradigm, they were asked to complete a mental visualization task with two other participants via the internet. In reality, these two other participants were computer-generated confederates with names that were of the same gender as the participant, whose name also appeared on the screen. Each participant was randomly assigned to one of two groups: the exclusion group, in which participants received only a couple of throws at the beginning and none afterward, and the inclusion group, in which the participants received one third of the throws. Next, all participants performed the vocal Stroop task. They listened to two blocks of the same 32 words, half of which are pleasant and the other unpleasant. Each word was presented in either a positive or negative vocal tone. The combination of word meaning and vocal tone then resulted in four distinct types of stimuli: positive meaning-positive tone, positive meaning-negative tone, negative meaning-positive tone, and negative meaning-negative tone. The participants were instructed to judge whether the meaning of the word was pleasant or unpleasant, while ignoring vocal tone. As a result, inclusion group showed larger N400 to incongruities of word meaning and vocal tone. Comparatively, exclusion group did not show the incongruent effect on N400. These results indicate that the participants in the social exclusion group showed less vocal sensitivity to the incongruities of word meaning and vocal tone, when compared to those in the inclusion group. The theories of emotional numbing and cognitive concussion may best address our finding. The theory of emotional numbing suggests that events such as social rejection or exclusion may lead to a state of numbness, both physically and emotionally. In addition, it is possible to explain the lack of N400 in the exclusion condition as simply the inability to process complex stimuli, resulting in reduced processing.

J22

ARE PARTICIPANTS IN NEUROIMAGING RESEARCH MORE INDEPENDENT? *Steven Tompson, University of Michigan, Ann Arbor; Hannah Faye Chua, University of Michigan, Ann Arbor; Shihui Han, Peking University; and Shinobu Kitayama, University of Michigan, Ann Arbor-* Sample sizes in neuroimaging research are typically small, which can pose serious interpretive problems unless there is reasonable assurance of the representativeness of research subjects who are recruited. On the basis of recent cultural psychological work that indicates independent social orientation significantly influences preference for high-risk/high-return activities, we hypothesized that there will be a systematic sampling bias such that independently-oriented individuals are more likely to participate in an fMRI experiment, inasmuch as fMRI research is viewed as relatively unknown and riskier than most other research but also as typically providing higher payouts than behavioral research—thus high-risk/high-return. In the present work, we used fliers to recruit participants (all Americans who were born in and grew up in the United States) for a study on “personality and music preferences.” During the subject recruitment no mention was made of neuroimaging. After completing personality questionnaires in the study, including an independent social orientation measure, participants were told that there would be a second part to the study and they had the option to participate in the second part. The second part would take place on a later date and involve an fMRI scan. Participants would earn \$12 for the initial session and were offered an additional \$30 for participating in the fMRI portion of the study. Overall, 80% of the 65 participants who participated in the initial study session agreed to participate in the fMRI study. As expected, the participants who agreed to participate in the fMRI portion of the study were significantly more independent than

participants who declined ($M = 3.80, SD = .53$; and $M = 3.38, SD = .70$, respectively), $F(1, 63) = 5.67, p < .03$, *Cohen's d* = 0.68. Additionally, no group differences were observed on other personality measures including interdependence, promotion or prevention focus, self-consciousness, self-esteem, or desire for self-consistency. The eligibility to participate in an fMRI study (based on health, safety, or psychiatric factors) was not associated with any personality measures. Furthermore, there were no significant differences in willingness or eligibility to participate based on gender or ethnicity. These results suggest the existence of a robust sampling bias in neuroimaging research. Because independent social orientation is known to be associated with a number of psychological characteristics including self-concept, mode of thought, attention, and motivation, among others, far more attention is called for to ensure the representativeness of research subjects in neuroimaging research.

J23

EMOTION RECOGNITION IN MUSIC AND BASAL GANGLIA DYSFUNCTION: A STUDY OF PARKINSON'S DISEASE- *César F. Lima, University of Porto, Portugal; Carolina Garrett, University of Porto, Portugal; and São Luís Castro, University of Porto, Portugal-* Neuroimaging and clinical studies suggest that basal ganglia are involved in emotion recognition abilities. One important source of evidence comes from studies of Parkinson's Disease (PD), a neurodegenerative disorder marked by a depletion of dopaminergic input to the striatum. PD patients show impaired recognition of emotions in facial expressions and in speech prosody, but it is still unclear whether the impairment is observed across all modalities and emotions. Music is a powerful tool to investigate emotion-related processes – it is capable of communicating diverse emotional qualities and of eliciting strong emotional responses. Are basal ganglia part of the neural network subserving emotion recognition in music? To examine this question, we tested a group of PD patients ($N = 15$) in the early stages of the disease (stages I to III, according to the Hoehn and Yahr scale) and without dementia, as assessed by the Mini-Mental State Examination. A background neuropsychological evaluation was conducted covering executive functions, working memory, verbal intelligence, depression signs, and audiometric screening. In two experimental tasks, patients were presented with short music excerpts composed to express happiness, peacefulness, sadness and fear/threat (Vieillard et al., 2008). In the first task, they rated how much each music excerpt expressed each of the four emotions on 6-point intensity scales. In the second task, they performed a forced-choice emotion identification. Patients were also assessed for non-emotional music processing abilities with the scale, rhythm and meter tests of the Montreal Battery of Evaluation of Amusia (MBEA; Peretz, Champod, & Hyde, 2003). For the rating task, results revealed that patients provided higher intensity scores to the intended than to the non-intended emotions of the excerpts. Performance on this task correlated with the scale and rhythm tests of the MBEA, indicating that perceptuo-cognitive musical abilities might be associated with the perceived intensity of musical emotions. In the forced-choice task, participants were able to correctly identify the four emotions well above the chance-level. Therefore, basal ganglia dysfunction does not preclude the perception of musical emotions. In order to determine whether patients exhibit an abnormal performance, they will be compared with a group of healthy controls matched for age, sex and education. This study will contribute to better specify the functional role of basal ganglia for emotional processing, and to inform clinical approaches that use music as a rehabilitation device in PD.

THE INFLUENCE OF GROUP MEMBERSHIP ON ADVICE TAKING- *Mirre Stallen, Erasmus University Rotterdam, Radboud University Nijmegen ;Ale Smidts, Erasmus University Rotterdam; and Alan Sanfe, Radboud University Nijmegen-* When making a decision, people often look to others for advice. At work, for example, people are likely to consult their colleagues when solving a difficult task. Similarly, at home people may well ask their peers or parents about their opinions before making an important decision. Interestingly however, advice is not always used. Even when the advice in question is valuable people sometimes decide to ignore it. To date, there is little knowledge on what factors influence advice use. The aim of this study was to investigate how the social relationship between an advisor and a decision-maker affects advice use. More specifically, we examined whether the sense of belonging to a particular group influenced the acceptance of advice. Are people more willing to accept advice when given by an in-group member instead of an out-group member? And, if so, what neural mechanism is underlying the susceptibility to advice from in-group members? To answer these questions, we conducted a behavioral (n=35) and an fMRI study (n=19) with the same experimental paradigm. At the start of the experiment, participants were categorized as members of a group on the basis of a trivial performance criterion. Thereafter, participants took part in a decision task in which they viewed an array of dots, ranging from 5 to 30, randomly displayed on a screen for 1500 milliseconds. Their goal was to simply estimate the number of dots as accurately as possible. However, before indicating their response, the estimation of another participant, the "advisor", was shown. This advisor either belonged to the same group as the participant (in-group advisor) or to a different group (out-group advisor). Unknown to the participants, the advice was predetermined so that advice was similar for in-group and out-group advisors. Results of the behavioral study demonstrated that advice use was influenced by the group identity of the advisor. Participants followed the advice more often when the advisor was an in-group member than when the advisor was an out-group member. In the imaging experiment, however, we did not find this behavioral effect, but we did see that advice coming from an in-group advisor was processed differently than advice of an out-group advisor. Exposure to in-group advice resulted in an increase in activity in the medial orbitofrontal cortex, caudate and occipital cortex, suggesting that, even when advice is not used, advice of a group member is processed as more favorable and more salient than advice given by an advisor who has no shared identity.

J25

SUBLIMINAL FACE PRIMING MODULATES ERN IN CULTURE-SPECIFIC WAYS- *Jiyoung Park, University of Michigan; Emre Demiralp, University of Michigan; William J. Gehring, University of Michigan; and Shinobu Kitayama, University of Michigan-* Previous work suggests that decisions made in private (in the absence of social eyes) or in public (in the presence of social eyes) have varying motivational significance depending on cultural backgrounds of participants. It has been suggested that individuals with independent selves (e.g., European Americans) invest themselves on decisions that are made in private because the private decision is perceived as expressive of the personal self. However, individuals with interdependent selves (e.g., East Asians) invest themselves on decisions that are witnessed by others because the public decision can implicate public aspects of the self such as the self's social reputation. Currently, however, little is known on brain mechanisms underlying this cultural difference. To investigate neural mechanisms underlying this effect, we examined the error-related negativity (ERN), an event-related brain potential that is observed when an error is made in a choice reaction time

task. The magnitude of the ERN is known to increase as a function of the motivational significance of an error. Because when people are exposed to human faces, they may categorize their decision to be public, under other's scrutiny, we predicted that the ERN would be strong after the face priming for Asians, whereas the ERN would be weak after the face priming for European Americans. Furthermore, previous work suggests that stimuli presented subliminally can have a considerable influence on some basic psychological processes. Building on this literature, we further predicted that perception of social eyes can be accomplished without conscious awareness even when the faces are presented subliminally. Twelve Asians and sixteen European Americans performed a flanker task while the EEG was recorded with 64 BioSemi active electrodes. Throughout the task, participants were presented with sets of five arrowheads and instructed to respond with the left or right hand according to the direction of the center arrow. We used backward masking to present priming images subliminally. Each trial began with a brief presentation (16ms) of either a face or a house image, and a mask stimulus was followed immediately afterward. Then, the target arrows appeared. The EEG recordings for correct and incorrect responses were averaged separately for CRN (correct-response negativity) and ERN. To control for any extraneous effects of priming on both ERN and CRN, we analyzed the relative magnitude of ERN (vs. CRN). As predicted, the relative ERN was larger in the face priming trials than in the house trials for Asians whereas the pattern was non-significantly reversed for European Americans. The interaction between culture and priming was significant. Moreover, the ERNs in the face priming trials were reliably predicted by participants' perceptions of social orientation (i.e., interdependence vs. independence) of people around them. Participants who perceived that most of their fellows are interdependent showed larger relative ERN in the face trials than in the house trials compared to those who perceived that their cultural members are less interdependent. These results are discussed in terms of culture and brain interaction.

J26

EMOTIONAL AWARENESS AND VERBAL MEMORY ARE POSITIVELY ASSOCIATED IN HEALTHY OLDER ADULTS- *J.J. Hartman, University of Iowa; J.S. Yuska, University of Iowa; D. Tranel, University of Iowa; S. Paradiso, University of Iowa; N.L. Denberg, University of Iowa-* Awareness of one's own and others' emotional experiences is critical to adaptive social functioning. In late life an open question concerns the extent to which emotional awareness is related to cognitive functioning. Here, awareness of self and others' emotional experience was examined in relation to cognitive ability as a proxy for brain health. Seventy community-dwelling older volunteers negative to neurological and psychiatric screening (56% female, mean age = 73.8 years, SD = 9.0; range = 60-95 years; mean education = 16.0 years, SD = 2.7; Performance IQ = 115.9; Verbal IQ = 117.4) completed the Levels of Emotional Awareness Scale (LEAS; Lane et al., 1990), a performance task in which participants provide verbal descriptions of their own anticipated feelings and those of another person for differing scenarios. Each response is scored for emotional complexity (i.e., use of emotional terms to describe the emotional reactions of self and other in the scenario), and higher scores reflect stronger emotional knowledge and emotional awareness. Participants also completed a comprehensive battery of norm-referenced neuropsychological measures assessing multiple cognitive domains (attention/working memory, anterograde memory, language, visuospatial, and executive functioning). LEAS performance was examined for associations with age, sex, and cognitive functioning. Neither age ($r = -.15, p > .05$) nor sex were significantly related to LEAS performance ($t = -.72, p > .05$). LEAS performance was directly associated to a measure of anterograde verbal memory (Rey Auditory-Verbal Learning Test's 30-minute delayed recall: $r =$

.44, $p < .0001$). There were no significant relationships between the LEAS and other domains of cognitive functioning. Among older volunteers with high cognitive and daily functioning, emotional awareness did not correlate with age and was not associated with sex. In spite of the narrow age range (not including young and mature adults), a significant association between emotional awareness and anterograde memory was found, indicating perhaps that individuals with more intact memory systems rely on better systems for verbally processing emotions. Future studies may examine the extent to which emotional awareness may protect the aging of the brain, especially regions that are vulnerable to interpersonal stress, such as the hippocampus and other medial temporal lobe structures (Gold & Chrousos, 1999).

J27

TRAIT ANXIETY MEDIATES EMOTION'S EFFECTS ON ATTENTION AND PERCEPTION - Emma Ferneyhough, New York University; Damian A. Stanley, California Institute of Technology; Elizabeth A. Phelps, New York University; and Marisa Carrasco, New York University- Anxiety modulates the capture of attention by emotion, prolonging reaction time to detect a probe. What has yet to be shown is whether anxiety may also modulate perceptual abilities. Previously it has been demonstrated that emotion potentiates the benefit of attention on low-level perceptual performance (e.g., contrast sensitivity). Here we investigated whether: 1) there is a corresponding cost of emotion and attention on contrast sensitivity; and 2) anxiety modulates this perceptual cost. 45 naïve observers participated in the study. Non-predictive precues directed exogenous (involuntary) attention to a visual task stimulus. On each trial, precues were grayscale faces with either neutral or fearful expressions and were presented to the left, right, or both sides of central fixation ($3.5 \times 4.6^\circ$, 8° eccentricity) for 80 ms. After a 53 ms inter-stimulus interval, a target ($3 \times 3^\circ$, 1.5 cpd Gabor patch, 4° eccentricity) was displayed on one randomly-selected side and a distracter was presented on the other side for 40 ms. Exogenous attention was thus randomly cued toward the target (valid cue), distracter (invalid cue), or distributed over both locations, yielding a total of six conditions (2 types of precue * 3 validity conditions). Observers had 2 s to discriminate the target's orientation (6° left or right from vertical). Stimulus contrast varied in 7 log steps, chosen individually per observer to equate task difficulty. Thus, there was a total of 672 trials, or 16 trials per data point, per observer. For each of the six conditions, a psychometric curve was fit to the performance data as a function of stimulus contrast. Contrast sensitivity was defined as the contrast required to get 67% correct on the task, and compared across emotion and attention conditions. After the experiment, observers completed self-reported measures of state- and trait-anxiety (PANAS, STAI). We found that emotion significantly interacted with attention in a manner that reflected trait- but not state-anxiety. Consistent with previous research, distributed-fear cues significantly improved sensitivity compared to distributed-neutral cues. Although valid- and invalid-fear cues did not consistently modulate sensitivity across observers, individual differences in anxiety had a significant negative correlation with the effect of invalid emotional precues (fear minus neutral sensitivity). Increased anxiety was associated with a greater emotion-induced cost, consistent with previous probe detection tasks showing that highly anxious individuals are impaired at disengaging their attention from threatening stimuli. Interestingly, only female observers showed both benefits and costs of emotion, consistent with sex differences in facial expression recognition and prevalence of anxiety disorders in the general population. Overall, our results provide further evidence that attention capture by an emotional stimulus is mediated by anxiety, and this modulation can be seen at the level of perception.

J28

WAVES OF REGRET: A MEG STUDY OF EMOTION AND DECISION-MAKING- Cinzia Giorgetta, University of Trento; Alessandro Grecucci, University of Trento; Nicolao Bonini, University of Trento; Giorgio Coricelli, University of Trento, University of Lyon, France; Gianpaolo Demarchi, University of Trento; Cristhoph Braun, University of Trento; Alan G. Sanfey, University of Trento, Radboud University Nijmegen, University of Arizona- Recent fMRI studies (e.g., Coricelli et al., 2005; Chua et al., 2009) have investigated brain activity involved in the role of regret while playing a standard gambling task, with these studies showing that the dorsal anterior cingulate cortex, medial OFC and anterior hippocampus (Coricelli et al., 2005) all contribute to the experience of regret. In these experiments gambles with different values and probabilities were used, and regret was studied by manipulating the feedback the subject saw: full-feedback (regret: where subject sees the outcomes from both the chosen and unchosen gamble) vs. partial-feedback (disappointment: where subject only sees the outcome from chosen gamble). However, an alternate conceptualization of regret is that it is characterized by the feeling of responsibility for the negative choice outcome (Gilovich & Melvec, 1994), whereas disappointment is related to external responsibility for choice outcome (Frijda et al., 1989). Therefore, in this experiment we tested this hypothesis by disentangling regret from disappointment by manipulating the responsibility for the choice: in one condition choice was made directly by subjects themselves (regret), and in the other the choice was made by a computer (disappointment). In both cases, we used a full feedback design. In the task, 16 participants played a total of 480 trials each while undergoing whole head magneto-encephalography (MEG). On each trial one option had smaller, safer outcomes, with the other offering larger, riskier outcomes. After making their choice, subjects saw the outcomes (either gain or loss) from chosen and unchosen options in two separate time windows. The combination of responsibility and outcome resulted in four conditions: regret (human-loss), disappointment (computer-loss), rejoice (human-win) and elation (computer-win). Event related fields (ERF) were measured using an Elekta Neuromag Vectorview® MEG scanner (306 channels). Data were sampled at a rate of 1kHz, and subsequently analyzed with SPM8 MEG toolbox. The baseline was removed using the average activity in the -100 - 0 ms time window. Furthermore, data were bandpass filtered in the frequency range of 2 to 10 Hz. Eyeblinks were detected by visual inspection and trials containing eye artifacts were discarded. Grand averages across subjects were computed and compared between different conditions. ERF waveforms presented a stronger M150 for regret relative to disappointment, with negative magnetic field amplitudes at sensors located over left temporal regions and corresponding positive over right temporal regions stronger. This component was followed by a characteristic polarity reversal. Source imaging localized the corresponding differential evoked potential (regret vs. disappointment) over the temporal-parietal region at maximum peak of 169ms. ERF waveforms presented a similar pattern between regret and rejoice, being stronger for regret. Source reconstruction localized the differential activity over right occipital and left temporo-polar regions with a maximum peak at 140ms. The present study extends the accumulating evidence for neural activity in processing regret in gambling tasks by using magneto-encephalography in this context for the first time. It shows also evidence that regret may be neurally differentiated from other emotions (disappointment and rejoice), with assessment of evoked magnetic fields determining two separate differential activities and localizations.

J29

NEURAL SUBSTRATES OF EMPATHY FOR 'SOCIAL PAIN' AND SUBSEQUENT PROSOCIAL BEHAVIOR- Carrie

Masten, University of California, Los Angeles; Sylvia A. Morelli, University of California, Los Angeles; and Naomi I. Eisenberger, University of California, Los Angeles- Empathy is widely considered to be a foundation of human social experience, and decades of research has emphasized empathy's role as a catalyst for prosocial behavior. Surprisingly, however, neuroimaging research on empathy has not examined empathy for others' social experiences or the neural processes through which empathy results in prosocial actions. In fact, most of the neuroimaging research on empathy has focused on empathy for physical pain rather than empathy for negative social experiences (e.g., Singer, 2006), even though observing negative social experiences is likely to be a more frequent occurrence. In the current study, we used functional magnetic resonance (fMRI) to identify neural regions involved in empathy for a negative social experience—social exclusion—and examined how neural activity in these regions predicted individuals' subsequent prosocial behavior toward the victim of this exclusion. Eighteen participants were scanned while they observed a staged social interaction, in which one person was excluded by two others during an online ball-tossing game. Following the scan, participants sent emails to each of these 'people' that they had observed, and a group of raters assessed how prosocial (e.g., helpful, comforting) the emails were to the excluded victim compared to the non-victims. In addition, participants self-reported their levels of trait empathy. As a whole, findings indicated that the neural regions supporting empathy for social pain may differ from those previously linked with empathy for physical pain (see Singer, 2006). Specifically, observing exclusion (vs. inclusion) activated regions associated with mentalizing (e.g., dorsomedial prefrontal cortex, medial prefrontal cortex, precuneus), and only highly empathic individuals activated both mentalizing regions and social pain-related regions (e.g., anterior insula, dorsal anterior cingulate cortex). One possibility is that observing physical pain triggers an automatic, spontaneous distress response in most people, whereas observing social exclusion might require mentalizing to understand the situation and imagine the victim's pain. Thus, observing social exclusion might only elicit pain-related neural activity among highly empathic individuals. Follow-up region of interest analyses further indicated that activity in two of these regions found to be associated with trait empathy—the anterior insula and the medial prefrontal cortex (MPFC)—predicted subsequent prosocial behavior toward the excluded victim, and activity in the medial prefrontal cortex in particular mediated the link between trait empathy and prosocial behavior. Given the MPFC's known involvement in self-related processing (e.g., Mitchell et al., 2006), it is possible that thinking about how observed others are similar to oneself is an important aspect of empathy that promotes increases in prosocial behavior. In sum, the current study provides an important first step toward understanding individual's experiences of empathy for negative social treatment and why certain individuals make efforts to help and support the victims of these negative social encounters. Understanding the neural links between empathic experience and efforts to help those in need may explain the adaptive role that empathy serves in promoting positive interactions with others.

J30

HIPPOCAMPAL DAMAGE DISTORTS THE UPDATING OF CHARACTER JUDGMENTS- Rachael D. Rubin, University of Illinois; Melissa C. Duff, University of Iowa; Daniel Tranel, University of Iowa; Neal J. Cohen, University of Illinois- As we learn new information about other people, we form and update representations of their character that can profoundly influence how we regard and act towards them. The question of what kind(s) of memory play(s) a critical role in this kind of social processing has received surprisingly little study. On the hypothesis that

declarative memory and thus the hippocampus are required for the formation, maintenance, and updating of relational representations that shape our perceptions of events and the people that participate in them (Eichenbaum and Cohen, 2001; Cohen and Banich, 2003), here we tested the role of the hippocampus in social judgments. In the current study, we assessed the ability of patients with hippocampal amnesia (n=5) to integrate different pieces of socially-valenced information about the action of an individual even within a single trial. In each trial, the amnesics were presented with a headshot of an individual and instructed to make initial ratings about the individual's attributes, including the individual's perceived moral character and trustworthiness. All ratings were made on a 7-point Likert scale (e.g. to the question "How morally GOOD or BAD do you think this person is?" the scale was anchored from 1=very bad to 7=very good). Then, the amnesics were presented with a (neutral) action shot of the individual with either a positive, negative, or neutral narration of the event. In one condition, a filled delay was imposed to disrupt the amnesics' declarative memory for the action of the individual, while in the other condition no delay was imposed. Next, the amnesics were presented with the original headshot of the individual and made final ratings on the same scales. Finally, there were recall and recognition memory probes evaluating the amnesics' memory for the action of the individual at the time of the final ratings. We predicted that even across the events of a single trial, declarative memory about the action of the individual would be critical for the amnesics' final ratings of the individual. That is, only when amnesics retained declarative memory for the action of the individual would their final ratings reflect the valence of the action performed by the individual. The results revealed that amnesics' final ratings were indeed associated with declarative memory for the action of the individual. Only when amnesics had declarative memory for the action as having been positive vs. negative vs. neutral did their final ratings of the individual's attributes change accordingly. Strikingly, the amnesics made exaggerated final ratings relative to matched comparison participants (i.e. more positive or more negative, depending on the valence of the action) when the amnesics' memory for the action of the individual was comparable to comparison participants. These data suggest that the hippocampus and declarative memory are required to integrate information necessary to evaluate the attributes of an individual and make appropriate social judgments.

J31

THE TASK-DEPENDENT IMPACT OF RACE ON EARLY FACE PROCESSING: AN ERP STUDY- Keith B. Senholzi, University of Colorado at Boulder; and Tiffany A. Ito, University of Colorado at Boulder- The N170 ERP component reliably differentiates between face and non-face stimuli, but it is unclear whether the processing indexed by this component is sensitive to differences among faces. Some previous studies suggest that early stages of face processing are insensitive to the race of perceived faces, whereas others show that race-of-face can differentially affect processing. Of importance, the tasks in these past studies were variable. To examine these disparate findings, ERPs were recorded while participants viewed Black faces, White faces, and butterflies and were required to pay particular attention to the race or identity of faces, or make face versus non-face judgments. Task affected N170 sensitivity to race. The N170 was larger for White faces than Black faces, but only for participants who made racial categorizations. Alternatively, the N170 was larger for Black faces than White faces, but only for participants who attended to the unique identity of the faces. These findings suggest that race-of-face can differentially impact face processing at early stages of encoding, but only when race or identity is specifically attended to by individuals.

FRONTO-PARIETAL THETA SYNCHRONIZATIONS FOR PERSPECTIVE TAKINGS FROM SELF-VIEW TO OTHER-VIEW-

Masahiro Kawasaki, Rhythm-based Brain Computation Unit, RIKEN BSI-TOYOTA Collaboration Center; and Yoko Yamaguchi, Rhythm-based Brain Computation Unit, RIKEN BSI-TOYOTA Collaboration Center, Laboratory for Dynamics of Emergent Intelligence, RIKEN Brain Science Institute- Perspective taking, which requires us to switch the self perspective into someone's perspective, plays an important role on social communications, such as understanding and predicting her behavior and intention. This ability is supposed to be processed by well-known human mirror neuron system which is associated with the imitation, mentalizing, and empathy. However, it is not clear how the mental representation from the self view point is mirrored to the transformed representation from the other view point. To address the issue, we focused on the laterality of the visual processing, for example, a right visual stimulus is processed by the left visual cortices, and analyzed the electroencephalogram (EEG) data from 14 healthy right-handed subjects during the viewpoint switching task. This task simultaneously presented a white arrow pointing to one of six directions (three upward directions as "self-view" conditions and three downward directions as "other-view" conditions) and a red circle at one of six positions in a computer display, and then asked the subjects to judge whether the circle was right or left relative to the arrow. Behavioral performance showed the lower accuracy rates (99.0% for the self-view and 96.0% for the other-view conditions) and the longer reaction times (0.75 sec for the self-view and 0.89 sec for the other-view conditions) under the other-view conditions to one position than the self-view conditions to the same position. These results indicated the additional demands on switching from self to other perspective. To investigate the brain dynamics for the view point switching, we conducted the wavelet analyses for the EEG data, by using the Morlet mother wavelets. The contra-lateral parietal theta activity (4-6 Hz) increased in the self-view condition and the control condition which required the subjects to merely see the visual stimulus but not judging whether right or left (e.g. right parietal theta amplitudes increased during the left visual stimulus). These results are consistent with the previous findings about the visual processing laterality. Interestingly, in the other-view condition, the additional theta activity increased in the ipsi-lateral parietal and frontal areas after the contra-lateral parietal theta activity appeared. And further, the phase synchronization analyses identifying the inter-cortical connections showed the significant theta synchronizations between the frontal and the ipsi-lateral parietal areas under the other-view condition but not the self-view condition and the control condition. These results suggested that the mental representation from the self view point in the contra-lateral parietal cortex would be projected to the ipsi-lateral parietal cortex in case of the other view point as if the subjects see the target from the other person. And the viewpoint switching would be executed by the theta network dynamically connecting the frontal and parietal areas. The present study would provide new neurological evidences about the mirroring systems of the basic human communication.

EFFECTS OF PERCEIVED DISCRIMINATION ON ENDOCRINE AND IMMUNE SYSTEM ACTIVITY-

Kyle G. Ratner, New York University; May Ling Halim, New York University; and David M. Amodio, New York University- Epidemiological studies reveal that African and Latino Americans are at greater risk for stress-related health problems than White Americans. Although this disparity is typically attributed to socioeconomic status, difficulty accessing health care, and other societal disadvantages, it is

possible that the disparity may also be due to chronic stress associated with experiences with racial and ethnic discrimination. The current study examined the biological pathways through which discrimination might affect health. We focused on adrenal hormones and proinflammatory cytokines because of their involvement in the physiological stress response and immune function. Our sample consisted of young adult to middle-aged Black and Latina women in the New York City community. We found that higher perceptions of ethnic and racial discrimination in society were related to greater perceived stress. Additionally, we found that perceived discrimination was negatively related to salivary DHEA and positively associated with levels of interleukin-6, beyond effects of self-reported stress. DHEA has been linked to a healthy stress profile and interleukin-6 is activated in response to inflammation and fever response to infection. These findings illuminate the endocrine and immune pathways through which discrimination-stress relate to racial and ethnic disparities in health.

SPECIFICITY OF THE PSTS RESPONSE TO HUMAN AND ANIMAL BIOLOGICAL MOTION-

Martha D. Kaiser, Yale University; Maggie Shiffrar, Rutgers University; Kevin A. Pelphrey, Yale University- Researchers often refer to human motion as biological motion. However, biological motion does not exclusively suggest human motion. Typical adult observers demonstrate enhanced sensitivity to human movement compared to animal movement. Yet, the neural underpinnings of this effect are unknown. The right posterior superior temporal sulcus (pSTS) is a critical region for processing biological motion. In this study we examine pSTS activation during the perception of human and animal movement. This is the first study to use fMRI to examine the visual perception of veridical human motion and animal motion. We sought to clarify the brain mechanisms for the perception of biological motion. During an fMRI scan, typical adults viewed point-light displays of human, dog and tractor motions created from motion capture data. As predicted, observers exhibited significant activation of the right pSTS during the perception of biological motion compared to object motion. A conjunction analysis of human > tractor and dog > tractor revealed regions of activation including areas of the pSTS ($K > 34$, $p < .05$). Further analysis of this region of interest revealed a differential response to distinct types of biological motion. That is, the pSTS exhibited a graded response where activation was significantly greater for human motion than dog motion, relative to tractor motion. This specificity of the neural response to human motion has implications for understanding development of the social brain and its role in disorders such as autism.

THE NEURAL CORRELATES OF PERCEIVING LIFE IN A FACE: A MULTIVOXEL PATTERN ANALYSIS-

Christine E. Looser, Dartmouth College; J. Swaroop Guntupalli, Dartmouth College; Thalia Wheatley, Dartmouth College- Interest in the human face has spurred thousands of years of manmade depictions (e.g., sculptures). These depictions have become increasingly realistic and yet are rarely perceived as alive. This suggests that face perception is tuned along at least two dimensions: form --whether a face recognizably looks like a person, and animacy --whether a face looks alive. Converging evidence suggests that a network of areas is sensitive to faces, yet the relative contribution of these areas to identifying human form versus animacy is unclear. The present study aimed to clarify these contributions. We recorded BOLD responses for 30 subjects with a 3T fMRI scanner while they passively viewed images of human faces, inanimate human faces (dolls), animal faces (dogs), inanimate animal faces (stuffed animal dogs). Importantly, these categories can be compared in terms of

their animacy (alive; not alive) or visual similarity (human form; dog form). Subjects also viewed pictures of clocks, which served as a control object category (neither living nor animate form). We performed a whole brain ANOVA to define regions of interest (ROIs) that had greater responses to all face categories relative to clocks. Of particular interest were the lateral fusiform gyrus (fusiform face area: FFA), the superior temporal sulcus (STS) and the inferior occipital gyrus (IOG), which make up the core network for face perception (Haxby et al. 2007). These three ROIs (FFA, STS and IOG) were then interrogated with multivariate pattern analyses to measure the multi-dimensional similarity structure of neural representations. These analyses revealed that hemodynamic response patterns in IOG clustered by form: responses to humans were similar to dolls and responses to real dogs were similar to stuffed dogs. In contrast, response patterns in the STS and FFA clustered by animacy: responses to humans were similar to real dogs and responses to stuffed dogs were similar to dolls. This suggests that representations in IOG are based primarily on visual similarity whereas the representations in STS and FFA may be based primarily on conceptual similarity, prioritizing animacy over form. A face can be processed as a visual object and as the emblem of another life. Here we used MVPA to dissociate the organizational priorities of face-sensitive regions along these two dimensions (form, animacy). The organizational schema delineated in this study suggests distinct roles within the face perception network in the service of identifying animate agents.

J36

NEURAL CIRCUITRY OF IMPLICIT EMOTIONAL FACE PROCESSING IN YOUTH WITH BIPOLAR DISORDER, SEVERE MOOD DYSREGULATION, AND CONTROLS-

Laura A. Thomas, National Institute of Mental Health; Brian L. Bonnes, National Institute of Mental Health; Gang Chen, National Institute of Mental Health; Daniel S. Pine, National Institute of Mental Health; Ellen Leibenluft, National Institute of Mental Health- Youth with bipolar disorder (BD) and severe, non-episodic irritability (severe mood dysregulation, SMD) show deficits in explicit labeling of facial emotion. However, emotional faces are also processed at an implicit level, so it is important to determine whether the groups differ in neural activity during nonconscious face processing. We compared whole brain activation in BD, SMD, and controls during performance of a backwards masking affective priming paradigm. Sixty-three youths, including 20 BD, 21 SMD, and 22 controls participated in this 3T fMRI study. In each condition, aware (A) and nonaware (NA), subjects indicated how much they liked an abstract shape (3000ms). In A, a face or blank oval was presented before the shape (187ms). In NA, a face or blank oval (17ms) was followed by a scrambled face mask (170ms), then the abstract shape. The emotions were angry, fearful, happy, and neutral, presented randomly. Only one cluster survived correction for Group (3) x Emotion (5) x Awareness (2); in the right parahippocampus/amygdala. In order to elucidate what was driving this 3 way interaction we extracted mean signal in this region and ran further statistical analyses. There was a Group x Awareness interaction when shapes were preceded by angry or neutral faces. For angry faces, between-group ANOVAs revealed a significant group effect in NA, with BD > SMD and a trend for HV > SMD. Within-group paired t-tests showed controls had significantly greater activation in NA vs. A. In contrast, SMD tended to have more activation in A vs. NA. The significant Group x Awareness interaction to shapes following a neutral face followed a pattern similar to that following an angry face. Between-groups ANOVAs revealed a main effect of group in NA, driven by BD > SMD. Within-group paired t-tests showed SMD had more activation in A vs. NA. Two exploratory psycho-physiological interaction analyses (PPIs) were conducted, one for angry and one for neutral, comparing functional connectivity for A vs. NA. The seed region

used was the R parahippocampal/amygdalar region. The angry PPI identified 7 inferior/middle frontal, parietal, and cingulate target regions where SMDs had decreased connectivity with the seed region vs. BD and controls. In contrast, the neutral PPI identified 4 target regions in superior and medial frontal areas where SMD had increased connectivity with the seed region vs. BD and controls. In this affective priming task, awareness of angry and neutral faces differentially affects parahippocampal/amygdala activation in SMD vs. BD and controls. SMD show increased activation for A vs. NA, whereas BD and controls demonstrate the opposite pattern. PPI analyses for angry and neutral faces indicate that SMD have different connectivity patterns from both BD and controls. These data indicate that conscious processes are not essential to elicit deficits in emotional face processing in SMD. Further research should explore the role that deficits in bottom-up processing of emotional stimuli and amygdalar connectivity may play in the severe, chronic irritability characteristic of SMD.

J37

NEURAL PREDICTORS OF ROMANTIC DECISION-

Jeffrey C. Cooper, Trinity College Dublin; Simon Dunne, Trinity College Dublin; Mary Teresa Furey, Trinity College Dublin; and John P. O'Doherty, Trinity College Dublin, California Institute of Technology- The decision to pursue or reject a potential romantic partner is both highly motivated and highly consequential, but predicting individual romantic decisions remains notoriously difficult. For example, stated ideal-mate preferences have little predictive power for real-life romantic decisions in the moment. However, individuals in many domains are often able to make accurate social judgments based on limited information about a partner, even just a photograph. To examine how these rapid social judgments are computed in the brain during romantic decision-making, we used a paradigm in which heterosexual volunteers underwent real interactions with a large number of potential partners through a speed-dating forum. 151 individuals participated in speed-dating events with 15-22 members of each sex, in which each participant met every opposite-sex participant for a five-minute "date" and made a "Yes" or "No" decision about whether they would want to see that date partner again. After the events, pairs of participants who gave each other a Yes were given each other's contact information. Before the events (1-9 days), a subset of these individuals (20 men and 18 women) were scanned with event-related fMRI. During scanning, each participant saw photos of each of his future date partners and made a first-impression rating of romantic potential. Activation in several regions during photo viewing predicted participants' subsequent "Yes" or "No" decisions, including both regions sensitive to reward (such as ventral medial prefrontal cortex and ventral striatum) and regions implicated in "mentalizing" and empathy (such as rostral medial prefrontal cortex and posterior superior temporal sulcus). Importantly, the predictive power of the latter set of regions were independent of the partner's subjective physical attractiveness. The results are consistent with the idea that rapidly-formed first impressions can be accurate predictors of consequential decisions, and that these first impressions may include social judgments of personality and desirability beyond physical attraction.

J38

EMOTIONAL EXPERIENCE FOLLOWING LEFT BASAL GANGLIA STROKE IS MEDIATED BY SEVERITY OF DEPRESSION AND IS ASSOCIATED WITH LIMBIC NEUROFUNCTIONAL ALTERATIONS-

Kate Ostedgaard, University of Iowa Carver College of Medicine; Jatin G. Vaidya, University of Iowa Carver College of Medicine; Beth Anderson, Olin Neuropsychiatry Research Center; Sergio Paradiso, University of Iowa

Carver College of Medicine- Basal ganglia damage affects emotional and motivational processes, including perception and experience of disgust and reward. Left basal ganglia (LBG) stroke also confers high risk of depression. Therefore, changes in emotion following LBG stroke may be secondary to depression. In addition, beyond the localized tissue loss in the stroke-damaged area, altered functioning in distant emotion processing regions may further contribute to emotional changes. This study examined the extent to which changes in emotion processing following LBG lesion can be exclusively attributed to localized stroke damage by examining emotional responses to affect-evoking challenges in relationship to 1) severity of depression, and 2) activity changes in regions distant from the damaged area. Emotion-evoking (frightening, happy or neutral) facial expressions were shown to 6 subjects with LBG lesions and 12 subjects of comparable age and sex without history of brain damage or psychiatric conditions while regional brain activity was recorded using positron emission tomography (PET) and the [15O]water method. Subjects were instructed to allow the stimuli to affect their emotional state and to report how strongly they experienced the following basic emotions: fear, disgust, anger, amusement and happiness. Affective responses were also compared to 5 subjects with depression and lesions elsewhere including the right middle cerebral artery territory and cerebellum. Associations between emotion ratings and depression severity were also examined. Whereas all subjects were able to perceive the valence of the stimuli appropriately, LBG patients experienced significantly lower emotions in response to frightening [$U=14.5$, $p=0.039$] and happy [$U=13.5$, $p=0.033$] stimuli compared to non-lesion subjects. LBG subjects exhibited relative decreases in activity in the contralateral fusiform gyrus and frontal-polar region in response to negative stimuli as well as in the posterior cingulate cortex (bilaterally) in response to positive stimuli. Lower activity in the cerebellum and primary and association visual cortices was found irrespective of stimulus valence. Interestingly, there were also regions of increased activity contralateral to the lesion side irrespective of valence (entorhinal cortex) or in response to positive (anterior cingulate cortex, insula and frontal regions) and negative stimuli alone (posterior cingulate cortex). As expected, severity of depression was significantly higher among lesion subjects (HamD LBG = 16 ± 6.8 , comparison = 3.75 ± 2.7 ; $U=4.5$, $p=0.003$). Therefore, LBG subjects were compared to subjects with depression and lesions elsewhere (HamD = 24.2 ± 6.3). There were no significant group effects on emotion response. Analyses including all subjects ($n=23$) showed that intensity of pleasant emotional experience inversely correlated with severity of depression (happy $\rho=-0.45$, $p=0.017$; amused $\rho=-0.45$, $p=0.017$; overall arousal $\rho=-0.35$, $p=0.05$). LBG damage is associated with overall blunted emotional experience that cannot be directly attributed to reduced hedonic *perception*. In addition to being a consequence of direct tissue damage to basal ganglia and related reward networks, alterations in *pleasant* emotional experience may be mediated by severity of depression. Increased activity in limbic structures may result from compensatory mechanisms albeit insufficient to elicit normative emotional responses.

J39

EMOTIONAL REGULATION IN SOCIAL DECISION-MAKING: BEHAVIORAL AND NEURAL EVIDENCE- *Alessandro Grecucci, University of Trento; Cinzia Giorgetta, University of Trento; Mascha van't Wout, Radboud University Nijmegen; Nicolao Bonini, University of Trento; Alan G. Sanfey, University of Trento, Radboud University Nijmegen, University of Arizona*- The ability to successfully regulate our emotions is a necessary skill for navigating our daily social interactions. Emotion regulation refers to the means by which "individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (cf. Gross, 1999). Although there are many

different means that people can use to regulate their emotions, the strategy of reappraisal is one of the most well-studied. Reappraisal is capable of lowering emotional experience, reducing or altering psychophysiological activity, and improving social functioning (Gross, 2002; Gross & John, 2003; Ochsner, Bunge, Gross, & Gabrieli, 2002). Our group has recently demonstrated an effect of reappraisal as compared to suppression on a test of social decision-making, the Ultimatum Game (van't Wout, Chang, & Sanfey, 2010), where responders accepted more unfair offers when instructed to reappraise their emotions. However, the question of how emotion regulation strategies affect our actual decision-making abilities remains largely unanswered. In this study, we investigated the effect of both up and down emotional reappraisal (following Ochsner, Ray, Cooper, Robertson, Chopra, Gabrieli, and Gross 2007) on social decision-making in the Ultimatum Game. After being trained on how to use this strategy, in a test phase 21 participants demonstrated the ability to both up and down regulate their emotions, compared to a baseline 'look' strategy, while viewing unpleasant IAPS pictures, as measured by valence and arousal mean ratings. In the experimental phase, participants played the Ultimatum game during fMRI while applying the strategies of up-regulation, down-regulation as well as a baseline 'look' condition. As hypothesized, participants accepted more unfair offers while down-regulating, and also rejected more offers while up-regulating, relative to the baseline condition. The acceptance rate for the fair offers was not modulated by the strategy, suggesting that emotional regulation was selective for the unpleasant emotions elicited by the unequal offers. At the neural level, the effect of strategy demonstrated significant activations of the middle frontal gyrus bilaterally, together with the right cingulate gyrus (involved in the decision process), the right insula (which codes the aversive reaction to the unfair offer), the inferior parietal lobe bilaterally (implied in quantity evaluation) and the fusiform gyrus bilaterally (coding the faces of the players). Importantly, the insula showed modulation of the BOLD signal for unfair offers: less activation for down-regulation and more activation for up-regulation. The interaction between strategy and offer (fair vs unfair) showed activity in the ventromedial prefrontal cortex, possibly involved in coding and recoding the values according to the reappraisal. These results support and extend previous findings that reappraisal is a powerful emotion regulation strategy that influences and changes how we interact with others even in the face of inequity. Additionally, the study further clarifies some key regions involved in the emotional regulation of our decisions processes.

J40

MU SUPPRESSION AND INTERACTION IN SOCIAL CONTEXT- *Ying Wu, Swartz Center for Computational Neuroscience, Center for Research in Language; and Scott Makeig, Swartz Center for Computational Neuroscience*- This study is part of a larger ongoing project investigating distributed brain dynamics associated with competitive, collaborative, and individual activity during learning. The present analysis will focus on mu rhythms, which are electroencephalographic (EEG) oscillations with spectral peaks between around 8-13 Hz and 22 Hz, typically detected over somatomotor cortex. Mu suppression is the phenomenon whereby mu rhythms are attenuated during preparation for and execution of movement. Mu is also suppressed, though not necessarily to the same degree, when an individual merely observes an action being performed (by somebody else) in the absence of any overt movement on the observer's part. The present study explores whether mu suppression is modulated by social context - that is, whether mu response to performing and observing the same type of action changes as a function of the participants' competitive or collaborative goals. High density EEG (133 channels per subject) was recorded simultaneously from pairs of healthy adults as they played a computerized version of the card game, "Concentration,"

which involves finding matching pairs of hidden values by touching a card image in a grid displayed on a touch-sensitive computer screen. Players participated in four types of games: they either competed against each other, collaborated as a team against a computerized agent, or played individually against the computer. EEG time-series data were submitted to independent component analysis (ICA). Trials were extracted from continuous IC activations time-locked to the release of a button that players were required to press before reaching toward the screen to select a card. Equivalent dipoles were modeled of all ICs that exhibited spectral peaks at 10 Hz and 22 Hz, revealing three IC clusters – one over right and over left somatomotor cortex, respectively, as well as a third cluster over posterior and occipital cortex. Right and left somatomotor clusters revealed substantial desynchronization within the mu frequency bands just before and during each player's release of the button and reach toward the touch screen. Mu suppression also occurred to a lesser extent and with a later onset when each player's partner executed a turn. Mu suppression to observed turns was stronger during competitive games (when both players took turns alternately) than solo ones (when one player simply observed his or her partner playing). In the case of the posterior cluster, desynchronized activity could be observed across a fairly broad spectral range from 4 to 22 Hz. For self-initiated turns, this desynchronization becomes apparent from approximately 10 to 200 ms after the release of the button. For observed turns, it becomes apparent approximately 500 ms after the button release. Results indicate that in the context of playing a game, action processing is impacted by the participants' interactive goals.

J41
THE NEURAL CORRELATES OF MAKING LONG-TERM CHOICES FOR OTHERS- *Sylvia A. Morelli, University of California, Los Angeles; Austin Grinberg, University of California, Los Angeles; Kenny Casebere, University of California, Los Angeles; Lian Rameson, University of California, Los Angeles; and Matthew D. Lieberman, University of California, Los Angeles-* When making decisions for others (e.g. children), choosing long-term benefits for them and ignoring short-term costs may have a powerful impact on the child's long-term well-being. Parents often face the choice between giving into their child's pleas (short-term choice) or doing "what's best" in the long-term for the child and making the child upset. The current study examines the neural mechanisms involved when a person chooses options that create short-term pain, but long-term gain for others. Do empathic responses in empathy-related regions like dACC and anterior insula (Singer et al., 2004) drive or interfere with this choice? Or do top down emotion regulatory processes in bilateral VLPFC and posterior DMPFC (Berkman & Lieberman, 2009) facilitate this type of process? Before entering the scanner, participants were told that they would (1) watch a another supposed participant (the 'player'), who is outside of the scanner trying to win money in a series of games, (2) have the ability to override the player's choice and influence their monetary outcomes, and (3) be able to hear the player's emotional reactions throughout the game. Once in the fMRI scanner, participants watched blocks of games with two different sets of instructions. For the "Mandatory Override" blocks, participants were told that they were required to switch the player to the worse monetary outcome for the majority of the games. For the "Voluntary Override" blocks, participants were told that they could win a large bonus for the player if participants chose to voluntarily switch the player to the worse outcome on the majority of the games. Throughout all the blocks, participants heard the player get upset when the player's choices were overridden (pre-recorded audio clips), as well as hearing the player react positively to better outcomes when the player was not overridden. In addition, reaction times for override choices were recorded for each block. Thus, this experimental design allowed us to compare neural responses when (1)

participants were forced to upset the player for *no reason* (Mandatory Override) and (2) when participants upset the player to earn the player a *long-term benefit* (Voluntary Override). We used reaction time for the override button press as an index of conflict. We pulled parameter estimates of activity in the comparison of the two override conditions in anatomically defined regions of interest (ROI) in right and left VLPFC and posterior DMPFC. The parameter estimates for the three ROIs were each significantly correlated with the reaction time measure suggesting that greater conflict prior to an override decision was associated with greater activity in these regions. No relationship was observed between this conflict index and activity in dACC or insula. These results suggest that a broader conception of empathic responding in which the other's long-term needs are taken into account may require linking to neurocognitive models of emotion regulation.

J42
HIT THE CHILD OR BEND THE WOMAN'S FINGER? THE ROLES OF VENTROMEDIAL PREFRONTAL CORTEX AND DORSAL ANTERIOR CINGULATE IN PROSOCIAL AND ANTISOCIAL MORAL DECISION MAKING- *Henry H. Yu, National Institute of Mental Health; Karina Blair, National Institute of Mental Health; and R.J.R. Blair, National Institute of Mental Health-* Ventromedial prefrontal cortex (vmPFC) and dorsal anterior cingulate cortices (dACC) have been long been associated with reward-based decision making though their specific functional roles have been debated. Moreover, both systems have been implicated in moral judgment. According to one view, vmPFC is critical for representing reinforcement value but is not involved in the selection between responses options while dACC is involved in the selection between response options but does not specifically represent reward value. The current study considers the implications of this view for the understanding of the contributions of vmPFC and dACC in moral judgment using a novel moral judgment paradigm. In this event related fMRI paradigm, subjects are asked to make choose between having to do one of two desirable actions or one of two undesirable actions. Response choice difficulty is manipulated by varying the value differences between the to be chosen between options; it is easier to choose between options that differ greatly in value (e.g., "slapping another person's face" vs "cutting off another's person's head") relative to choosing between options that differ less in value (e.g., "slapping another person's face" vs. "punching another person's shoulder" or "cutting off another's person's head" vs. "slicing another person's eye open"). In short, 20 healthy adults participated in a 2 (response choice: choosing between prosocial vs. choosing between antisocial actions) x 3 (value difference level: close, medium or far) design. In line with predictions, activity in vmPFC varied as a function of value; the more prosocial or the less antisocial the action, the greater the BOLD response within this region. Activity within dmPFC varied as a function of value difference level; it was significantly greater for more difficult choices than less difficult choices. These data suggest that vmPFC and dACC have specific roles in moral judgment, particularly with respect to action choice.

J43
SELF-REGULATORY FATIGUE: NEUROPHYSIOLOGICAL EVIDENCE THAT INITIAL ACTS OF CONTROL AFFECT SUBSEQUENT CONTROL AND EMOTION- *Jennifer Gutsell, University of Toronto; and Michael Inzlicht, University of Toronto-* Self-control is essential for adaptive behavior and is the basis for some of the most culturally valued behaviors. Self-control, however, is limited: Past research indicates cognitive control depletes quickly after initial exertions. Although regulatory depletion is an extensively researched phenomenon, the exact nature of the

depleted state remains unclear. Here, we examine the why and how of regulatory depletion by examining its neurocognitive and emotional/motivational sequelae. In Study 1, participants watched an emotional movie while instructed to either suppress their emotions or watch normally, and then completed an ostensibly unrelated Stroop task while EEG was recorded. Results indicate that emotional suppression impaired Stroop reaction-time performance, an effect mediated by a lower error-related negativity (ERN)—a neural waveform generated by the anterior cingulate cortex and thought to index aspects of the affective reaction to the detection of errors. In Study 2, participants watched a video of a person being interviewed while distracting words appeared at the bottom of the screen; participants were instructed to either control their attention ignoring the words, or to watch normally. They then viewed positive, negative, and neutral IAPS images within which were embedded 50 ms startle auditory probes while their startle-blink response was measured with EMG. Results show a decrease in the startle-blink response of depleted participants, suggesting that cognitive suppression dampened the strength of subsequent emotional reactions. In study 3 participants first completed the attention control task used in study 2 and then received positive, neutral and negative feedback on their performance in a time estimation task while their EEG was recorded. Results indicate a decrease in amplitude of the feedback related negativity (FRN) after the presentation of negative feedback for depleted participants. Similarly to the ERN, the FRN is a negative deflection in the Event related potential generated by the anterior cingulate cortex, but it follows the presentation of feedback and is thought to reflect the affective reaction to self-relevant information. The decrease in FRN amplitude following negative feedback provides further evidence for a dampening effect of previous exertion of self-control on emotions, specifically the emotional reactions to negative stimuli. Taken together, the results of all three studies offer a neural mechanism for regulatory depletion and suggest an important place for emotion in executive control.

J44

DIFFERENT WAYS TO MAKE MEANING: COMMON RELAXATION RESPONSE- *Julia Penn Shaw, SUNY-Empire State College*; This project seeks to identify psycho-physiological evidence that correlate to underlying patterns of dimensionality that adolescents/adults use to construct personal meaning (Shaw, 2002). Adults constructed 'personal meaning', putting ten self-generated single abstract perspectives onto cards they then used to 'create a personally-meaningful arrangement'. Most used the cards to construct meaning dimensions, although the protocol did not specify what a 'personally meaningful arrangement' looked like. The four dimensions (narrative, ranking, partition, image/theme) appeared to provide structure for psychological 'intention'. Cross-sectional research showed mature adults uniquely combining the four dimensions into complex meaning structures. These SymbolSort© results show how natural and concrete these meaning dimensions are. Research Design: Participants attending college, thirty from age 18 to 22, and thirty from age 40 to 55, equal males and females in each group, were administered the SymbolSort©, untimed, while breath measurements were taken. Using the SymbolSort© protocol, the participant: 1) read a children's story, Encounter; 2) listen to definition of a single abstract perspective; 3) generated ten perspectives from the story and put them on cards; 4) physically arranges cards in a personally-meaningful way; 5) verbally described the personal meaning of the arrangement; and 6) recorded the arrangement on the Symbol Sort© worksheet. SymbolSort© results (structure and complexity) were evaluated by a trained assessor. In prior research (Shaw, 2002), adults who constructed "personally meaningful" arrangements using the SymbolSort© process, said they had a personally-meaningful experience, exhibiting behaviors suggesting

both cognitive closure and physical relaxation. Adults described pleasure in creating gestalts new to their awareness (Shaw, 2006). We found that each participant after creating a 'personally meaningful' SymbolSort© arrangement had a change in physiological state from more aroused to more relaxed as measured by change in breath and that these changes correlated with camcorder-recorded visual cues such as relaxation of the shoulders or smiling. There were no statistically significant differences due to age or gender. Although the types of arrangements were different with respect to pattern and level of complexity, there was a measurable common state of relaxation associated with all personal meaning-making. The relaxed state resulting from a personally-meaningful experience is hypothesized to increase success in personal reflection and also in communal collaboration. This has ramifications for success in counseling, workgroups, and family exchange. If each member of a group can achieve their own unique personally-meaningful gestalt related to the common goal, they will be relaxed and potentially ready to communicate with others about the meaning of their own experience, and be willing to communicate with others about the meaning of their experiences.

I45

STEREOTYPE ACTIVATION IN PERSON PERCEPTION: THE EFFECTS OF TARGET RACE ON NEURAL INDEXES OF EXPECTANCY VIOLATION- *Ivo I. Gyurovski, College of William and Mary; and Cheryl L. Dickter, College of William and Mary*- Person perception research has demonstrated that expectancy-violating information about people is remembered better (e.g., Stangor & McMillan, 1992) and processed differently (Bartholow et al., 2001) than expectancy-confirming information. Expectancy violation occurs when a discrepancy exists between new information and pre-existing person concepts, leading to working memory updating (e.g., Bargh & Thein, 1985). Research using psychophysiological measures has shown that the P300 component of the Event-Related Brain Potential (ERP) is an electrocortical index of working memory updating (e.g., Donchin & Coles, 1988), and its amplitude can thus be used to index neural processes associated with expectancy violations. In fact, expectancy-violating definitional or behavioral information produces larger amplitude P300s than expectancy-consistent information (e.g., Bartholow et al., 2001; Osterhout et al., 1997). Additionally, research by Bartholow, Dickter, and Sestir (2006) demonstrated that P300 amplitude was larger for trials in which race-specific stereotypes were inconsistent with the race of a target face prime, compared to trials in which the stereotype was consistent with the race of the target face. The goal of the current study was to examine whether the neural effects of encountering expectancy violations after the impression formation of individuals would be moderated by the social group (i.e., race) of the target individual. Participants ($N=33$) completed a computer task while EEG data were recorded. Each trial of the task involved the presentation of a sentence describing an action that a fictitious individual did, followed by a picture of either a Black or a White male face. The actions described in the sentences reflected commonly held racial stereotypes about Black and White Americans, and were derived from a series of three pilot studies using different samples from the same population ($N_1=188$, $N_2=68$, $N_3=49$). Each sentence-face trial represented one of four conditions: Stereotype-Confirming-Black, Stereotype-Violating-Black, Stereotype-Confirming-White, and Stereotype-Violating-White. Participants were instructed to form an impression of the person based on the sentence and to indicate with a button press whether the person in the picture could potentially be the person described in the sentence. The P300 amplitude was quantified as the maximum positive deflection from baseline at the Pz electrode site between 250-500 milliseconds, and was time-locked to the onset of the face stimulus. Results indicated a significant interaction

between race and expectancy, such that trials presenting Black targets following White (positive and negative) stereotype content elicited the largest P300 amplitude relative to the other conditions. Interactions between race and expectancy were also obtained in the N100 and P100 components, suggesting that these early attentional components are sensitive to differences in target race as well as impression-related information. As expected, our findings demonstrated that the P300 amplitude increased following expectancy violations, but was further moderated by race, suggesting that social perceivers may be especially sensitive to Black male targets who act in a stereotype-inconsistent manner. These results have important implications for person perception research examining stereotype-related impression formation.

J46

ENHANCED ATTENTIONAL BIAS TO VISUAL MARIJUANA CUES IN SMOKERS INDICATED BY EVENT-RELATED POTENTIALS-

Jesse T. Kaye, University of Colorado at Boulder; Justin T. A. Busch, University of Colorado at Boulder; and Tiffany A. Ito, University of Colorado at Boulder- Salient visual marijuana cues may capture an attentional bias among frequent smokers and those who hold positive prototypes of peer marijuana users. Event-related potentials have been demonstrated to be a sensitive measure of such bias to drug cues among drug dependent users. While attentional biases have been well documented in cigarette, alcohol, cocaine, and heroin dependent users, there is a paucity of data to substantiate these claims in marijuana users. The current study investigated the relationship between ERPs to visual marijuana cues and marijuana use among recreational college users and non-users. Participants completed a visual oddball paradigm in which they viewed infrequent target pictures (related to either marijuana or exercise) within a context of frequently presented neutral images. We examined the late-positive potential (LPP), which is sensitive to the attentional and motivational salience of stimuli. The LPP was larger to both exercise- and marijuana-related pictures than neutral pictures, reflecting a general oddball effect. However, marijuana pictures elicited a larger LPP than equi-probable exercise pictures in smokers, but not non-smokers, indicating greater processing of these drug cues among users. Furthermore, the LPP to marijuana images was positively correlated with both frequency of marijuana use and favorable prototypes of peer marijuana use. These findings suggest that heavier marijuana use and a more positive social view of marijuana users is associated with enhanced attentional capture or motivational significance of marijuana-related stimuli. Drug cue LPP reactivity may relate to craving, precipitate relapse or represent pre-morbid individual differences that increase risk for drug dependence.

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NEED IS IN THE EYE OF THE OBSERVER: RESPONSES TO TARGETS OF NEED DEPEND ON OBSERVER-SPECIFIC ASSOCIATIONS BETWEEN GENDER AND AFFECT-

Alicia J. Hofelich, University of Michigan, Ann Arbor; and Stephanie D. Preston, University of Michigan, Ann Arbor- Much of the prior work on empathy has attempted to find characteristics of “good empathizers” or “good targets” by identifying the personalities, situations, or expressions that predict helping. However, there are vast individual differences in the way people express need and even “effective” emotional displays do not always elicit empathy or helping, suggesting a complex interaction between the way targets express their need and the way observers respond to them. For example, we have identified at least five distinct emotional responses to serious illness ranging from negative and *distraught* to very positive and *resilient*, with observers varying widely in which

of these two very different groups they prefer to empathize with and help. According to a Perception Action Mechanism (PAM; Preston & de Waal, 2002), such differences in empathy and helping reflect varying levels of correspondence between the state and situation of the target and the observer’s own representations for that state and situation from prior experience. Affective neuroscience has yet to capitalize on these “mismatches” because the early neuroimaging work was focused on demonstrating the existence of neural self-other overlap, and so selected affective experiences that should not deviate from person to person (i.e., pain; Singer et al., 2004). However, the predicted mismatches between self and other should be easy to study for states that are expected to differ in systematic ways across individuals. We investigated self-other interactions in empathy by testing whether observers’ empathy and altruism for our distraught female patients would vary in predictable ways based on their predetermined associations between females and sadness. Participants first performed an IAT task to measure their implicit association between females and sadness and then watched two *distraught* and two *resilient* patient videos. For each patient, they reported their level of empathic concern, personal distress, and amount of help they would offer as well as an actual amount of their subject payment money and number of hours they donated to the patient’s charity. The amount of empathy and helping was compared between the patient types and correlated with each participant’s IAT score. Confirming the more general assumptions of the study, participants did overall exhibit a stronger association between females (rather than males) and sadness and reported higher levels of empathy, helping and actual money donated to the *distraught* compared to the *resilient* patients. However, confirming the more specific predictions of the PAM, the strength of participants’ association between females and sadness significantly predicted their differential monetary donation to the *distraught* over *resilient* patients (giving more to the distraught patients when they thought sadness was more normative for females). In accordance with the PAM, helping increases not only when the target feels and displays need, but also when the observer resonates with that display for the particular individual and situation. Similar extensions of this finding are expected for cultures that are known to vary in their tolerance for high negative affect, with particularly reticent cultures perhaps even showing a reaction against the distraught patients.

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DIFFERENTIAL GAZE PROCESSING IN ATTRACTIVE AND ANOMALOUS FACES: A STUDY OF THE REWARD AND PAIN NETWORKS-

Yi Zhang, Brandeis University; and Leslie Zebrowitz, Brandeis University- Previous research has shown that the positive response toward attractive faces, as indicated by greater activity in the reward region, was enhanced by direct gaze, but weakened by averted gaze (Kampe et al., 2001). However, little is known about the reward value of direct vs. averted gaze in faces with extreme low attractiveness such as anomalous faces. In addition, no research has examined whether the ‘pain network’ is also engaged by eye gaze cues. Yet, averted gaze in attractive faces may activate this region insofar as it evokes feelings of social rejection that share a similar neural mechanism with the experience of physical pain (Eisenberger & Lieberman, 2004). The present study investigated whether eye gaze direction differentially modulates perceivers’ neural responses to attractive and anomalous male faces in both the reward and the pain network. Twenty-eight participants passively viewed a random order of videos of attractive or anomalous faces zooming in and make gaze shifts toward or away from them, while being scanned in a Siemens 3T Allegra MR Scanner. Functional imaging runs consisted of whole-brain acquisitions (32 sagittal slices, 4mm thick, TR = 2 seconds). The data were analyzed by FSL 4.0 (www.fmrib.ox.ac.uk/fsl) using each face type as a regressor in the

GLM, and group effects were estimated by mixed-effects analysis (Beckmann 2003). Statistic images were thresholded using voxelwise $P < .01$ and extent threshold of 15 continuous voxels. Activated clusters in a priori reward and pain network brain regions of interest were used to extract BOLD signal change compared to fixation from each participant for a repeated 2 (attractiveness) \times 2 (gaze direction) \times 2 (subject sex) ANOVA followed by planned t-tests. Activations in the neural reward circuit supported the prediction that direct gaze in attractive faces was more positively perceived than averted gaze, with the reverse pattern for anomalous faces. Specifically, anomalous faces with averted gaze elicited greater activation than direct gaze in regions that respond to positive rewards (ACC and medial OFC). In areas that have been found to respond to negative rewards (LOFC), anomalous faces with direct gaze elicited greater activation than averted gaze, whereas attractive faces with averted gaze elicited greater activation than direct gaze. Also as predicted, activation in the pain network (bilateral insula and thalamus) showed greater responses to averted than direct gaze in attractive faces, but not in anomalous faces. In summary, the current study is the first to show evidence that eye gaze is differentially processed for faces with high and low attractiveness in the neural reward and pain networks.

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DYSFUNCTION OF FRONTAL AND SUBCORTICAL REGIONS DURING AN EMOTIONAL DOWN-REGULATION TASK IN EUTHYMIC BIPOLAR I DISORDER SUBJECTS USING fMRI- *Jennifer D. Townsend, University of California, Los Angeles; Lara Foland-Ross, University of California, Los Angeles; Susan Y. Bookheimer, University of California, Los Angeles; and Lori L. Altshuler, University of California, Los Angeles, VA Greater Los Angeles Healthcare System* Bipolar disorder is characterized by symptoms of extreme mood states indicating possible dysfunction of emotion regulatory networks. In normal control populations, the processing of emotional faces has been demonstrated to activate the amygdala and orbitofrontal cortex (OFC), with the OFC playing a role in the down-regulation of emotional responses. This study sought to investigate the functional underpinning of cognitive reappraisal of emotions in subjects with Bipolar I Disorder while euthymic and control subjects using fMRI. 30 adult BPI subjects (11F/19 M; ave. age=37.6 \pm 13.2 yrs.) and 26 control subjects (11F/15M; ave. age=35.8 \pm 12.6 yrs.) underwent fMRI scanning while performing an emotion processing task which required the simple viewing ("observe negative") or cognitive reappraisal ("decrease negative") of negative emotional stimuli. Distress level was measured by asking subjects to rate their average distress level after performing the reappraisal task. Whole-brain activation patterns were analyzed using FSL 4.0. Contrasts were made for each group comparing the "decrease negative" vs. "observe negative" conditions, and these contrasts were entered into a between-group random effects analysis to assess between-group differences in activation. Distress ratings did not differ significantly between the subject groups ($p=0.48$). Within groups, control subjects showed robust bilateral activation of multiple frontal and subcortical regions ($Z > 2.3$, $p=0.05$ corrected). Between-group analyses revealed this activation was significantly decreased in BPI subjects, specifically in the bilateral medial frontal gyrus (BA6), bilateral middle frontal gyrus (BA 46/9), right pre-central gyrus (BA4), right inferior frontal gyrus (BA47) and bilateral anterior and posterior cingulate (BA24 and 23) ($Z > 2.0$, $p=0.05$ corrected). Other regions of greater activation

in the control subjects were seen in the bilateral caudate and right thalamus. The reverse comparison showed no areas of significantly greater activation in BPI euthymic compared with controls subjects. Main features of Bipolar I Disorder include extreme emotional swings and difficulties in emotional regulation. This study provides evidence of dysfunction in the neural networks responsible for emotional reappraisal, including the prefrontal cortex, cingulate and subcortical structures in BPI euthymic subjects.

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INFLUENCE OF VARYING LEVELS OF RISK AND AMBIGUITY ON NEURAL SYSTEMS MEDIATING CHOICE- *Dan Lopez Paniagua, Colorado State University; Carol A. Seger, Colorado State University; and Matthew G. Rhodes, Colorado State University-* Previous studies have dissociated two types of uncertainty in decision making: risk and ambiguity. Generally, people prefer risky decisions to ambiguous ones, in a phenomenon known as ambiguity aversion. However, many of these studies have categorically defined ambiguity as a complete lack of information regarding outcome probabilities, thereby precluding the study of how various neural substrates may acknowledge and track levels of ambiguity. In a novel task, we parametrically varied the levels of ambiguity for financial decisions involving potential monetary gains to better assess the neural representation of ambiguity and its contribution to ambiguity aversion or preference. Participants were presented with 2 wheels representing different gambles, one ambiguous and one risky. Throughout the task, the risky choice presented to participants was always a 50% chance of winning \$2. This was presented alongside the ambiguous choice in which various probabilities of winning (20%, 33%, 50 % or 80%) were combined with different potential gains (2\$, 3\$, 5\$, or 8\$) so that expected values ranged from being better, equal or worse than the expected value of the risky decision. For both types of choices, the probability of obtaining any given payout was indicated along the borders of the wheel, increasing from 0% to 100% in a clockwise direction starting at the 12 o'clock position. For the risky gamble, a "dial" explicitly indicated the probability of winning. For the ambiguous gamble, there was no dial to indicate a specific probability. Instead, a blinder that covered a portion of the wheel occluded the dial. This occlusion represented the possible range of percentages in which the actual probability of winning lay. Finally, the blinder covered 15%, 33%, or 66% of the wheel in order to vary the level of ambiguity. Participants completed this task while BOLD contrast images were collected using a 3T MR scanner. Overall, participants were sensitive to the manipulations of expected value; subjects selected advantageous choices and avoided disadvantageous ones. Interestingly, there was an interaction between expected value and ambiguity level. Participants showed ambiguity aversion when ambiguity increased, which means subjects opted more for the risky option (despite having lower expected value) when the choice favored the ambiguous gamble. However, participants actually showed ambiguity preference when the level of ambiguity increased for trials favoring the risky option. These results suggest a dynamic shift between risk aversion when ambiguity is low to ambiguity aversion when ambiguity is high. Moreover, our imaging results suggest areas of the striatum and medial prefrontal cortex are necessary for tracking levels of ambiguity.