

The Society for Social Neuroscience

**2011 Annual Meeting
Washington, DC**

The Society for Social Neuroscience is an international, interdisciplinary, non-profit, scientific society established to advance and foster scientific research, training, and applications.

The Society for Social Neuroscience

2011 Annual Meeting

We thank our sponsors for the meeting, the National Science Foundation and the Center for Cognitive and Social Neuroscience at the University of Chicago.



The Society for Social Neuroscience

2011 Annual Meeting

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The Society for Social Neuroscience

Program Overview

Thursday, November 10, 2011

Locations:

The Grand Hyatt Washington
1000 H Street, NW
Washington, D.C., 20001
Penn Quarter Room

Times:

11:00 AM- 1:00 PM

The Carnegie Institution for Science
1530 P Street, NW
Washington, D.C., 20005

5:00 PM- 7:00 PM

Registration begins at 4:15 PM

The evening program is a joint meeting with the International Neuroethics Society

11:00 AM - 1:00 PM	Panel Discussion (<i>Grand Hyatt</i>)
5:00 PM - 6:00 PM	Keynote Address (<i>Carnegie Institution</i>)
6:00 PM - 6:15 PM	Invited Response (<i>Carnegie Institution</i>)
6:15 PM - 8:00 PM	Poster Session I and Reception (<i>Carnegie Institution</i>)

Friday, November 11, 2011

Location:

The Grand Hyatt Washington
1000 H Street, NW
Washington, D.C., 20001
Constitution Ballroom, A&B

Time:

8:00 AM- 7:00 PM

Registration and continental breakfast begin at 7:00 AM

8:00 - 8:15 AM	Welcome
8:15 - 9:55 AM	Session I: Communication and Social Cues
9:55 - 10:15 AM	Break
10:15 - 11:30 AM	Session II: Individual Decisions and Group Processes
11:30 - 11:50 AM	Morning Panel Discussion
12:00 - 1:30 PM	Break
1:30 - 3:10 PM	Session III: Developmental Processes and Epigenetics
3:10 - 3:30 PM	Break
3:30 - 4:50 PM	Session IV: Young Investigator Award Presentations
4:50 - 5:10 PM	Afternoon Panel Discussion
5:10 - 7:00 PM	Poster Session II and Reception

The Society for Social Neuroscience

Thursday, November 10, 2011

Locations:**Panel Discussion**

The Grand Hyatt Washington
1000 H Street, NW
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Times:

11:00 AM - 1:00 PM

Keynote and Poster Session

The Carnegie Institution for Science
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Program

11:00 AM - 1:00 PM

Panel Discussion

Chair: Steve Phelps

University of Texas- Austin

Data Management and Supercomputing

Panelists include:

Hakizumwami Birali Runesha, Director of Research Computing University of Chicago

Jasmin Cloutier, University of Chicago

Stephanie Ortigue, Syracuse University and University of Geneva

Martin Shumway, National Center for Biotechnology Information

Tor Wager, University of Colorado- Boulder

Qiaoping Yuan, National Institutes of Health

Zhifeng Zhou, National Institutes of Health

5:00 PM - 6:00 PM

Keynote Address

Robert Seyfarth and**Dorothy Cheney**

University of Pennsylvania

*Social knowledge and the evolution of cooperation
in animals*

Group-living animals compete for food and mates but also cooperate at high rates. Indeed, there is accumulating evidence that close, long-term bonds enhance reproductive success. By favoring such bonds, selection has favored the social and cognitive skills needed to maintain them. Cooperation in animals, however, differs in important respects from human cooperation, in both its underlying mechanisms and our apparent willingness to cooperate with strangers.

6:00 PM - 6:15 PM

Invited Response

Patricia Churchland

University of San Diego

6:15 PM - 8:00 PM

Poster Session I and Reception

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Thursday, November 10, 2011

Posters

Number	Authors	Title
1	Elissar Andari, Fabien Schneider, Philippe Vindras, Raphaëlle Mottolese, and Angela Sirigu	Oxytocin's fingerprint in personality traits and regional brain volume
2	Helder F. Araujo, Jonas Kaplan, Hanna Damasio, and Antonio Damasio	Activity of cortical midline structures during two conditions of autobiographical self
3	Mylène Bolmont, Guillaume Lorenz, Francesco Bianchi-Demicheli, and Stephanie Ortigue	Disorders of sexual desire impact your own quality of life. What about your partner's?
4	Teresa M. Daniele, Rista C. Plate, Johanna M. Jarcho, Daniel S. Pine, and Monique Ernst	Effects of social salience on youths with anxiety disorders
5	Erwin Defensor, Michael Corley, D. Caroline Blanchard, and Robert Blanchard	Facial expressions in mice
6	Tracy Jill Doty, Shruti Japee, Martin Ingvar, and Leslie G. Ungerleider	Neural correlates of bias towards neutral faces relative to fearful faces in healthy individuals
7	Milena Dzhelyova, David I. Perrett and Ines Jentzsch	Spontaneous perception of trustworthiness? Trustworthiness modulation of early face related components
8	Miles R. Fontenot, Lauren A. O'Connell, and Hans A. Hofmann	Molecular profiles and evolution of dopaminergic cell populations in the vertebrate brain
9	Robert G. Franklin and Reginald B. Adams	Behavioral and neural interactions between mentalizing and face memory
10	Jeffrey A. French, Kevin B. Smith, Adam Guck, John R. Alford, and John R. Hibbing	The stress of politics: Endocrinology and voter participation
11	Christopher S. Gabor, Jenny Lymer, Uliana Systerova, Anna Phan, and Elena Choleris	Rapid effects of estrogen receptor GPER/GPR30 on learning and memory in female mice
12	Mario Gil, Mark McDonald, Ngoc-Thao Nguyen, and H. Elliott Albers	Rewarding properties of aggression in the male Syrian hamster
13	Jamie Hanson, Moo Chung, Brian Avants, Karen Rudolph, Elizabeth Shirtcliff, James Gee, Richard Davidson, and Seth Pollak	Child maltreatment, cumulative lifetime stress and amygdala volume

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Posters

Number	Authors	Title
14	Rowshanak Hashemiyoon and J.A. Scott Kelso	Fluctuation analysis of brain signals reveals brain states during social coordination
15	Erin Hecht, Lauren Davis, and Lisa Parr	Do chimps “mirror” others’ actions? A functional neuroimaging study of action execution and observation
16	Sarah Henderson and Catherine J. Norris	Neural evidence for the bivariate model of affect: An fMRI study on ambivalence
17	Ashley L. Jensen, Erwin B. Defensor, Brandon L. Pearson, D.C. Blanchard, Robert J. Blanchard, and Adrian J. Dunn	Neurochemistry of the BTBR T+tf/J mouse model of autism
18	Kelly Jordan, Heather Soder, Rachel Kramer, and Julian Keenan	Depression and self-enhancement: A transcranial magnetic stimulation study examining the dorsal lateral prefrontal cortex and affective self-illusions
19	Amy R. Krosch and David M. Amodio	Weapon primes facilitate the perception of Black faces: Evidence from the P2 event-related potential
20	Frank Krueger, Kevin McCabe, Gopikrishna Deshpande, Olga Dal Monte, Anjani Kumar, Kristine Knutson Viren Vasudeva, Maren Strenziok, Jeffrey Solomon, Morris Hoffman, Paul Robinson, and Jordan Grafman	Unpacking the psychological and neural components of legal third-party punishment
21	Jordan Livingston, Adam Savine, and Todd Braver	Differentiating the neural correlates of pro-social vs. self-oriented motivation
22	Iria Meléndez-Pérez, Victoria Villalta-Gil, Christian Stephan-Otto, Montserrat Fusté, Helena Abellán-Vega, Tamara Russell, Olga Bruna, Antoni Capdevila, and Josep Maria Haro	Recognizing emotions is a good predictor of social outcome in First Psychotic Episodes
23	Peter Mende-Siedlecki, Yang Cai, and Alexander Todorov	The neural bases of updating impressions
24	Junaid Merchant, Will Moore, and Jennifer Pfeifer	The self beyond the medial prefrontal cortex: The role of the extended network in self-construal
25	Ksenia Z. Meyza, Brandon L. Pearson, Jaclyn K. Bettis, Samantha M. O’Hanlon, D. Caroline Blanchard, and Robert J. Blanchard	Impaired social conditioned place preference in BTBR mice in a social reinforcement paradigm

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Posters

Number	Authors	Title
26	Meera Modi, Rainer Landgraf, Larry Young, and Lisa Parr	Intranasal oxytocin increases plasma but not lumbar cerebrospinal fluid oxytocin concentrations in anesthetized rhesus monkeys
27	Pascal Molenberghs, Veronika Halász, Jason Mattingley, Eric Vanman, and Ross Cunnington	Seeing is believing: Neural mechanisms of action perception are biased by team membership
28	George T. Monteleone, Elizabeth A. Majka, Haotian Zhou, J.S. Irick, Kimberly Quinn, Gun R. Semin, and John T. Cacioppo	Neural correlates of synchrony
29	Maryam Okhovat, Nick Lysak, Polly Campbell, Alex Ophir, and Steve Phelps	Complex associations of cis-regulatory sequence polymorphisms with neuronal V1aR abundance: Implications for social behavior and genome-wide association studies
30	Suzanne Oosterwijk, Kristen A. Lindquist, Eric Anderson, Rebecca Dautoff, Yoshiya Moriguchi, and Lisa Feldman Barrett	Mapping the mind: A constructionist view on how mental states emerge from the brain
31	Daniel R. O'Young, Elizabeth Redcay, Joe M. Moran, Jasmin Cloutier, Penelope L. Mavros, and John D.E. Gabrieli	The role of attention on face processing in Autism Spectrum Disorder
32	Brandon Pearson, Atsushi Sugawara, D. Caroline Blanchard, and Monika Ward	Female mice with no male siblings in utero show enhanced pup care and maternal aggression
33	Anna Phan, Vithya Vivekananthan, Virginia Roberts, Jessica A. Mong, Rochelle Abadilla, Elena Choleris, and Mertice M. Clark	The involvement of vasopressin and oxytocin in male Mongolian gerbil parental and social behaviours
34	Steve Phelps, Bret Pasch, and Rachel Sanford	Ecological variation in species recognition and auditory processing in Alston's singing mouse, <i>Scotinomys teguina</i>
35	Lucia Tejada and Emilie F. Rissman	Sexual differentiation of mouse social recognition
36	Bradley C. Thomas, Aaron M. Scherer, Pierce Edmiston, Heather Robinson, and Daniel Tranel	Intact confirmation bias following damage to the ventromedial prefrontal cortex
37	Xiao-Fei Yang, Darby E. Saxbe, Larissa A. Borofsky, Maeve C. Murphy, and Mary Helen Immordino-Yang	Do you think it or feel it? Language and neural activity reflect individual differences in emotion processing

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Morning Program, Part 1

8:00 - 8:15 AM Welcome

8:15 - 9:55 AM Session I: Communication and Social Cues

8:15 - 8:40 **Alex Todorov, Princeton University**
Affective perception of the human face

Using data-driven, reverse correlation methods, it is possible to model evaluation of faces on any social dimension (e.g., trustworthiness) and identify principles of neural coding of faces. Recent research suggests that the amygdala codes faces in terms of their typicality and that this coding carries information that is used to make social attributions to faces such as trustworthiness.

8:40 - 9:05 **Lisa Parr, Emory University**
Face processing in monkeys and apes

My lab studies how monkeys and apes process information about identity and emotion from faces. This talk will review our studies on configural and holistic processing, the recognition of facial expressions, categorization of individual identity, and new data that utilizes a face space framework to understand the perceptual representation of faces. Through these studies, similarities and differences between humans and nonhuman primates have emerged that reflect important species differences in social cognitive processing.

9:05 - 9:30 **Motoaki Sugiura, Tohoku University**
Context dependency of self in self-face recognition

The meaning of 'self' varies by the context in which the term is used. Recent fMRI findings on self-face recognition identified the neural correlates of the self's context dependency. Self-face specific responses are observed in different brain networks depending on the context of face presentation.

9:30 - 9:55 **Steve Rogers, University of Cambridge**
A transition from asocial to social behaviour in an insect: phase change in locusts

Depending upon population density, locusts can reversibly transform between a cryptic solitary phase in which they avoid each other and a gregarious phase where they become much more active and instead seek out conspecifics, forming coherent swarms. Serotonin (5HT) has a key role in mediating the initial switch to gregarious behaviour.

9:55 - 10:15 AM *Break*

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Morning Program, Part 2

10:15 - 11:30 AM Session II: Individual Decisions and Group Processes

10:15 - 10:40

Jim Goodson, Indiana University- Bloomington

Neuropeptide mechanisms of grouping diversity in monogamous birds

Vertebrate species display extreme variation in grouping behaviors, ranging from solitary living to the aggregation of thousands of animals. Comparisons of territorial and gregarious species reveal differences in the distributions of several neuropeptide receptor types, primarily within the lateral septum, and the presence of neuropeptide neurons that encode social valence (positive-negative). These neural elements potentially influence decisions about group size.

10:40 - 11:05

Brian Knutson, Stanford University

Affective processing and financial decision-making

As the crystallization of social value, money provides a powerful tool for motivating human behavior. By combining financial incentives with functional magnetic resonance imaging (fMRI), investigators have localized subcortical networks involved in representing expected good and bad outcomes, and are now using activity from these circuits to predict choice.

11:05 - 11:30

Hans Hofmann, University of Texas- Austin

Evolution of a vertebrate social decision-making network

We analyzed in 88 vertebrate species neurochemical gene expression profiles across twelve brain regions that constitute a social decision-making network. We show that across vertebrates this network is highly conserved, yet sites of ligand production vary more than receptor distributions, with little within lineage variation.

11:30 - 11:50 AM Morning Panel Discussion

Goodson, Hofmann, Knutson, Parr, Rogers, Sugiura, and Todorov

12:00 - 1:30 PM

Break

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Afternoon Program, Part 1

1:30 - 3:10 PM Session III: Developmental Processes and Epigenetics

1:30 - 1:55

Leslie Carver, University of California- San Diego

Typical and atypical development of social cognition in human infants: Behavioral and electrophysiological evidence.

The development of social cognition in infancy involves learning to share attention, referencing others as sources of information in ambiguous situations, and understanding others thoughts, desires, beliefs, and emotions. In this presentation, I will describe studies of social cognition and its precursors in typically developing children and in children with and at risk for ASD, with the goal of developing a comprehensive model of the brain basis of social cognitive development.

1:55 - 2:20

Steve Suomi, National Institutes of Health

Epigenetic consequences of adverse early social experiences in primates

Adverse early social experiences can have lasting effects on primate bio-behavioral development. For example, rhesus monkeys raised by neglectful mothers exhibit excessive fearfulness, aggression, heightened HPA activity, and reduced serotonin metabolism. They also differ from monkeys not experiencing such early social adversity in both brain structure and function. Some of these characteristics appear to be transmitted to their offspring via epigenetic mechanisms.

2:20 - 2:45

Frances Champagne, Columbia University

Maternal care and epigenetic processes

Offspring development is shaped by the quality of mother-infant interactions and there is emerging evidence that neurobiological variation can be induced by maternal effects on epigenetic pathways within the developing brain. These molecular changes have consequences for social and reproductive behavior and can lead to a transgenerational inheritance of behavior.

2:45 - 3:10

Andreas Meyer-Lindenberg, University of Heidelberg

Imaging genetics of human social development

Social behaviors have likely driven the evolution of the human brain and often show high to moderate heritability. In this talk, we will join these two biological facets in an imaging genetic approach that aims to identify neural mechanisms underlying genetic variation impacting on the social brain. Drawing examples from rare high-penetrance conditions such as Williams Syndrome and common genetic variants both from candidate and genome-wide association studies, we show convergent effects on prefrontal regulatory circuits linked to the limbic system, especially amygdala and hippocampus. We present evidence that this system is critically involved in social-environmental risk for mental illness and gene-environment interactions related to early adversity and social stress.

3:10 - 3:30 PM

Break

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Afternoon Program, Page 2

3:30 - 4:45 PM Session IV: Young Investigator Award Presentations

3:30 - 3:45 **Student Research Award: Kimberly Cox, University of Virginia**
Sex chromosome gene effects on juvenile social and anxiety behaviors: Implications for Turner's Syndrome

3:45 - 4:00 **Student Research Award: Rachel Kramer, Montclair State University**
Body Image and the Medial Prefrontal Cortex

4:00 - 4:25 **Early Career Award: Lauren O'Connell, University of Texas- Austin**
From social networks to gene networks

How do behavioral phenotypes spread through social networks? I will discuss how a highly social cichlid fish has provided insight into the molecular and neural mechanisms of phenotypic transmission through communities by examining how behavior of one individual affects the behavior, physiology, and brain gene expression of other community members.

4:25 - 4:50 **Early Career Award: Liane Young, Boston College**
When the mind matters for morality

Mental state reasoning is critical for moral cognition, allowing us to distinguish, for example, murder from manslaughter. I will present neural evidence for distinct cognitive components of mental state reasoning for moral judgment, and investigate differences in mental state reasoning for distinct moral domains, i.e. harm versus purity, for self versus other, and for groups versus individuals. I will discuss these findings in the context of the broader question of why the mind matters for morality.

4:50 - 5:10 PM Afternoon Panel Discussion

Carver, Champagne, Meyer-Lindenberg, O'Connell, Suomi, and Young

5:10 - 7:00 PM Poster Session II and Reception

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Posters

Number	Authors	Title
1	Allison Anacker, Todd Ahern, Larry Young, and Andrey Ryabinin	Alcohol self-administration inhibits the expression of partner preference in a sex-specific manner in prairie voles
2	Lane Beckes, James A. Coan, and Joseph P. Allen	Mother supportiveness and neighborhood quality predict self-other overlap in the neural response to threat
3	Alejandro Berrio, Jorge Pino, and Steve Phelps	Cis-regulatory evolution of the <i>avpr1a</i> locus and its pseudogene among New World voles
4	Remco Bredewold, Caroline Smith, and Alexa Veenema	Septal vasopressin regulates play-fighting in male and female juvenile rats: Sex- and context-specific effects
5	Yawei Cheng	Autism spectrum disorder and conduct disorder as diametrical disorders of empathy imbalance
6	Mina Cikara and Susan Fiske	Bounded empathy: Neural responses to outgroup targets' (mis) fortunes
7	Amy E. Clipperton-Allen, Véronique R. Roussel, Ho L. Ying, Kristina V. Mikloska, and Elena Choleris	Effects of chronic ER α and ER β agonists on a socially transmitted food preference in ovariectomized CD1 mice
8	David Creswell, James Bursley, and Ajay Satpute	Neural reactivation links unconscious thought to improved decision making
9	Jeff Davis	Life chances: A model system for social neuroscience
10	Zoe R. Donaldson and Larry J. Young	A polymorphic microsatellite element upstream of the vole <i>Avpr1a</i> gene contributes to both individual and species differences in brain AVPR1A expression
11	Emily B. Falk, Elliot T. Berkman, and Matthew D. Lieberman	From neural responses to population behavior: Neural focus group predicts population level media effects
12	Ricardo Fonseca, Alexandre Fernandes, Jim Blascovich, and Teresa Garcia-Marques	Modes of processing and challenge and threat in the presence or absence of others
13	Aaron S. Heller, Carien M. van Reekum, Stacey M. Schaefer, Carol D. Ryff, and Richard J. Davidson	Sustained nucleus accumbens activation predicts self-reported psychological well-being
14	Elsa Juan, Francesco Bianchi-Demicheli, Chris Frum, James Lewis, and Stephanie Ortigue	Beyond human intentions: A statistical Multi-Level Kernel Density fMRI analysis towards social neuroscience

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Posters

Number	Authors	Title
15	Johannes Klackl, Eva Jonas, and Martin Kronbichler	Terror management in the brain: Shedding light on the neuronal basis of existential threat processing and regulation
16	Xiaonan Liu and Renlai Zhou	Functional MRI reveals neural substrates of emotion and lateralized activation while viewing affective pictures varying in valence and arousal
17	Loren Martin, Hannah Sample, Hannah Neal, Sydnee Esquibel, Christina Painton, and Angela Schoonover	Validation of a quantitative measure of social motivation in mice using an operant conditioning paradigm
18	John Morris and Randy Nelson	Adult affective, immune, and reproductive responses are altered following adolescent sex
19	Greg J. Norman, Louise C. Hawkley, Aaron Ball, Maike Luhmann, Steve W. Cole, Gary G. Berntson, and John T. Cacioppo	Genetic variation in the oxytocin receptor is associated with alterations in perceived social isolation, social rejection and psychological stress reactivity: A population based study in older individuals
20	Barbara Oakley, Barbara Penprase, Dana Driscoll, and Rueben Ternes	The correlation of empathizing-systemizing with political party and political affiliation
21	Veronica N. Orr, Michael Q. Steinman, Sarah A. Laredo, Elizabeth Y. Takahashi, Andrea L. Silva, and Brian C. Trainor	Sex differences in social interaction and gene expression following social stress in male and female california mice
22	Young-Rim Paik, Su-Kyoung Kim, Jae-Shin Lee, and Byoung-Jin Jeon	Comparison of the effects of simple mirror therapy with task-oriented mirror therapy on the affected upper extremity function in stroke patients
23	Nisa Patel and Stephanie Ortigue	Spatio-temporal dynamics of intention understanding in friendship: an electrical brain imaging study in dyads with "shared representations" of actions
24	Christa Payne and Jocelyne Bachevalier	Sex differences in scan patterns to dynamic bimodal species-specific vocalizations: A study in rhesus macaques
25	Roger L. H. Pobbe, Brandon L. Pearson, Erwin B. Defensor, Valerie J. Bolivar, D. Caroline Blanchard, W. Scott Young III, and Robert J. Blanchard	Oxtr KO mice display social deficits in semi-natural visible burrow systems

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Friday, November 11, 2011

Posters

Number	Authors	Title
26	Kayla Quarterman, Kimberly Cox, and Emilie Rissman	Immune deficiency influences juvenile behaviors in mice
27	Elizabeth Redcay, David Dodell-Feder, Mario Kleiner, and Rebecca Saxe	Look at this: The neural correlates of joint attention during a face-to-face communicative game
28	James Rilling, Ashley DeMarco, Patrick Hackett, Richmond Thompson, Beate Ditzen, Rajan Patel, and Giuspee Pagnoni	Effect of intranasal oxytocin and vasopressin on cooperative behavior and brain activity in men
29	Federica Riva, Alberto Zani, and Alice Mado Proverbio	Electrophysiological indexes of opposite vs. same sex face processing
30	Heather Soder, Kelly Jordan, Racher Kramer, and Julian Keenan	Hijacking freewill: Transcranial magnetic stimulation and decision making
31	Leah Somerville, Rebecca Jones, Natasha Mehta, and Juan Molina	Common and distinct neural representation of arousal during anticipatory and appraisal phases of social evaluation
32	Danielle S. Stolzenberg, Jacqueline Stevens, and Emilie F. Rissman	Epigenetic modifications in the regulation of maternal experience in mice
33	Arshya Vahabzadeh, Christa Lese Martin, Daniel Moreno-De-Luca, and Joseph Cubells	Identification of potentially etiologic copy number variations in adults with intellectual disability and autistic spectrum disorders using array Comparative Genomic Hybridization.
34	Gerard Wallace, Ondi Crino, and Steve Phelps	Type 1 and 2 corticotropin releasing factor receptor distributions in <i>Scotinomys teguina</i>
35	Bo Zhang, Pamela Noble, Jeremy Kruger, Stephen Suomi, Daniel Pine, and Eric Nelson	Social dominance behavior and threat orienting in young adult monkeys is modulated by fluoxetine during early adolescence

The Society for Social Neuroscience

Poster Abstracts

Thursday

Oxytocin's fingerprint in personality traits and regional brain volume

Authors: Elissar Andari, Fabien Schneider, Philippe Vindras, Raphaëlle Mottolese, and Angela Sirigu

Abstract: Oxytocin has a fundamental role in social behavior. Brain oxytocin distribution differed between social and solitary vole species. In humans, supporting evidence show that exogenously administrated oxytocin enhances people's ability to trust or affiliate with others. However, the precise role of oxytocin in human social cognition remains unclear. A key question is whether differences in basal oxytocin concentration in humans can predict people's differences in their degree of sociality; and if such differences are reflected in the structural organization of brain areas, responsive to the action of this hormone. First, we thought to investigate the degree of sociality by the mean of a personality test which shadows a robust and stable pattern of individual differences. We examined the correlation between oxytocin plasma levels and personality traits in 30 healthy subjects, using the NEO-PI-R, which assesses five major personality dimensions (Extraversion, Neuroticism, Openness, Agreeableness, and Conscientiousness). A positive correlation was found between plasma oxytocin and Extraversion, a dimension that capture social affiliative tendencies. Second, in a whole brain analyses, using Voxel Based Morphometry, we showed an inverse correlation between plasma oxytocin and the volume of right amygdala and right hippocampus, two brain areas implicated in fear and anxiety processing respectively. Also, the amygdala-hippocampal complex correlated negatively with Extraversion scores. In other terms, individuals with lower plasma oxytocin level and with lower scores in extraversion displayed larger volume in these areas. In such individuals, approaching others could be emotionally costly and could evoke higher degree of anxiety and fear. This implicates higher activity of key areas such as hippocampus and amygdala, thus leading in the long run to experience-dependent expansion of their structure. Thus, we found that differences in plasma oxytocin are echoed in the variability of individuals' social attitudes and in the structure of brain regions (amygdala/hippocampus complex) important for regulating stress and emotional responses. Our findings emphasize an evolutionary role of oxytocin in overcoming fear and stress and in sociality, in order to increase human fitness.

Affiliations: Center for Cognitive Neuroscience, UMR 5229, Centre National de la Recherche Scientifique, 69675 Bron, France; University Claude Bernard Lyon 1, Villeurbanne, France; Radiology Center, North Hospital & University of Saint Etienne, France

Keywords: oxytocin, extraversion and brain volume

Activity of cortical midline structures during two conditions of autobiographical self

Authors: Helder F. Araujo, Jonas Kaplan, Hanna Damasio, and Antonio Damasio

Abstract: At each moment, we can access information about our own body, which includes the changes that occur as a consequence of interactions with the world and of functional adjustments within the organism's interior. Ultimately, many such moments of self-knowledge are recorded in memory and are integrated in a coherent biography (the autobiographical self, Damasio, 1998, 1999, 2010), which amplifies the scope of the self process and can be used, as needed, in conscious social interactions. The neural basis of the autobiographical self has not been fully elucidated, although one of the most consistent findings of studies about self-reference is the involvement of cortical midline structures (CMSs): medial prefrontal, anterior cingulate, and posteromedial. However, most of these studies have targeted a limited domain of autobiographical self: the investigation of personal traits. Here we explore the involvement of CMSs in the domain of factual biography, e.g. facts that compose each person's identity. In addition, we also study the involvement of CMS in the evaluation of personal traits, a domain often approached in investigations on self-reference. This is an fMRI block design study, in which 19 subjects answered questions about their own traits, about their factual biography, about the traits of an acquaintance and about factual biography of an acquaintance (4 experimental conditions). In each run, each of the conditions (blocks of 24 seconds) is repeated 3 times and separated by a 'one-back-task' (also in blocks of 24 seconds). The one-back-task was used as a baseline. There were a total of three runs per study. Preliminary analysis of data suggests that CMSs are involved in processing both self and non-self biographic information. In some regions of CMSs, non-self conditions were even correlated with higher activity levels than did self-related conditions. These results prompt further discussion about the role of CMSs in self-reference.

References

Damasio AR: Investigating the biology of consciousness. Transactions of the Royal Society (London) 353:1879-1882, 1998.

Damasio AR: The Feeling of What Happens: Body and Emotion in the Making of Consciousness, Harcourt, New York, 1999

Damasio A: Self Comes to Mind: Constructing the Conscious Brain. Pantheon, 2010

Affiliations: Brain and Creativity Institute, University of Southern California, USA; Neuroscience Graduate Program, University of Southern California, USA; Graduate Program in Areas of Basic and Applied Biology, University of Oporto, Portugal

Keywords: self, cortical midline structures

Disorders of sexual desire impact your own quality of life. What about your partner's?

Authors: Mylène Bolmont, Guillaume Lorenz, Francesco Bianchi-Demicheli, and Stephanie Ortigue

The Society for Social Neuroscience

Poster Abstracts

Thursday

Abstract: According to the WHO, sexual health is characterized by the integration of somatic, emotional, intellectual and social aspects of human sexuality. This integration contributes to the enrichment and development of one's own personality as well as to the interpersonal communication and love with one's partner. Although a growing body of evidence demonstrates negative consequences of sexual disorders at the personal level, little remains known about their impact on the partner's mental and sexual health overall. To address this question, we conducted a review of the clinical literature investigating the possible consequences of sexual disorders (i.e., hypoactive sexual desire (HSDD) and erectile dysfunction (ED)) on both the personal and the partner's lives. Studies, including standard scales such as the personal distress scale, profile of female sexual function, life satisfaction index, self-esteem and relationship questionnaires, female sexual function index, and medical outcome survey, were considered for the present review. At this stage, we found twenty-seven studies with a total of 9905 participants (mean age 55.60 years \pm 8.64). Among this sample, 4174 men suffered from ED, while 1293 women suffered from HSDD. Preliminary results showed that men with ED reported having a lower sexual satisfaction ($p < .001$) and a lower self-esteem ($p < .0001$) than men without ED. Men with ED, however, reported having a greater satisfaction with their financial status and hobbies ($p < .001$). At the interpersonal level, results showed that the more severe the ED, the more the men reported feeling lonely, despite the presence of a partner. ($p < .05$). In addition, ED had a significant negative impact on the sexual satisfaction, desires and pleasure of the man's partner ($p < .01$). For women, results showed that individuals with HSDD reported more negative emotional psychological states compared to women without HSDD ($p < .001$). For example, 50% of women with HSDD reported having a low self-esteem compared to 4% of women without HSDD. In addition 88.5% of women with HSDD declared they were unhappy compared to 7.5% of women without HSDD. Surprisingly no information was found in the current clinical literature regarding the impact of a woman's sexual disorder on their partner's well-being. Based on this shocking lack of consideration of one's partner in the interactive cycle of human sexual response, here we propose an integrative model of the human sexual response in which every phase integrates not only one's own desires and mental states, but also the partner's desires and mental states, and their dynamic interaction.

Affiliations: Action, Intention, and Relationships Laboratory, University of Geneva, Department of Psychology, Geneva, Switzerland; University of Geneva, Department of Psychology, Geneva, Switzerland; University Hospital of Geneva, Psychosomatic Gynecology and Sexology unit, Geneva, Switzerland; Syracuse University, Department of Psychology, Syracuse, New York

Keywords: sexual disorder, partner, consequence, satisfaction

Effects of social salience on youths with anxiety disorders

Authors: Teresa M. Daniele, Rista C. Plate, Johanna M. Jarcho, Daniel S. Pine, and Monique Ernst

Abstract: Peer evaluation has been shown to increase reward-motivated risk-taking. This increase typically peaks in adolescence, a time also associated with a rise in anxiety disorders. Data on (1) abnormal behavioral and neural reward responses in anxious youths and (2) hypersensitivity to social stimuli in certain anxiety disorders beg the question of a unique pattern of risk-taking behavior in anxious children and adolescents. To this aim, we implemented a novel, child-friendly paradigm, the Social Stunk task, to probe potential differences in the social modulation of reward-motivated risk-taking in healthy and anxious youths. Fifteen healthy ($M=13.92$ yo, $SD=2.58$) and 18 anxious ($M=11.53$ yo, $SD=2.18$) youths completed the task. Participants were told that they would see a cyclist attempt to jump over a varying number (1-9) of school buses; sometimes the cyclist would successfully complete the jump, and sometimes he would not. Completion rates were proportional to the number of buses. Prior to the jump, participants chose to either "Bet" (if they thought the cyclist would complete the jump) or "Pass" (if they thought the cyclist would not complete the jump). When participants bet, they could either gain or lose 2 points, depending on the outcome of the jump. When participants passed, no points were at risk. Participants were told that the cumulative amount of points would be converted into money at the end of the task. Each participant performed the task with and without peer evaluation (order randomized). In the peer evaluation condition, participants were told that a group of 5 age-matched peers were watching and evaluating their performance via live video feed. In the non-evaluation condition, participants were told that no one was watching them perform the task. In actuality, no peers observed the participants. Participants were debriefed at the end of the study. During perceived peer evaluation, while there was no difference in probability of betting, anxious children bet more rapidly than non-anxious children on high-risk trials (8 or 9 buses). Additionally, the probability of betting did not differ between evaluation conditions for anxious children, however, these participants bet less rapidly on low (1 or 2 buses) and moderate (4 or 5 buses) risk trials during perceived peer evaluation versus non-evaluation. In this preliminary analysis, anxious children made hastier decisions than healthy children in high-risk situations, but only in the presence of perceived peer evaluation. Further, when faced with social evaluation, patients were more hesitant to bet on lower risk trials than when social pressure was absent. In sum, social context distinctly affected motivated behaviors in anxious youths, and in particular situations, these behaviors differed from those of healthy controls.

Affiliation: Section on Developmental and Affective Neuroscience, National Institute of Mental Health, Bethesda, MD

Keywords: anxiety disorders, peer evaluation

Facial expressions in mice

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Authors: Erwin Defensor, Michael Corley, D. Caroline Blanchard, and Robert Blanchard

Abstract: A previous study described a method to measure facial expressions in mice experiencing pain (Langford et al, 2010). The method measured graded changes in the eyes, ears, cheek, nose and vibrissae of the mouse. Similar criteria were adopted in the current study to further characterize the nature of mouse facial expressions in several conditions: a medium bristle brush approaching the face, non-aggressive social interaction, aggressive social interaction, rat exposure and cat odor exposure. Results showed situation-dependent changes in facial expressions of mice. Most notably, different facial expressions were clearly displayed by resident and intruder mice prior to and during aggressive encounters, suggesting that changes in particular facial components may serve to protect sensitive or exposed body parts. The use of facial expressions as social signals is also discussed.

Affiliation: University of Hawaii

Keywords: facial expressions, aggression, social behavior

Neural correlates of bias towards neutral faces relative to fearful faces in healthy individuals

Authors: Tracy Jill Doty, Shruti Japee, Martin Ingvar, and Leslie G. Ungerleider

Abstract: Stimuli that signal threat, such as fearful and angry faces, are known to enhance behavioral responses and neural processing in the brain. However, the extent of this enhancement varies even among healthy individuals. Prior research has assumed that all individuals in a healthy cohort display some level of enhancement for threatening stimuli. In this fMRI study, we investigated whether individuals in a healthy population might not show a bias towards threatening stimuli, but instead have a bias towards neutral stimuli. Accordingly, we created a forced choice decision-making task for categorizing fearful and neutral faces presented at varying levels of expectation. We aimed to probe for behavioral biases towards or away from fearful faces and investigate their neural correlates. We altered expectation by presenting face images within runs containing three different proportions of fearful(F):neutral(N) faces: 80F:20N, 20F:80N, and 50F:50N. Subjects were instructed to report as fast and as accurately as possible whether the face was fearful (i.e. signaled threat) or not. In each trial a red fixation cross served as a cue to let subjects know a face would be presented four seconds later. Overall, subjects responded significantly faster to the face type that was expected. However, across the subjects, there was a spectrum of response times. By taking the difference in reaction time between responses to fearful and neutral faces, we quantified a fear reaction time bias (faster to fearful than neutral faces) for all subjects. Unexpectedly, nine of the fifteen subjects had a negative reaction time bias, being faster to categorize neutral faces compared to fearful faces. Subjects who were faster to categorize neutral faces, compared to those faster to categorize fearful faces, showed greater early trial activation (4-6 seconds post cue) in the striatum for expected neutral faces and less late trial activation (12-14 seconds post cue) in the ventral medial prefrontal cortex for unexpected fearful faces. Both the striatum and ventral medial prefrontal cortex are critical areas for salience and value encoding. Therefore, subjects who categorized neutral faces more quickly than fearful faces preferred the expected neutral face over the unexpected fearful face. This preference is not consistent with previous research demonstrating that infrequent threatening stimuli elicit a larger neural response than expected threatening or neutral stimuli. These results underscore the large variability that exists in healthy adults in the processing of stimuli that signal threat. Supported by the NIMH IRP.

Affiliations: Laboratory of Brain and Cognition, NIMH, NIH; Department of Clinical Neuroscience, Karolinska Institutet

Keywords: fearful faces, individual differences, fMRI

Spontaneous perception of trustworthiness? Trustworthiness modulation of early face related components

Authors: Milena Dzhelyova, David I. Perrett and Ines Jentzsch

Abstract: Behavioural and neuroimaging studies suggest that the attribution of trustworthiness to faces relies on emotional and structural cues. Attributions happen spontaneously and very rapidly but the precise temporal dynamics of the underlying processes are rarely investigated. Recent event related potential studies had begun to explore the time course of trustworthiness perception. Rudoy and Paller (2009) investigated how “perceptual” information (a picture of a face) and “memory-based” information (trait attribution provided by an adjective describing personality) affect trustworthiness perception. Trustworthy as compared to untrustworthy faces evoked greater positivity, 200 to 400 ms post-stimulus – at frontal electrode sites. This modulation may reflect higher cognitive evaluation rather than spontaneous stimulus driven perception. Even though there is evidence that sex of face and facial trustworthiness are not entirely independent dimensions, ERP studies to date have not addressed the relationship between these two facial aspects. In order to address the spontaneous stimulus driven perception of trustworthiness and explore if trustworthiness modulation is contingent on the gender of the face, we employed scalp recorded ERP and evaluated effects on components previously implicated in face processing: P1 (positive component ~100 ms post-stimulus), N170 (negative deflection sensitive to faces) and a posterior-occipital negativity ~ 200 to 300 ms. Since numerous neuroimaging and ERP studies support the view of a right-lateralized face perception, and a stronger activation within the regions involved in trustworthiness perception in the right hemisphere is reported, we focused our analysis solely on the right hemisphere. Thirty-two (16 male) participants judged the gender and trustworthiness of female and male images manipulated to look either more or less trustworthy. The results indicated that facilitated behavioural processing of socially important stimuli – in particular males that looked untrustworthy (and should be avoided) but also females that looked trustworthy (and who might therefore be useful

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in cooperative ventures) – was reflected in an increased negativity of N170 amplitude, thus arguing for a rapid and automatic processing of trustworthiness. Additionally, trustworthiness continued to modulate the amplitude of the negative deflection ~ 200 to 300 ms post-stimulus. Similarly to N170, the amplitude of this component increased for female trustworthy and male untrustworthy faces. The results suggest that negativity accompanies the relevance of the faces (female trustworthy and male untrustworthy) that are important to remember for future social interactions. Furthermore, the different modulation of the face-evoked ERP components based on sex of the face reinforces the importance of gender when investigating trustworthiness perception. In conclusion, our study showed early effects of trustworthiness contingent on sexual differences of facial structure. The structural coding is maintained at longer latencies perhaps by amygdala-cortical connections for a more effective future recollection of important faces.

Affiliation: School of Psychology, University of St Andrews, UK

Keywords: P1, N170, posterior-occipital negativity, trustworthiness perception, gender

Molecular profiles and evolution of dopaminergic cell populations in the vertebrate brain

Authors: Miles R. Fontenot, Lauren A. O'Connell, and Hans A. Hofmann

Abstract: The mesolimbic reward system encodes stimulus salience, which provides the basis for adaptive decision-making. Numerous mental disorders, such as drug addiction and depression, are commonly associated with a dysfunction of this system, and dopamine is generally considered the neurotransmitter most relevant to its function. Although brain regions in the dopaminergic reward system have been well characterized in mammals, homologizing these brain areas with structures in teleost fishes has been difficult. However, a recent synthesis by O'Connell & Hofmann (2011) suggested that this brain system is indeed highly conserved across vertebrates. Nevertheless, the evolutionary antecedents of the ventral tegmental area (VTA) in particular – which serves the main source of dopamine in the reward system – remain unclear. Here we use the highly social cichlid fish *Astatotilapia burtoni* to examine the neurochemical profiles of five dopaminergic groups: the ventral subpallial division of the telencephalon (Vc; putative homolog of the striatum), the preoptic area (POA), the rostral periventricular pretectal nucleus (PPr), the posterior tuberculum (TPp; putative VTA/substantia nigra), and the posterior tuberal nucleus (pTn; putative substantia nigra). To better understand the putative homologies between fish and mammals for these brain regions, we have characterized the expression patterns of five genes (*Etv5*, *Nr4a2*, *Pitx3*, *GRP*, *Otx2*) in these five dopaminergic cell groups in *A. burtoni* and compared these patterns to those in the mammalian brain. We find high concordance despite 450 million years of divergent evolution. Our results suggest that many of these dopaminergic cell groups are evolutionarily ancient.

Affiliation: University of Texas, Section of Integrative Biology, Institute for Cellular & Molecular Biology, Institute for Neuroscience

Keywords: reward system, dopamine, VTA, Evolution

Behavioral and neural interactions between mentalizing and face memory

Authors: Robert G. Franklin and Reginald B. Adams

Abstract: Reading another's mental state (mentalizing) from one's face and face memory are two essential skills for social interaction. Though extensive work has investigated each of these abilities, very little work has examined if mentalizing influences how we remember faces. In the current study, we investigated if differences in mentalizing impacted how we subsequently remembered others and what the neural correlates of this relationship were. Seventeen participants were presented with a series of faces in an emotional attribution task (encoding task) and then were surprised with a retrieval task. During the encoding task, faces were shown for 2s and participants judged whether a face matched one of twelve adjectives that indicated either a complex mental state (e.g., reflective, regretful) or a basic mental state (e.g., bored, tired). Participants completed two blocks of the encoding task with each block consisting of 96 faces, half paired with a complex mental state adjective and half paired with a basic mental state adjective. Each encoding task was followed by a surprise retrieval task six minutes later. During the retrieval tasks, the 96 seen faces were mixed with 84 distracter faces and participants used a 4 button choice to judge if a face was definitely old or definitely new (high confidence judgment) or possibly old or new (low confidence judgment). Encoding faces with complex minus basic mental state adjectives led to greater subsequent memory for the faces when comparing high confidence hits and misses. Faces seen with complex adjectives were significantly more likely to lead to high-confidence hits and less likely to lead to high-confidence misses. Further, complex minus basic adjectives led to activation in regions involved with face memory, including the fusiform gyrus (FG) and hippocampus, as well as regions previously found to be involved with mentalizing, including the superior temporal sulcus (STS) and dorsomedial and ventromedial prefrontal cortex (dmPFC and vmPFC, respectively). In order to investigate if brain activation contributed to the behavioral difference in memory, we used the difference in memory between faces encoded with complex and basic adjectives as a subject-level regressor for the neural analysis comparing complex minus basic mental state adjectives. This analysis revealed activation in the FG, temporoparietal junction, dorsolateral prefrontal cortex, and parahippocampal cortex as well as the dmPFC and vmPFC, indicating that activity in networks involved with memory and mentalizing contributed to individual differences in memory for complex versus basic adjectives. This research explores the neural mechanics underlying the relationship between mentalizing and face memory. Increased mentalizing about faces leads to better memory or them in a surprise memory task. Further, this relationship is driven by increased activation in brain regions involved with face memory as well as mentalizing. This supports the contention that mentalizing affects how we remember others and that brain regions involved with mentalizing may be functionally related to how we remember others.

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Affiliation: The Pennsylvania State University

Keywords: face perception, mentalizing, emotion

The stress of politics: endocrinology and voter participation

Authors: Jeffrey A. French, Kevin B. Smith, Adam Guck, John R. Alford, and John R. Hibbing

Abstract: People vary in the way they respond to stressful situations. These variations can sometimes be seen in actions and facial expressions but they can be measured more precisely by determining the amount of cortisol, a well-known stress hormone. Given the indisputable tendency of politics to generate stress, we hypothesized that individuals with the highest cortisol levels will be the least likely to participate in politics. We tested this hypothesis by collecting a series of saliva samples from 105 individuals before and after they were subjected to a standardized and validated social stressor (the Trier Social Stress Test). Using standard Salimetrics procedures, we then conducted laboratory analyses of the samples to determine cortisol levels in preparation for correlating these levels with previously recorded participation in various political activities. These measures of participation included the individual's self-reported involvement with political clubs, political campaigns, political discussions, political office-holding, political contact (sending a message to a public official), and financial contributions. Moreover, data were collected from the relevant Secretary of State on each participant's actual (not reported) voter turnout in six recent elections (both primaries and general elections). The results indicate that, even after controlling for a standard array of demographic traits as well as self-reported tendencies toward feeling stressed, people with the highest cortisol levels were indeed the least likely to vote in elections, with weaker effects being reported for self-reported participation in political activities other than voting. Effects were strongest for baseline (that is, pre-stress) cortisol levels than for the extent to which the social stressor increased cortisol levels. Finally, even though only four individuals in the sample reported having held public office, these four individuals were significantly lower in cortisol, particularly stress-induced cortisol, than the much larger number of research participants who had never held public office, a finding suggesting either that the type of person seeking office in the first place tends to have cortisol levels that are less responsive to social stress or that the experience of serving in public office tends to inure people from stress responses in socially stressful situations. The larger implication of this research is that efforts to enhance voter turnout would be assisted by consideration of individual-level differences in stress reactivity. For example, it seems likely that publicizing polling places and sending reminders that it is election day (two commonly suggested strategies for increasing turnout) are likely to be more effective on low cortisol individuals than on high cortisol individuals.

Affiliations: University of Nebraska- Omaha, University of Nebraska- Lincoln, Rice University

Keywords: endocrinology

Rapid effects of estrogen receptor GPER/GPR30 on learning and memory in female mice

Authors: Christopher S. Gabor, Jenny Lymer, Uliana Systerova, Anna Phan, and Elena Choleris

Abstract: G protein-coupled estrogen receptor 1 (GPER/GPR30) is a novel, membrane bound, estrogen receptor (ER) capable of mediating rapid signaling events in response to estrogen. Chronic treatment of G-1, a selective GPER agonist, enhanced the rate of acquisition of a spatial learning task in ovariectomized rats. Previously, our lab demonstrated that ER agonist propyl pyrazole triol (PPT) and ER agonist diarylpropionitrile (DPN) affected social recognition, object recognition and object placement learning within a rapid time scale (Phan A et al., *Endocrinology*, 2011, in press). The fact that GPER is expressed in areas of the adult rat brain important for learning and memory such as the hippocampus and forebrain, suggests that GPER could mediate rapid estrogenic effects on learning. Therefore, we used ovariectomized CD1 female mice to investigate the effects of a GPER selective agonist, G-1 at 0, 1, 6, 10 or 30µg/kg, on social recognition, object recognition and object placement learning, within 40 min of subcutaneous drug administration. Results show that social recognition was improved at the 6µg/kg dosage and object placement learning was improved at the 6µg/kg and 10µg/kg dosage. The analysis of the effects on object recognition is on going. These preliminary results suggest that GPER, in addition to ER and ER, is involved in rapid estrogen-mediated learning. These results also support the role of GPER as an estrogen receptor important in non-genomic signaling. To the best of our knowledge, this is the first report of the rapid effects of GPER on learning and memory. Supported by a grant of the Natural Sciences and Engineering Research Council of Canada to Elena Choleris.

Affiliation: University of Guelph

Keywords: learning memory

Rewarding properties of aggression in the male Syrian hamster

Authors: Mario Gil, Mark McDonald, Ngoc-Thao Nguyen, and H. Elliott Albers

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Abstract: Conditioned place preference (CPP) is a type of classical conditioning in which an animal develops a preference for a compartment or environment that was previously paired with a rewarding stimulus. We tested the hypothesis that male Syrian hamsters can develop a CPP for aggression. Our CPP paradigm consisted of three phases: (1) initial preference tests (pretests), (2) conditioning, and (3) a final preference test (posttest). For all preference tests, the amount of time spent in each compartment of the CPP apparatus was recorded. The animals used in this study showed a clear initial preference for 1 of the 2 compartments. For the conditioning trials, an individually-housed (experimental) male was paired with a nonaggressive group-housed male (stimulus) in their non-preferred compartment for 10 min. An hour before or after stimulus-paired trials in the non-preferred compartment, experimental males were placed alone in their preferred compartment for 10 min. This procedure occurred daily for 5 consecutive days, and order of placement in the compartments was alternated daily. Preference scores and difference scores were calculated for both (pre and post) preference tests. There were no significant differences between pretest and posttest scores for control animals ($n=13$). Four of the experimental animals flank marked but didn't show aggression toward the stimulus males. There was a trend toward an increase in preference scores ($p=0.1$) and a decrease in the difference scores ($p=0.09$) following conditioning in these animals. That is, before conditioning the mean preference and difference scores were $0.29 (\pm 0.01)$ and $324.63 (\pm 21.34)$, respectively. After conditioning, scores changed to $0.49 (\pm 0.08)$ and $6.25 (\pm 114.50)$, respectively. Eleven experimental animals showed low to medium levels of aggression. In these animals, conditioning significantly increased the mean preference score from $0.36 (\pm 0.02)$ to $0.50 (\pm 0.05)$ ($p < 0.05$), while the mean difference score decreased from $208.55 (\pm 26.17)$ to $5.55 (\pm 76.82)$ ($p < 0.05$). The strongest effect was observed in 6 highly aggressive males, as conditioning significantly increased their mean preference score from $0.34 (\pm 0.04)$ to $0.56 (\pm 0.04)$ ($p < 0.01$), while their mean difference score changed from $240.42 (\pm 54.98)$ to $-86.50 (\pm 68.99)$ ($p < 0.01$). Our results demonstrate that the Syrian hamster is an excellent rodent model for the study of the rewarding properties of aggression & social behavior. Our data support the hypothesis that aggression has rewarding properties and suggest that the expression of social dominance in nonaggressive animals may also be rewarding. Supported by NSF Grant IOS-0923301 to HEA.

Affiliations: Center for Behavioral Neuroscience; Neuroscience Institute, Georgia State University, Atlanta, GA USA

Keywords: aggression, social behavior, motivation, hamsters

Child maltreatment, cumulative lifetime stress and amygdala volume

Authors: Jamie Hanson, Moo Chung, Brian Avants, Karen Rudolph, Elizabeth Shirtcliff, James Gee, Richard Davidson, and Seth Pollak

Abstract: Child maltreatment and cumulative lifetime stress (e.g., unexpected deaths in the family, major health issues) are associated with a cascade of deleterious changes such as major alterations in important brain circuitry, negative outcomes in behavioral functioning, and increased risk for certain psychopathologies (for review, see Lupien et al., 2009). Child maltreatment and the associated disruption of the primary care-giving relationship, in particular, may be a unique diathesis for socio-emotional difficulties, as children who suffer abuse or deprivation/neglect experience significant problems with sensitivity to social boundaries, establishing relationships, emotion regulation under conditions of stress or change, and processing of specific emotions (Pollak, 2008). By investigating the commonalities and discontinuities existing in the sequelae of these different forms of adverse experiences, unique insights may be garnered regarding normative and atypical functioning. For example, there may be unique interactions between child maltreatment and cumulative lifetime stress, with greater negative impacts in children who have faced this early adversity than in those who have not faced this adversity. In this study, we examined the neurobiological correlates of lifetime stress exposure in a sample of children with and without a history of child maltreatment ($n=128$; mean age=12.6 years), using Symmetric Normalization (Avants & Gee, 2004) and a tensor-based morphometry analytic framework. We hypothesized that cumulative lifetime stress exposure would uniquely affect the amygdala, a brain region central to the processing of socio-emotional information, in children who suffered from early maltreatment but not those who did not suffer from early maltreatment. As hypothesized, a significant association emerged between higher levels of life stress and smaller amygdalae volumes in maltreated children ($t=3.6$, $p<.005$, uncorrected; see figure below) but not in non-maltreated children. Individual differences in amygdala volume were related ($r=-.296$, $p=.015$) to socio-emotional functioning (e.g., number of close friends, frequency of disciplinary issues at school) as assessed by semi-structured interviews with children and their parents. These findings suggest maltreatment and higher levels of cumulative lifetime stress may interact to uniquely affect important socio-emotional neural circuitry. Results will also be discussed in relation to neuroendocrine variables.

Affiliations: University of Wisconsin- Madison, University of Pennsylvania, University of Illinois at Urbana- Champaign, University of New Orleans

Keywords: adolescence, stress, early experience, maltreatment, socio-emotional

Fluctuation analysis of brain signals reveals brain states during social coordination

Authors: Rowshanak Hashemiyoon and J.A. Scott Kelso

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Abstract: Humans are very social animals. The foundation of our daily lives is generally built upon our relationships with others. Concurrently, we champion our individuality and value the ability and opportunity to make our own decisions. This interplay of influences, from within and without, creates very complex behavioral dynamics for the individual and for its populations. How does the human brain handle this dynamic reciprocity? Neuronal activity has been shown to produce or regulate behavior via network interactions. Recordings from these signals pose two problems for deciphering underlying information processing dynamics. Both nonstationarity and high dimensionality make it notoriously difficult to decipher correlation processes in these assemblies. We examine the effects of dimensionality on these correlations during social interaction. Pairs of subjects were placed opposite each other with no visual contact and were instructed to make self-paced rhythmic finger movements (uncoordinated condition). After 20s the opaque screen between them became clear and they were instructed to either 1) continue their movements with their own intrinsic rhythm, 2) coordinate with their partner making inphase movements, or 3) coordinate with their partners making antiphase movements. Hyperscanning with 60 channel dual EEG caps revealed underlying individual and interpersonal neural activity throughout the entire range of behaviors. Detrended fluctuation analysis (DFA) was applied to the data to ensure reliable detection of long range correlations denoted by the scaling exponent. Traditional techniques such as power spectrum or correlation analysis are designed for stationary data and can erroneously indicate long range correlations as an artifact of the heterogeneity of the signal under time translation. DFA was designed to accurately detect and quantify long range correlations, such as power law behavior, embedded in the fluctuations of a noisy signal as observed in EEG. Thus, DFA was used to reveal underlying correlation properties before and after coordination (the 20s mark) as well as between different instructional conditions (inphase, antiphase and intrinsic). Preliminary data reveal the presence of long term correlations regardless of epoch or condition. However, within each paradigm, there was an increased presence of power-law in the second epoch (coordination), suggesting an increase in persistent long term correlations as demonstrated by the scaling exponent. This increase in power-law behavior indicates a change in the complexity of the system. Such a change could be caused either by a change in an existing attractor during the interpersonal interaction or the presence of a new one, which could be the social interaction itself.

Affiliations: Human Brain and Behavior Laboratory, Center for Complex Systems and Brain Sciences, Florida Atlantic University; Intelligent Systems Research Centre, University of Ulster, Derry, Northern Ireland

Keywords: network behavior, dimensionality, self-organizing criticality, motor coordination

Do chimps “mirror” others’ actions? A functional neuroimaging study of action execution and observation

Authors: Erin Hecht, Lauren Davis and Lisa Parr

Abstract: Social learning is a behavioral adaptation that varies across primate species. Humans have a broad and complex repertoire of socially transmitted behaviors. We can duplicate not only the result of an observed action, but also the specific kinematic method in which it is achieved. In contrast, macaques have a smaller, simpler range of socially transmitted behaviors and duplicate only observed actions’ results. These species differences in behavior are paralleled by species differences in brain activity. Both humans and macaques have a fronto-parietal action observation/execution matching system. In macaques, this system responds only to object-directed actions - those that involve results. In humans, it also responds to purely kinematic, non-object-directed actions. Thus species differences in social learning may be related to which aspects of observed actions are “mirrored” in the brain. Chimpanzee social learning is intermediate to macaques and humans, but their mirror system has not yet been studied. Like humans, they are profuse social learners, but like macaques, they duplicate mainly the results of observed actions. We used positron emission tomography (PET) to investigate how the chimpanzee brain mirrors observed actions. Four chimpanzees were given a 15 mCi oral dose of flourodeoxyglucose (FDG), a radio-labeled glucose analog. Each subject was scanned in four separate conditions. In the execution condition, the chimp performed an object-directed reach-to-grasp action with a small ball. These actions occurred inside a box so that the chimp could not see its own movement. In the transitive observation condition, the chimp observed the experimenter performing the same actions. In the intransitive observation condition, the chimp observed the experimenter miming this action without the ball. In the rest condition, the chimp rested quietly. After a 45 minute testing period, subjects were anesthetized and scanned. FDG has a half-life of 110 minutes and upon decay releases a positron which is detected by the scanner. Brighter areas in the scan thus represent greater FDG uptake and therefore greater metabolic activity during the testing period. In both execution and transitive observation, chimpanzees activated frontal and parietal regions homologous to macaque and human “mirror areas.” In intransitive observation, these activations were weaker and more variable across subjects. Results are related to behavioral data on each subject’s observational learning abilities, as well as to diffusion tensor imaging data on the white matter connectivity of each subject’s activated regions.

Affiliations: Neuroscience Graduate Program, Yerkes National Primate Research Center, Center for Translational Social Neuroscience, Center for Behavioral Neuroscience, Division of Psychiatry and Behavioral Sciences

Keywords: social cognition/sensorimotor transformation: behavior and whole animal

Neural evidence for the bivariate model of affect: An fMRI study on ambivalence

Authors: Sarah Henderson and Catherine J. Norris

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Abstract: The Evaluative Space Model of affect posits that positivity and negativity exist as two partially dissociable systems that act independently but can co-activate, resulting in a state of ambivalence (Cacioppo & Berntson, 1994; Cacioppo, Gardner, & Berntson, 1997, 1999). Though a great deal of behavioral research has provided support for this model of affect, the neural mechanisms driving the experience and resolution of ambivalence remain elusive. The current study sought to provide evidence that ambivalence (a) co-activates neural networks involved in positive and negative affect while also (b) activating unique regions, potentially those implicated in the detection and resolution of conflict. Using functional magnetic resonance imaging (fMRI), participants (N = 30) viewed pictures from the International Affective Picture System (IAPS) presented in 10 sec blocks. In each block, two pictures were displayed for 5 sec each. The paired pictures were either both pleasant, both unpleasant, both neutral, or one picture was pleasant and one was unpleasant (i.e., ambivalent pairs). Following the fMRI portion of the study, participants rated their positive and negative responses to each picture pair. Ratings indicated that participants did indeed feel positive when viewing the pleasant picture pairs, negative when viewing the unpleasant picture pairs, and mixed (i.e., both positive and negative) when viewing the ambivalent picture pairs. We then conducted a whole-brain conjunction analysis to examine our two hypotheses regarding the neural mechanisms underlying ambivalence. First, we sought to examine regions that were activated both when viewing ambivalent and either pleasant or unpleasant picture pairs. A cluster in subgenual anterior cingulate (ACC) showed activation both to pleasant and ambivalent pairs; whereas clusters in ventrolateral prefrontal cortex (BA 11/47), bilateral thalamus (medial dorsal nuclei), and bilateral caudate nuclei showed activation both to unpleasant and ambivalent pairs. Given that previous research has suggested these regions are involved in processing the affective value of pleasant (e.g., subgenual ACC) and unpleasant (e.g., ventrolateral PFC) stimuli, these findings support a bivariate model of affect in which ambivalence co-activates separable neural systems specialized for processing positivity and negativity. Second, we sought to investigate neural regions uniquely activated by ambivalence. A cluster extending from the frontal eye fields (BA 8) through the right dorsal ACC (BA 32) and a cluster in the ventral ACC (BA 25) were activated only when viewing ambivalent picture pairs (and not pleasant or unpleasant pairs). These regions have been implicated in both cognitive and emotional conflict as well as uncertainty, and our findings thus suggest that ambivalence brings online resources that monitor for conflict. In sum, our findings provide further evidence in support of the bivariate model of affect and suggest two neural mechanisms underlying ambivalence: (a) co-activation of specialized neural networks for positivity and negativity leading to (b) conflict monitoring. Further research is needed to understand the mechanisms that ultimately resolve ambivalence after the system has processed positive and negative attributes and recognized the existence of a conflict.

Affiliation: Dartmouth College

Keywords: ambivalence, affect, fMRI

Neurochemistry of the BTBR T+tf/J mouse model of autism

Authors: Ashley L. Jensen, Erwin B. Defensor, Brandon L. Pearson, D.C. Blanchard, Robert J. Blanchard and Adrian J. Dunn

Abstract: Autism is defined by three core behavioral features: impaired reciprocal social interactions, impaired communication and repetitive and stereotyped behaviors. Despite the absence of a reliable biomarker, several neuropathologies have been associated with the disorder including increased cortical volume at particular developmental ages, agenesis of the corpus callosum and dysfunction of neurotransmitter systems. Animal models allow investigation of anatomical, neurochemical and hormonal abnormalities potentially related to this disorder. Previous studies have shown that the inbred BTBR T+tf/J mouse strain (BTBR) displays several behaviors analogous to the core symptoms of autism. The current study measured central neurotransmitter activity in the BTBR at basal concentrations and also in response to a novel environment and social proximity. Brain tissue concentrations of norepinephrine (NE), dopamine (DA), serotonin (5-HT) and their respective metabolites were measured using high performance liquid chromatography (HPLC) with electrochemical detection. Behavioral results were consistent with previous findings in the social proximity test, showing that BTBR mice displayed decreased facial contact and increased crawl over and crawl under behaviors. Several neurochemical strain differences were observed, especially in cortical and cerebellar concentrations of DA and 5-HT.

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Keywords: autism, animal models, neurotransmitters

Depression and self-enhancement: A transcranial magnetic stimulation study examining the dorsal lateral prefrontal cortex and affective self-illusions

Authors: Kelly Jordan, Heather Soder, Rachel Kramer, and Julian Keenan

Abstract: It has been widely reported that people who suffer from clinical depression exhibit a deficit in self-enhancement. It is possible that self-enhancement provides a buffer against negative affect. Recently, a number of studies have indicated that prefrontal cortex (PFC) abnormalities are commonly seen in depressed patients. Specifically a hypoactivation of the left dorsolateral prefrontal cortex (DLPFC) and a hyperactivity in the right DLPFC is correlated. Repetitive transcranial magnetic stimulation (rTMS) is currently being employed in the treatment of depression by altering that cortical functioning of the DLPFC; with mixed but promising results, it is unknown whether such changes in depressive symptoms coincide with changes in self-enhancement. Low frequency rTMS can be used to inhibit cortical activation, while, high frequency rTMS can be used to increase cortical activation. It is our hypothesis that self-enhancement and

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depression have a relationship in which they are yoked together and therefore any change in depression should have an associated change in self-enhancement. This investigation utilized low frequency rTMS to the left DLPFC in an attempt to further elucidate the relationship between depression and self-enhancement. Specifically, as depressed mood increased self-enhancement decreased. These results support the theory that self-enhancement or positive illusions about the self play a role in maintaining positive affect and combating depressive tendencies. While concepts such as self-enhancement have normally been within the purview of social psychologists these findings seem to indicate that such ideas may warrant further investigation by clinicians. Furthermore, these data add to the interplay between the cognitive, social and emotional functioning of the PFC. We suspect, though speculative, that such regions evolved with concurrent advances in affective and cooperative abilities.

Affiliations: Cognitive Neuroimaging Laboratory, Montclair State University

Keywords: rTMS, dorsal lateral prefrontal cortex, self-enhancement, depression

Weapon primes facilitate the perception of Black faces: Evidence from the P2 event-related potential

Authors: Amy R. Krosch and David M. Amodio

Abstract: Much previous research shows that prior knowledge of a social group (e.g., stereotypes) shapes a perceiver's impressions and behaviors toward members of the group. But can it also shape the early visual perception of a stereotyped person's face? In research designed to test this question, we hypothesized that stereotypes facilitate perception of stereotype-relevant faces. Specifically, we predicted that when primed with objects related to the stereotype of Blacks as dangerous (guns), participants would exhibit greater rapid attentional processing of Black faces than White faces, as indicated by the P2 component of event-related potential (ERP), compared with stereotype-unrelated primes. ERPs were recorded while participants categorized a series of Black and White faces, houses, cars and chairs as either a "Face" or an "Object". Each target was primed with either a gun or a tool. As predicted, the P2 amplitude was larger to Black than White faces following gun primes, but did not differ following tool primes. This finding highlights the powerful influence stereotypes have on even the earliest components of person perception, and points to a potential mechanism through which stereotypes might affect downstream impressions and behaviors.

Affiliation: New York University

Keywords: face processing, P2, race

Unpacking the psychological and neural components of legal third-party punishment

Authors: Frank Krueger, Kevin McCabe, Gopikrishna Deshpande, Olga Dal Monte, Anjani Kumar, Kristine Knutson Viren Vasudeva, Maren Strenziok, Jeffrey Solomon, Morris Hoffman, Paul Robinson, and Jordan Grafman

Abstract: Although legal third-party punishment (TPP) is an essential feature of human society, remarkably little is known about the underlying psychological and neural components of TPP. First, administering a TPP task we demonstrated that only ventromedial prefrontal cortex (vmPFC) damage led to diminished punishment decisions. Second, employing parametric fMRI and a TPP task, we revealed a neural TPP network relying upon specific psychological components each modulated by a distinct cortical midline structure: intention behind norm violation (dorsomedial prefrontal cortex), harm to the victim (posterior cingulate), and outcome for the perpetrator (vmPFC). Finally, applying Granger causality mapping we identified the vmPFC based on its effective connectivity as the engine of the TPP network, providing rapid access to an underlying value system determining the degree of punishment for illegal behavior. In conclusion, the identified components of legal TPP provide a route by which human evolution enabled abstract and objective views of behavioral transgression.

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Keywords: judgment, decision-making, social cognition, fMRI, lesion study

Differentiating the neural correlates of pro-social vs. self-oriented motivation

Authors: Jordan Livingston, Adam Savine, and Todd Braver

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Abstract: Recent findings have clearly demonstrated that self-oriented motivational incentives (e.g. earning money, praise, or consumed rewards for the self) can enhance executive function and goal pursuit. These enhancements have been found not only in terms of behavioral indicators, but also in modulations of neural activity in brain regions associated with reward and cognitive control, during attention, working memory, and task-switching paradigms. However, human motivation is often pro-social in nature (e.g., giving benefit to another); it is not known whether pro-social motivation might engage similar or distinct neural mechanisms from that engaged by self-oriented motivation. In the current study, participants performed cued task-switching in two separate mixed block-event related fMRI scanning sessions that were analogous in structure and differed only in terms of motivational incentives (self-oriented vs. pro-social) available for optimal performance. In each session, participants met a confederate whom they believed would simultaneously participate in the experiment. In the self-oriented condition, participants earned money for themselves, whereas in the pro-social condition, participants earned money for the confederate. Behaviorally, both self-oriented and pro-social motivational incentives enhanced cognitive control and reduced task-switch costs, but via distinct performance profiles. Consistent with prior work, brain activation increases were observed in cognitive control and reward regions in both incentive conditions, relative to baseline. Most notably, increased sustained activity in anterior lateral PFC was observed in the pro-social relative to self-oriented condition. This finding supports the idea that pro-social motivation may activate more higher-order, abstract, and global task goals than self-oriented motivation, and as such, produce distinct effects on cognitive control strategy.

Affiliation: Washington University, St. Louis, MO, USA

Keywords: motivation, social cognition, cognitive control

Recognizing emotions is a good predictor of social outcome in First Psychotic Episodes

Authors: Iria Meléndez-Pérez, Victoria Villalta-Gil, Christian Stephan-Otto, Montserrat Fusté, Helena Abellán-Vega, Tamara Russell, Olga Bruna, Antoni Capdevila, and Josep Maria Haro

Abstract: Deficits in social functioning are a characteristic hallmark of schizophrenia present at premorbid and early prodromal stages of the disorder. Several studies have aimed to disentangle the factors contributing to such difficulties. While efforts have been made to relate cognitive functioning to social disability, robust results remain elusive, yet social cognitive abilities (especially face emotion recognition) has emerged as a good predictor of social outcome. The aim of our study is to assess whether social cognitive performance (facial emotion recognition) could be a better predictor of social outcome than non-social cognitive functioning even at early stages of the disorder. **Method:** Cross-sectional study with 18 subjects diagnosed with a First Psychotic Episode (FPE) and 18 control subjects matched for gender and age. All subjects were assessed with a clinical assessment battery comprising the Structured Clinical Interview for DSM Disorders (SCID), the Calgary Depression Scale (CDS) and the Young Mania Rating Scale (YMRS), patients were also assessed with the Positive and Negative Syndrome Scale (PANSS). A battery of neuropsychological assessment (including measures of verbal, visual and working memory, executive functioning, language abilities and attention) and a battery of social outcome assessment (comprising the Premorbid Adjustment Scale, the Disability Assessment Scale-short version and the Global Assessment of Functioning) were also administered. Face emotion recognition was assessed with a computerized experiment consisting on four tasks using Ekman's stimuli (1976). In two of the tasks subjects were asked to match a target face with one of two probe faces regarding the emotion expressed (either happiness or fear), in the other 2 tasks subjects were asked to match the target face with one of the 2 probe faces regarding their identity (all faces expressing an emotion: happy or fear). Accuracy and reaction time were collected. All the tests were two-tailed and only P values <0.05 were considered as significant. Group comparisons were performed using Chi-square test (for categorical variables) and analysis of variance using independent samples t-tests for continuous variables. To determine the relations between symptomatology, basic and social cognition, and functional outcome variables were performed using Pearson correlations. Linear regression analyses using the step-wise method were performed to assess whether functional outcome was explained by social cognition or by basic cognition. **Results:** Patients show significantly worse social outcome (current and premorbid; $p < 0.0001$), neurocognition (vocabulary, $p < 0.0001$; verbal memory, $p = 0.007$; and attention, $p < 0.01$) than control subjects. They show similar accuracy rates but much slower reaction times than control subjects ($p < 0.01$) on face recognition tasks. This slowness is associated with negative symptoms $r = 0.748$; $p < 0.01$) and a worse social outcome ($r = 0.681$; $p < 0.01$). Moreover variables of face emotion recognition explain 38% of the variance of premorbid social functioning ($p = 0.015$; Beta = 0.615) and a 35% of the variance of current social functioning ($p = 0.010$; Beta = -0.587) independently of neurocognitive variables. **Conclusions:** Results suggest that face emotion recognition deficits are a good indicator of social outcome in early stages of psychotic disorders and could be a good therapeutic target in order to redress social disability in these patients.

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Keywords: emotion recognition, social cognition, neurocognition, social outcomes

The neural bases of updating impressions

Authors: Peter Mende-Siedlecki, Yang Cai, and Alexander Todorov

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Abstract: Person perception is a dynamic, evolving process. Since other people are an endless source of social information, quite often we find ourselves in situations where new information we learn about an individual is not consistent with previously learned information. Thus, the capacity to update our impressions of those around us is critical. We devised an fMRI study designed to identify brain regions involved in the process of updating impressions. Subjects saw neutral male faces with either positive or negative behavioral information printed below them, and were asked to form impressions of these individuals. Each face was seen five times in a row, each time with a different piece of behavioral information. For half of the faces, the valence of the information was kept consistent—on all five trials, the face was paired with either positive or negative information. Critically, for the rest of the faces, the valence of the information changed on the fourth trial—making the fourth and fifth trials inconsistent with information previously learned about that person. We ran a contrast of all face-plus-behavior trials against control trials (faces alone) to identify regions involved for impression formation. Consistent with prior work, this contrast yielded activity in dorsomedial prefrontal cortex (dmPFC) and posterior cingulate cortex. Activity in the dmPFC ROI increased significantly from trial 3 to trial 4 in the inconsistent condition, but remained stable from trial 3 to trial 4 in the consistent condition. We compared between “update direction” (ie, the difference between updating from a positive impression to a negative impression and vice versa) and observed an area of right inferior frontal gyrus that was preferentially active for updating from a positive to a negative impression.

Affiliation: Princeton University

Keywords: impression formation, person perception

The self beyond the medial prefrontal cortex: The role of the extended network in self-construal

Authors: Junaid Merchant, Will Moore, and Jennifer Pfeifer

Abstract: Neuroimaging studies of self-construal have primarily focused on the extent to which the medial prefrontal cortex (mPFC) is engaged when making evaluations about the self versus when making evaluations about a close other. The amount of overlap between these patterns of activity has been correlated with different measures of self-construal style, and is often used as an index of how closely the self-other distinction is represented at the neural level. While these findings extend our understanding of regions traditionally associated with self-relevant processing, they still leave open questions about how self-construal is substantiated by other neural systems involved in social cognition. To address this gap in the literature, the present study used a novel self-other neuroimaging paradigm to explore the relationship between self-construal style and lateral cortical areas involved in mentalizing, as well as insular regions associated with empathy. 19 participants (10 female; mean age 25.7) underwent functional magnetic resonance imaging (fMRI) while they evaluated phrases as being self-descriptive (both from their own perspective, and from the perspective of their best-friend), descriptive of their best friend, or descriptive of a quality that can change (control). To maximize participants' ability to mentalize/empathize, each participant was asked to provide the first name of the same-sex friend they new the best (i.e., best friend), which was then programmed and used in the stimuli presented during scanning. After the fMRI session, participants completed a packet of measures aimed at assessing their general self-construal style, including the independent and interdependent sub-measures of the Self-Construal Scale (SCS), and the Relational-Interdependent Self-Construal Scale (RISC). Whole-brain regressions using each of the different self-construal measures reveal a consistent pattern of results. In general, activity in regions associated with theory of mind (i.e., temporal-parietal junction; TPJ), social perception (i.e., superior temporal sulcus; STS), and empathy (i.e., anterior insula; AI) are predicted by measures of interdependent self-construal and negatively correlated with measures of independent self-construal, while engagement of lateral prefrontal areas are correlated with measures of independent self-construal. Interestingly, when looking at the self greater than best friend contrast, we found that RISC was most strongly correlated with activity in right TPJ, and not the mPFC. This finding is particularly striking considering that the self greater than best friend contrast revealed significant activity in the mPFC, stretching from anterior-rostral to dorsal aspects, and no activity in the lateral temporal or parietal regions. Results from the present study indicate that the neural correlates of self-construal style involve more than just mPFC regions associated with self-relevant processing, but also implicate an extended network for social cognition. Moreover, these findings suggest an alternative framework for how self-construal style is substantiated in neural systems, expanding the study of self beyond the mPFC.

Affiliation: University of Oregon

Keywords: self, social cognition, theory of mind

Impaired social conditioned place preference in BTBR mice in a social reinforcement paradigm

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Abstract: Juvenile male and female mice from both the C57BL/6J and BTBR T+tf/J strain were conditioned to an arena much like those used in psychostimulant-based conditioned place preference studies. Every 24 hours, for five days or for ten days, mice received daily conditioning sessions in a visually distinct side chamber containing an unfamiliar, age-matched stimulus mouse for ten minutes, and ten additional minutes on the opposite, visually-distinct side, without a mouse. Initial side order was counterbalanced. For three contiguous days following the fifth or tenth day of conditioning, mice were tested for their side preference in the arena, with unrestricted access to the two visually distinct sides and the center compartment. The percentage change in preference for the side that was their socially-conditioned side relative to their spontaneous preference for that side during baseline testing, prior to conditioning, was compared for the groups. B6 mice showed an elevated preference for the side previously associated with the mouse stimulus, and this effect was much stronger for the ten day conditioning group. BTBR mice, in contrast, showed no net change or a slight aversion in preference for the socially-conditioned side chamber. These results add to a growing body of literature on animal models of autism-like social impairments, and may provide insights into the relative positive incentive value of social interactions in candidate strains. Acknowledgements: Funded by NIH R01 MH081845 to RJB. Study designed by BL. Pearson.

Affiliation: Pacific Biosciences Research Center, University of Hawaii at Manoa

Keywords: autism model, BTBR mice, reward, social conditioned place preference

Intranasal oxytocin increases plasma but not lumbar cerebrospinal fluid oxytocin concentrations in anesthetized rhesus monkeys

Authors: Meera Modi, Rainer Landgraf, Larry Young, and Lisa Parr

Abstract: Oxytocin (OT) modulates complex social behaviors in rodents as well as humans. However, until recently, investigation into the effect of central OT using non-invasive means has been limited by the inability of peripherally administered OT to cross the blood-brain-barrier (BBB) outside the circumventricular organs (CVO). It has been hypothesized that intranasally (IN) administered OT can reach the central nervous system via a compromised BBB in the nasal epithelium. IN OT in humans enhances trust, emotional perception, social memory and empathetic behavior and IN oxytocin has been proposed as a potential pharmacotherapy to enhance social functioning in ASD. However, there has been no published documentation that IN delivered OT actually increases central OT concentrations. To address this limitation, we have used rhesus macaques to determine the extent to which IN and intravenous (IV) OT administration effects plasma and cerebrospinal fluid (CSF) OT concentrations. Six rhesus monkeys (*Macaca mulatta*) were anesthetized and given the synthetic oxytocin analogue, Syntocinon (24 or 48 IU, Novartis), or its placebo, IV or IN. Serial CSF samples were taken from the lumbar region 0, 60 and 120 minutes after administration. Plasma samples were taken at the same time points for the IN administration and at 0, 5, 15, 60 and 120 minutes for the IV administration. Each subject received all four conditions during separate sampling sessions. CSF and plasma samples were assayed for OT and vasopressin (AVP) levels by radioimmunoassay. Neither IN nor IV OT had a significant effect on the level of OT in the lumbar CSF of rhesus monkeys as compared to placebo administration or pretreatment levels. Both OT treatments, however, did dramatically increase plasma levels of OT compared to placebo treatments [$F(3,5)=23.515$, $p<0.0001$] and over the pre-administration time points [$F(2,5)=15.685$, $p=0.001$]. Plasma levels of OT increased 100 fold after IN administration and 1000 fold after IV administration. Neither treatment nor route of administration had a significant effect on either CSF or plasma levels of AVP. There are two possible explanations for this finding in light of the behavioral effects of IN OT. Either IN OT does penetrate the BBB, perhaps via the CVO, and accesses CNS receptors, but bypasses CSF circulation or IN OT does not reach the CNS in appreciable amounts and has behavioral effects via peripheral mechanisms. In vivo microdialysis studies are needed to distinguish these two possibilities.

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Keywords: intranasal, oxytocin, non-human primate

Seeing is believing: Neural mechanisms of action perception are biased by team membership

Authors: Pascal Molenberghs, Veronika Halász, Jason Mattingley, Eric Vanman, and Ross Cunningham

Abstract: Group identification can lead to a biased view of the world in favor of “in-group” members. Studying the brain processes that underlie such in-group biases is important for a wider understanding of the potential influence of social factors on basic perceptual processes. In this study we used fMRI to investigate how people perceive the actions of in-group and out-group members, and how their biased view in favor of own-team members manifests itself in the brain. We divided participants into two teams and had them judge the relative speeds of hand actions performed by an in-group and an out-group member in a competitive situation. Participants judged hand actions performed by in-group members as being faster than those of out-group members, even when the two actions were performed at physically identical speeds. In an additional fMRI experiment we showed that, contrary to common belief, such skewed impressions arise from a subtle bias in perception and associated brain activity rather than decision making processes, and that this bias develops rapidly and involuntarily as a consequence of group affiliation. Our findings suggest that the neural mechanisms that underlie human perception are shaped by social context.

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Keywords: fMRI, perception of action, group membership

Neural correlates of synchrony

Authors: George T. Monteleone, Elizabeth A. Majka, Haotian Zhou, J.S. Irick, Kimberly Quinn, Gun R. Semin, and John T. Cacioppo

Abstract: The human tendency to spontaneously synchronize with others has been extensively documented in various domains. In the present investigation, we experimentally investigated the neural correlates of perceived synchrony using a newly developed minimal synchrony paradigm that addresses several problems in the extant research, such as a confounding of synchrony and task performance. Specifically, individuals participated in a task similar to cell-phone texting but in which a simple beat (a single tap on the computer keyboard) replaced lexical content. The task was described to participants as “bexting,” short for beat-based texting. During the task, participants believed they were exchanging beats via computer with a human partner, unaware that the ostensible partner’s response was actually a computer-generated response manipulated to be synchronous or asynchronous. Following each condition, participants entered ratings of perceived synchrony with and affiliation for the partner. Sixteen healthy participants performed the task in a 3T Philips scanner. The experimental design was a Period (Bexting versus Rating) x 2 (Bexting Synchrony: high versus low) within-participants factorial design. In the bexting period, participants were instructed to tap beats at around 1 Hz on their own while viewing a pulsing icon representing each finger tap next to a second pulsing icon representing the ostensible partner’s response. In the rating period, participants rated how synchronous they regarded their partner, as well as a series of affiliation ratings felt towards the partner including rapport, liking, and desire to collaborate in the future. Bexting trials were 8s in duration and were blocked in sets of eight constituting each of four bexting rounds. The partner in half of the rounds produced beats that followed the participant by a mean lag of 120 or 220 ms with a temporal jitter of + 10 ms (high synchrony condition), and the partner in the other half of the blocks produced beats that followed the participant by a mean lag of 120 or 220 ms with a temporal jitter of + 110 ms added (low synchrony condition). For the fMRI analysis, 25 ROIs were identified based on prior research on social cognition including sub-regions of the medial prefrontal cortex, superior temporal sulcus, and temporo-parietal junction. Participants’ behavioral ratings were correlated with the BOLD response within participants for each ROI. R-values were converted to Fisher’s Z, and Z-scores were subjected to a one-sample, two-tailed t-tests at the group level to determine which neural regions were positively or negatively correlated with behavioral ratings at the group level. Results demonstrated a significant positive correlation between BOLD response and both perceived synchrony ratings and affiliation ratings in the ventromedial prefrontal cortex (vmPFC) during the bexting task. The vmPFC has been reported in prior research to be involved in self-relevant processing as well as theory of mind tasks involving reasoning about the thinking of others. The current study suggests that components of neural networks involved in social cognition are also incorporated in spontaneous perceptions of social synchrony even without any explicit context of observing others’ actions or thinking about oneself.

Affiliations: University of Chicago, University of Birmingham, Utrecht University

Keywords: social neuroscience, social cognition, social psychology, synchrony

Complex associations of cis-regulatory sequence polymorphisms with neuronal V1aR abundance: Implications for social behavior and genome-wide association studies

Authors: Maryam Okhovat, Nick Lysak, Polly Campbell, Alex Ophir and Steve Phelps

Abstract: Although genomic methods have identified a growing number of candidate genes thought to govern social behavior, researchers are rarely able to identify causal genetic variants. Prairie voles are useful models because they are genetically diverse and exhibit well studied variation in social behavior. Microsatellites 5’ of *avpr1a*, which encodes the vasopressin 1a receptor (V1aR), have been linked to social behavior in both voles and humans. However, this linkage has been plagued by the complexities evident in many association studies. We examined relationships between two categories of sequence markers – microsatellite lengths and unique nucleotide polymorphisms (UNPs) – and the abundance of V1aR in forebrain regions implicated in vole social behavior (ventral pallidum, lateral septum, posterior cingulate cortex, laterodorsal thalamus and accessory olfactory bulb). In the first study, we cloned and sequenced ~2.5kb of DNA immediately 5’ to the *avpr1a* translation start site in 28 wild-caught prairie voles. We compared sequence polymorphisms to V1aR abundance measured by autoradiography. In 4 of 5 brain regions at least one UNP was significantly associated with V1aR abundance ($P < 0.05$), while overall microsatellite length was not associated with V1aR in any brain region ($P > 0.10$). In particular, a pair of polymorphisms within 400 bp of the transcription start site were significant predictors of V1aR in the posterior cingulate cortex ($P < 0.05$), a highly variable region implicated in space use and sexual fidelity among voles. In a second study, we focused more narrowly on cingulate expression in 39 lab-reared individuals. We PCR-amplified the microsatellite to determine length polymorphisms, and separately amplified the region between the microsatellite and the *avpr1a* translation start site. We again found no associations between overall microsatellite length and cingulate V1aR ($P > 0.10$). In this study, no individuals were homozygous for the sequence polymorphisms associated with high cingulate expression in the first study, making it impossible to identify whether either UNP was causing variation in expression. Lastly, one UNP present in both studies was associated with cingulate expression in the second study ($P < 0.05$), but not the first ($P > 0.10$). This suggests that the novel association was either not causal, or that its causal influence depended on complex interactions with genetic background or environment. While animal models offer the best hope of identifying causal variants, our data demonstrate that even a narrowly defined phenotype may depend on diverse genetic and environmental influences.

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Keyword: GWAS, vasopressin, vole, attachment, neuroendocrinology, epigenetic

Mapping the mind: A constructionist view on how mental states emerge from the brain

Authors: Suzanne Oosterwijk, Kristen A. Lindquist, Eric Anderson, Rebecca Dautoff, Yoshiya Moriguchi, and Lisa Feldman Barrett

Abstract: Neuroimaging studies tend to organize around specific categories, such as memory, cognition and emotion. Psychological constructionism provides a different view on how the mind emerges from the brain and proposes that different mental events (such as emotions, feelings or thoughts) arise from the continuous interplay of the same ‘psychological ingredients’, including sensation, interoception, conceptual knowledge, executive attention, and language. In the present study we used fMRI to examine how the neural networks associated with these ingredients contribute to the experience of three different mental states; a bodily state, an emotion, or a thought. While in the scanner, participants listened to auditory scenarios describing negative events. Participants were instructed to experience these scenarios in four different ways; to focus on bodily sensations; to experience an emotion, or to think about the event in an objective way. Trials started with a cue, followed by the auditory scenario, followed by two consecutive phases. In the construction phase participants created the mental state in reaction to the scenario; in the elaboration phase participants prolonged their mental state by elaborating on its content. To investigate brain regions that are important for the generation of variable mental states, we performed conjunction analyses on the activation patterns for all three conditions during the construction and elaboration phase. Analyses demonstrate substantial overlap in the construction phase in regions associated with self-reflection (precuneus, temporal parietal junction), sensory/motor processing (precentral gyrus, postcentral gyrus, SMA, MCC), executive attention (dlPFC, frontal pole), language (pars triangularis, pars opercularis) and interoception (anterior insula). Conjunction during the elaboration phase showed similar regions, with in addition a large cluster in the left ventromedial prefrontal cortex. To examine difference between body focus, emotion and thought, we calculated contrast maps focusing on the cortical surface of the whole brain. The most prominent results concerned the listening and elaboration phase. During listening, we found stronger activation in areas associated with self-reflection and conceptual knowledge (precuneus, temporal parietal junction, posterior cingulate gyrus), interoception (insula, anterior cingulate cortex) and sensation (precentral and postcentral gyrus) when participants were cued with body focus than when they were cued with emotion or thought. In contrast, emotion and thought demonstrated stronger activation in areas associated with auditory processing (planum temporale, superior temporal gyrus, Heschl’s gyrus). During the elaboration phase, we found stronger activation in areas associated with interoception (anterior insula) and sensory motor processes (precentral and postcentral gyrus) for body focus compared to emotion. Comparing thought to body focus and emotion, we found stronger activation in the default network (medial prefrontal cortex) and in areas associated with memory and conceptual processing (anterior temporal lobe, precuneus, parahippocampal gyrus). Overall, the results show that different mental states involve similar brain areas, associated with basic processes such as conceptualization, interoception, attention and language, albeit with relative differences in strength of activation. These results enrich our understanding of how different mental states emerge from the brain.

Affiliations: Northeastern University, Harvard University, Martinos Center for Biomedical Imaging; National Institute of Mental Health, National Center of Neurology and Psychiatry

Keyword: mental states

The role of attention on face processing in Autism Spectrum Disorder

Authors: Daniel R. O’Young, Elizabeth Redcay, Joe M. Moran, Jasmin Cloutier, Penelope L. Mavros, and John D.E. Gabrieli

Abstract: The perception, recognition, and memory for faces are critical aspects of everyday social interactions. A region within the fusiform gyrus, the fusiform face area (FFA), plays a key role in these processes (Kanwisher et al., 1997). Some have proposed that impairments to the FFA may underlie many of the social impairments seen in autism (e.g. Schultz 2000). Indeed, many studies of face perception report hypoactivation of the FFA in individuals with autism. Recent studies suggest that drawing attention to the face through the use of faces which are familiar to the participants (e.g. Pierce & Redcay 2008, Pierce et al., 2001) or directing attention to different parts of the face (e.g. Perlman et al., 2011) lead to more typical activation of the FFA in autism. In one previous study, there was no difference in FFA activation between a group of high-functioning adults with autism and typical adults during passive viewing of faces (Hadjikhani et al., 2004). These faces had a red cross over the nose which led the authors to suggest that inclusion of a red cross to enhance attention to the face leads to more typical FFA activation. However, other factors may have accounted for this lack of difference such as sample demographics or the particular stimuli used in the study. In the current study, we directly investigated this claim by presenting the same set of faces with either the presence or absence of a red cross over the nose. Seventeen individuals diagnosed with ASD (mean age: 17.23) and 23 typically developing (TYP) individuals (mean age: 17.22) performed a 1-back task while being presented with images of faces and outdoor scenes during an fMRI scan. All stimuli consisted of gray-scale images. The faces were presented either unaltered (Natural Face, NF) or with a red fixation cross over the nose (Natural Face Red, NFR). The right FFA was selected manually within each individual subject for the contrast of Natural Face vs. Places and the contrast of Natural Face Red vs. Places. Only individuals who had a significant FFA ($p < .001$, uncorrected) for both contrasts were included in further analyses. These included 16 of 23 controls and 11 of 17 ASD. The sizes of each individual’s FFA for both contrasts were included in a repeated measures ANOVA and a trend

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towards a significant group x condition interaction was found. Follow-up contrasts revealed that while controls showed no difference in size between conditions, the ASD group showed a significantly larger FFA in the condition in which the red cross was placed on the face. Importantly, the FFA was significantly smaller in the ASD group than the TYP group in the Natural Face condition, but not the Natural Face Red condition. These data support the hypothesis that the fusiform face area shows a typical response in individuals with autism as long as the experimental conditions ensure that sufficient attention is drawn to the face.

Affiliations: University of Maryland, Harvard University, University of Chicago, Massachusetts Institute of Technology

Keywords: face processing, autism, attention, fMRI, FFA, fusiform gyrus

Female mice with no male siblings in utero show enhanced pup care and maternal aggression

Authors: Brandon Pearson, Atsushi Sugawara, D. Caroline Blanchard, and Monika Ward

Abstract: Many sex differences can be found in the expression of aggression and parental nurturing behaviors. It is important to determine if these are modulated by prenatal conditions. Here, using assisted reproduction technologies, we generated females that were (mixed-sex) or were not (same-sex) exposed to males during fetal development, raised them by cross fostering among fosters' own female only pups to control for effects of postnatal environment, and compared their reproductive abilities and behavior. There were no differences between females from the two prenatal conditions in estrus cycle length and length of time spent at individual estrus cycle stages. Both types of females had similar ovulation efficiency and bred equally well yielding comparable litter size and progeny sex ratio. Females from the two prenatal conditions were also indistinguishable in social behavior and exhibited normal social responses towards unfamiliar females in the three-chamber social approach and social proximity tests. When urine was collected from both types of females and used as a point source in a scent-marking paradigm, exposed males showed a similar distribution and extent of urinary scent marking to urine from each type of female but tended to engage in higher durations of sniffing the urine from same-sex females. When females were tested in a resident-intruder paradigm three days after giving birth, same-sex females exhibited enhancement of pup grooming and an overall decrease of non-pup activity prior to male intruder introduction, and after introduction were more defensive as evidenced by higher rates of burying, open-mouth threat/lunges, and attacks towards the male, and decreased latencies to display these defensive behaviors. Our results suggest that females devoid of male exposure during fetal development have reproductive abilities similar to those of females from mixed-sex pregnancies, and have normal social interactions with other females. However, they exhibit hyper-maternal behavior both in terms of the care and defense of pups in front of a male intruder, and potentially produce a pheromonal milieu that renders them more attractive to males during olfactory investigations.

Affiliation: University of Hawaii

Keyword: behavioral neuroendocrinology

The involvement of vasopressin and oxytocin in male Mongolian gerbil parental and social behaviours

Authors: Anna Phan, Vithya Vivekananthan, Virginia Roberts, Jessica A. Mong, Rochelle Abadilla, Elena Choleris, and Mertice M. Clark

Abstract: Mongolian gerbils (*Meriones unguiculatus*) are a social species in which both the male and female contribute to raising their pups. In other rodent species, arginine vasopressin (AVP) and oxytocin (OT) are involved in a variety of social behaviors, e.g., social recognition, maternal behaviors and mate bonding. Therefore we correlated the expression of AVP and OT to various social behavior measures to investigate the potential role of these neuropeptides in Mongolian gerbil social behavior. Fifty-seven male and six female gerbils were tested for various social behaviors including social investigation durations, time spent scent marking and mating, number of times the male gerbils were found in the nest, and the amount of time males spent with their pups when given a choice between either their pups and mate, or their pups and an empty chamber. Various physiological measurements were also taken from the male gerbils, including body, testes, seminal vesicles, and penile muscle weights. Brains were extracted and fixed with paraformaldehyde, then sectioned coronally (at a thickness of 30µm). The sections were divided into groups each consisting of every 6th section. Separate groups were stained with diaminobenzidine (DAB) using AVP- and OT-specific antibodies. Various brain nuclei were measured for the density of cells immunostained for AVP (paraventricular nucleus (PVN)) and OT (PVN, periventricular nucleus (PeVN)), by using ImageJ software to measure pixel densities from binary images. AVP expression in the PVN was significantly higher in females than in males, whereas there were no sex differences in OT expression in either the PVN or PeVN. OT expression in the PVN and PeVN was significantly higher in males that had mated and raised pups (experienced males) than in virgin males. AVP expression in the PVN was also higher in experienced males compared to virgin males. In virgin male gerbils, both AVP in the PVN and OT in the PVN and PeVN negatively correlated with the amount of time they spent sniffing a novel conspecific. In experienced male gerbils, OT expression in the PVN and PeVN correlated negatively with the number of intervals fathers were found to be in the nest. In a choice test, AVP and OT in the PVN correlated positively with the amount of time experienced males spent in a chamber with their pups, and negatively with the time spent in a chamber with their mate. These results suggest that higher levels of AVP and OT in the Mongolian gerbil may be involved in mediating paternal behaviors, but not mate bonding. Funded by NSERC.

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Affiliations: University of Guelph, University of Maryland, McMaster University

Keywords: neuropeptides, social behaviour, parental behaviour, oxytocin, vasopressin

Ecological variation in species recognition and auditory processing in Alston's singing mouse, *Scotinomys teguina*

Authors: Steve Phelps, Bret Pasch, and Rachel Sanford

Abstract: Species recognition touches on deep themes in diverse domains, ranging from the origin of species to the nature of social cognition. While evolutionary and ecological aspects of species recognition have received much attention, the neural substrates underlying receiver decisions are far less explored. When related species occupy overlapping habitats, receiver responses to heterospecific signals are often altered. Such character displacement in communication presents an opportunity to explore ecological variation in the mechanisms of social cognition. Among animals that use acoustic signals to identify conspecifics, such as insects and anurans, sympatric species often shift the tuning of their auditory systems to reduce responses to heterospecific signals, a phenomenon known as a "sensory filter". In principle, it is also possible that animals could preserve the function of peripheral sensory systems, but assign species-specific stimuli different motivational values, a phenomenon we refer to as a "motivational filter". We tested these alternatives in two populations of Alston's singing mouse, *Scotinomys teguina*. Neotropical singing mice are diurnal insectivorous rodents that inhabit montane cloud forests throughout Central America. Males commonly emit rapid frequency-modulated trills that function in male-male aggression and female mate choice. In some sites, *S. teguina* co-occurs with the behaviorally dominant long-tailed singing mouse, *Scotinomys xerampelinus*. Staged aggression tests revealed that in 12 of 12 encounters, male *S. xerampelinus* exhibited a shorter latency to attack, and exhibited more lunges than did male *S. teguina*. We performed playback studies in the lab and field using male *S. teguina* from populations that co-occurred with *S. xerampelinus* (sympatric) and those that did not (allopatric). We found that allopatric male *S. teguina* sang back in response to both *S. teguina* and *S. xerampelinus* songs. In contrast, male *S. teguina* from populations sympatric with the dominant *S. xerampelinus* seem to suppress song in response to *S. xerampelinus* playback. To examine whether species-specific responses were modulated by the tuning of the auditory system, we examined song-evoked induction of the immediate early gene *egr-1* in the medial geniculate and auditory cortex of *S. teguina* males. Both populations exhibited significant induction of *egr-1* in response to conspecific songs when compared to noise stimuli. Surprisingly, we found that heterospecific songs elicited stronger responses in sympatry than in allopatry, despite the fact that these songs elicit less singing behavior in sympatry. These data refute the sensory filter hypothesis for this species, and suggest that the auditory system is actually increasing its responses to heterospecific vocalizations in sympatry. Despite such phenotypic differences, these two populations are not genetically distinct from one another. Recent work demonstrates that either positive or negative experience can increase the sensitivity of the medial geniculate and auditory cortex to associated sounds. We suggest that differences in aggressive experience with heterospecifics modify auditory tuning to match ecologically important stimuli.

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Keywords: singing mouse, vocalization, communication, ecology, audition, evolution, immediate early gene

Sexual differentiation of mouse social recognition

Authors: Lucia Tejada and Emilie F. Rissman

Abstract: Social recognition is a crucial skill required by almost all organisms living in complex social structures. Recently, we have shown that in mice, the androgen receptor (AR) plays a role in the sexual differentiation of social recognition of a female conspecific. Here we asked whether AR played a similar role when the stimulus is a male conspecific. I used C57BL/6J mice carrying the testicular feminization mutation (Tfm) of AR. Subjects were kept on a 12:12 light:dark cycle, weaned at postnatal day 21 (PN21), group housed until surgery and individually housed afterwards. Mice were gonadectomized between PN70-120 and received an estradiol (E2) or testosterone (T) implant. Social recognition of an intact male (C57BL/6J) was assessed two weeks after surgery using a habituation/ dishabituation paradigm. Briefly, the subject is repeatedly introduced to another individual for 8 1-minute interactions. Investigatory time decreases as a direct reflection of habituation to the stimulus. The subject's ability to discriminate between a familiar and novel stimulus is assessed by replacing the familiar mouse for a new conspecific (dishabituation - trial 9, T9). I used 68 animals (22 WT females, 23 WT males and 23 Tfm males, with roughly half of each group receiving E2 or T). All animals habituated (investigatory time T1>T8, $p<0.05$). E2-treated WT females spent less time investigating the stimulus than WT males throughout the test ($p<0.05$). T-treated WT females showed male-like levels of investigatory time, attributing a masculinizing effect to activational androgens. Strikingly, the pattern of social recognition was similar between WT and TFM males, independently of hormone treatment. These findings are exciting as they suggest the existence of alternative mechanisms responsible for male-male social recognition. We are currently exploring the role of sex chromosomes in the differentiation of this behavior. Support by R01 MH057759 and T32 HD007323.

Affiliation: University of Virginia

Keywords: social recognition, androgen receptor

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Intact confirmation bias following damage to the ventromedial prefrontal cortex

Authors: Bradley C. Thomas, Aaron M. Scherer, Pierce Edmiston, Heather Robinson, and Daniel Tranel

Abstract: After making a choice, people often show a “confirmation bias”—a preference toward information that is consistent with their choice. It has been hypothesized that individuals exhibit a confirmation bias in order to prevent cognitive dissonance that might arise from considering information inconsistent with one’s choice (Jonas et al., 2006). According to this view, to avoid cognitive dissonance, a negative emotional state (e.g., somatic marker) arises when one considers disconfirming information, and this drives the bias toward confirming information (Jonas et al., 2006). The cognitive dissonance explanation suggests that individuals with injury to the ventromedial prefrontal cortex (vmPFC), who have impairments in integrating somatic information into the organization of behavior, would show a reduced confirmation bias. An alternative theory holds that the confirmation bias is triggered by a drive toward immediate reward associated with the consideration of confirming information (Scherer et al., 2011). This desirability account suggests that individuals with vmPFC injury would show an intact confirmation bias, consistent with their ability to seek immediate reward in other contexts (e.g., on the Iowa Gambling Task; Bechara et al., 1996). Here we report on an intact confirmation bias in a group of patients with impairments due to circumscribed, bilateral brain lesions to the ventromedial prefrontal cortex (vmPFC). The patients predicted which of two pieces of art was preferred by most people. After each prediction, the patients selected information to read; information that was either consistent or inconsistent with their prediction. The vmPFC patients demonstrated a strong confirmation bias toward selecting information that supported their choice. Moreover, this confirmation bias was consistent in magnitude with that observed in comparison participants. These data support the desirability account of the confirmation bias, and suggest that this bias is not due to the use of negative somatic information to avoid cognitive dissonance.

Affiliation: University of Iowa

Keyword: affective decision making

Do you think it or feel it? Language and neural activity reflect individual differences in emotion processing

Authors: Xiao-Fei Yang, Darby E. Saxbe, Larissa A. Borofsky, Maeve C. Murphy, and Mary Helen Immordino-Yang

Abstract: How do people describe their emotional states, and how does their word use reflect the underlying neural processing? This study explored the relationship between subjects’ word use when responding to emotional stories and their subsequent BOLD activity elicited by the same stories. We hypothesized that subjects’ use of cognitive words (words that reflect abstract thinking, such as “understand,” “know” and “wonder”) and body words (words that describe visceral sensations and body parts) would reflect two differing emotion processing strategies: one that relies more on abstract reasoning, and another that relies more on the feeling of the physical body during emotion. We expected these strategies to correlate with BOLD activity in brain regions involved in somatosensation, such as the somatosensory cortices (SI & SII), and self-reflection, such as the dorsal medial prefrontal cortex (dMPFC) and the posteromedial cortices (PMC, including precuneus and posterior cingulate cortex, PCC). During an emotion induction interview that preceded the scanning session, 28 subjects discussed their feelings about true stories designed to elicit specific social emotions; these included stories describing self-sacrificing or heroic behavior (admiration for virtue; AV); and stories of social exclusion or isolation (compassion for social pain; CSP). During the scanning session, the subjects viewed brief reminders of the stories and were asked to become as emotional as possible (see Immordino-Yang et al., 2009). Transcripts of subjects’ verbal responses during the interviews were analyzed using the quantitative word counting software program LIWC (Linguistic Inquiry and Word Count; Pennebaker, Booth and Francis, 2001) to generate word use frequencies for cognitive and body words. BOLD activity across the AV and CSP conditions was estimated for each individual and entered into group-level whole brain correlation analyses using cognitive and body word frequencies as regressors (SPM8). Consistent with our hypotheses, subjects who used more cognitive words tended to use fewer body words (Pearson’s $\rho = -.375$, $p < .025$). Cognitive word use inversely correlated with activation in dMPFC, SI and SII, while body word use directly correlated with activations in dMPFC, posterior/inferior sector of precuneus/PCC and supramarginal gyrus ($p < .005$, cluster threshold of 10 voxels). The word use patterns and associated BOLD results support our hypothesis that individuals adopt different strategies during emotion processing: some engage in more cognitive, abstract reasoning, while others rely more on representing their physical body states.

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Keywords: social emotion, language use, embodiment

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Alcohol self-administration inhibits the expression of partner preference in a sex-specific manner in prairie voles

Authors: Allison Anacker, Todd Ahern, Larry Young, and Andrey Ryabinin

Abstract: Alcohol (ethanol) abuse can have devastating effects on interpersonal relationships, in some cases leading to violence or estrangement. Prairie voles (*Microtus ochrogaster*) are socially monogamous rodents that form strong, lasting pair bonds that have been used to model the formation of social bonds in humans. We have previously demonstrated that prairie voles exhibit high levels of voluntary alcohol intake. Here we tested whether alcohol self-administration would affect social bond formation. Males and females were paired for 24 hours and given continuous access to either two bottles of water or one bottle of water and one bottle of 10% ethanol. Following cohabitation, the expression of bond formation was assessed by the partner preference test (PPT). Male and female experimental subjects were gonadally intact, as were male PPT stimulus animals. Female PPT stimulus animals were ovariectomized two weeks prior to testing to ensure that female partner and stranger were equally sexually receptive at the time of testing. Others have previously shown that ovariectomy of females does not affect pair bond formation of males. The PPT took place in a three-chambered partner preference cage with the partner stimulus animal tethered in one chamber and a stranger stimulus animal of the same sex and equivalent water/ethanol exposure tethered in the opposite chamber. Then the experimental subject was placed in a middle chamber and allowed to roam freely for 3 hours. The outcome variable was time spent huddling with the partner and the stranger. Alcohol exposure during cohabitation prevented partner preference expression in male prairie voles (time huddling with partner vs. stranger, $t(10)=0.16$, $p=0.87$), while control males spent significantly more time huddling with the partner than the stranger [$t(8)=2.7$, $p=0.03$]. In female prairie voles, alcohol exposure had no effect on partner preference [alcohol group: partner > stranger, $t(28)=5.8$, $p<0.0001$; water group: partner > stranger, $t(28)=2.1$, $p=0.04$]. Overall, these results indicate that alcohol can significantly affect the formation or expression of social bonds in prairie voles. Future studies will tease apart whether the effect is on formation or expression as well as the neural basis of this effect. Supported by NIH AA016886 to AER and AA02013601 to AMJA.

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Keywords: alcohol, pair-bond

Mother supportiveness and neighborhood quality predict self-other overlap in the neural response to threat

Authors: Lane Beckes, James A. Coan, and Joseph P. Allen

Abstract: We investigated whether self-other overlap in the neural response to threat was related to self-reported empathy, early maternal support, and early neighborhood quality. Twenty-three young adult participants were scanned using fMRI during a threat-to-self task and a threat-to-other task. The threat task involved viewing varied presentations of safety cues (a blue "O") indicating no possibility of shock or threat cues (a red "X") indicating a 17% chance of shock. In one block participants themselves received the shock, in another block a stranger received the shock while holding the participant's hand, and in a third block the participant's friend received the shock while holding the participant's hand. Regions of interest (ROIs) were determined using a whole brain corrected cluster analysis, $z > 2.3$, and $p < .05$ on the threat-to-self activation maps. To operationalize self-other overlap at the individual level, we correlated BOLD (blood oxygenation level dependence) response within ROIs between the threat-to-self threat trials and the threat-to-other threat trials to get a correlation between self and other BOLD response during threat over time. These intra-individual correlations between self and other threat predicted self-reported empathy, and were predicted by observer ratings in mother engagement during a supportive behavior task from 8 years prior, and parental reports of neighborhood quality (including risk and connectedness) from 12 years prior. For mother engagement, several main effects were found indicating significant positive correlations between self-threat and stranger/friend-threat in the bilateral anterior insular cortex (AIC), and the bilateral orbitofrontal cortex (OFC). Correlations ranged from moderate to high, including a correlation between self and friend-threat in the left OFC reaching .70. This indicates stronger links between the evaluation and representation of threat to self with the evaluation and representation of threat to others in participants with more maternal support. Neighborhood quality, alternatively, interacted with relationship type (stranger vs. friend) to differentially predict self-other correlations in the neural response to threat. These interactions emerged in a variety of regions including the bilateral thalamus, bilateral putamen, and right caudate. All of these interactions indicated negative correlations between self-friend overlap and neighborhood quality (as low as -.54) and positive correlations between self-stranger overlap and neighborhood quality (as high as .57). This pattern may reflect a stronger need for people growing up in "bad" neighborhoods to rely on and have greater connection with friends in order to buffer the negative effects of those neighborhoods, and the need for more wariness and reticence in connecting with strangers because they have posed a threat in the past. Interestingly, the correlations between self-other overlap and mother responsiveness were localized in integrative regions of the brain such as the AIC, known to be involved in integrative models of the self and its context (c.f., Craig, 2009) and the OFC, known to process an integrative picture of the evaluative context. Alternatively, self-other overlap correlated with neighborhood quality in largely sub-cortical affective regions of the brain.

Affiliation: University of Virginia

Keyword: empathy

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Cis-regulatory evolution of the *avpr1a* locus and its pseudogene among New World voles

Authors: Alejandro Berrio, Jorge Pino, and Steve Phelps

Abstract: Gene duplication is a common process with profound consequences for the function and evolution of a locus. Once a gene has been duplicated, either copy can be lost or can assume a new function, and it is necessary to examine both copies across related species to make correct inferences about the evolution of the locus. Voles are increasingly important models for the molecular mechanisms of social behavior. The evolution of *avpr1a* locus, which codes for the vasopressin 1a receptor, has been a major focus of this work. The *avpr1a* locus has undergone a duplication thought to be unique to the socially monogamous prairie voles, *Microtus ochrogaster*. However, the locus and its duplicate have not been systematically investigated across *Microtus* species. To do so, we PCR-amplified the 2500 bp of cis-regulatory sequence of the *avpr1a* locus and its putative pseudogene, as well sequence from two neutral loci (LCAT introns 2-4 and exons 3-5, ~700bp; b-fibrinogen intron 7, ~700bp) from 7 species of New World *Microtus* with well-characterized mating systems: *M. ochrogaster*, *M. pinetorum*, *M. agrestis*, *M. arvalis*, *M. californicus*, *M. pennsylvanicus* and *M. richardsonii*. The first 2 species are socially monogamous, and the remaining 5 are all promiscuous. We first used Bayesian methods to reconstruct a phylogeny for these species based on neutral markers, using *Myodes glareolus* as an outgroup. The phylogenetic analysis gave substantially higher resolution than has been previously reported. Remarkably, this included a strongly supported pairing of the two monogamous species, *M. ochrogaster* and *M. pinetorum* (posterior probability = 0.99), which suggests that monogamy may have evolved a single time within this clade. This is a novel pairing, but accords with historic groupings based on dental morphology. Preliminary analysis suggests the *avpr1a* pseudogene emerged within the prairie vole lineage, but may have been paralleled by duplications at the *avpr1a* locus in other species. Examination of the *avpr1a* sequence suggests several cis-regulatory changes that may be responsible for the brain expression pattern that promotes monogamy in *M. ochrogaster* and *M. pinetorum*. Together, our data highlight how phylogenetic analyses can inform our understanding of the evolution of genes regulating social behavior and other complex phenotypes.

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Keywords: gene transcription, cis-regulation, vasopressin, neuroendocrinology, evolution

Septal vasopressin regulates play-fighting in male and female juvenile rats: Sex- and context-specific effects

Authors: Remco Bredewold, Caroline Smith, and Alexa Veenema

Abstract: The vasopressin system within the lateral septum modulates neural responses to a variety of social stimuli. We recently demonstrated a role for the septal vasopressin system in the regulation of play-fighting behavior in male and female juvenile rats. Play-fighting is usually tested in home-cage settings which provide a familiar and less fearful environment. However, social behaviors like play-fighting are not limited to this particular environment. Yet, little is known about the influence of different social contexts (e.g. familiar versus unfamiliar) on vasopressin-regulated social behaviors. In the current study, we investigated the extent to which the effects of the septal vasopressin system on play-fighting are dependent upon the social context. Play-fighting was tested in 5-week-old juvenile rats by exposing each rat to a sex- and age-matched unfamiliar rat in a familiar (home-cage) and an unfamiliar (novel-cage) context using a counterbalanced order. In vehicle-treated rats, the percentage of time spent play-fighting did not differ between males and females or between home-cage and novel-cage settings. However, administration of the specific vasopressin V1a receptor antagonist (CH2)5Tyr(Me) AVP into the lateral septum enhanced play-fighting in males and reduced play-fighting in females in the home-cage setting, confirming our previous findings. Conversely, blockade of septal V1a receptor did not alter play-fighting in either sex in the novel-cage setting. Furthermore, administration of vasopressin into the septum did not alter play-fighting in either sex in the home-cage setting, but decreased play-fighting in females in the novel-cage setting. These findings suggest that the modulation of play-fighting by the septal vasopressin system is social context-specific. While home-cage findings suggest that the septal vasopressin system inhibits play-fighting in males and stimulates play-fighting in females, the opposite is found in novel-cage settings, at least in females. Together, these data may contribute to a better understanding of the impact of different social contexts on the regulation of social behavior.

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Keywords: vasopressin, lateral septum, social behavior, juvenile, sex differences, play-fighting, rats

Autism spectrum disorder and conduct disorder as diametrical disorders of empathy imbalance

Author: Yawei Cheng

Abstract: Empathy imbalance hypothesis (EIH) (Smith, 2008) speculated that autism has a deficit of cognitive empathy (i.e., mentalizing) but a surfeit of emotional empathy whereas antisocial disorder has the opposite. Here, we assessed the pressure pain threshold and measured the event-related potential and mu suppression elicited by the perception of people in pain in adolescents with autism spectrum disorders (ASD), conduct disorder with high callous-unemotional traits (CD), and typically developing controls. Compared to the controls, pain thresholds were decreased in the ASD but increased in the CD. When perceiving someone accidentally in pain, the ASD showed frontal N120 and central late positive potentials (LPP), which were diminished in the CD. When exposed to situations in which

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someone intentionally hurts another, the CD retained but the ASD lost the LPP. Both groups had no deficit in sensorimotor mirroring as assessed by mu suppression. Taken together, youth with ASD and CD exhibits atypical neural dynamics of empathy for pain as indicated by double dissociation of affective arousal and social understanding. Phenotypically lacking empathy, autism and psychopathy can be considered as diametric disorders with imbalanced genomic imprinting in brain development.

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Keywords: autism spectrum disorder; conduct disorder; pain empathy; event-related potentials

Bounded empathy: Neural responses to outgroup targets' (mis)fortunes

Authors: Mina Cikara and Susan Fiske

Abstract: A cursory reading of the emotion, empathy, and perception–action literatures might leave one with the impression that people spontaneously experience empathy in response to seeing another person in distress. Recent developments in social psychological and cognitive neuroscience research suggest otherwise: People frequently fail to empathize to the same extent with outgroup members as ingroup members. Not all outgroups are equivalent, however. Depending on the target, people may feel not only less empathy but also pleasure (Schadenfreude) in response to outgroup members' misfortunes. In contrast, there may also be specific outgroups for whom people feel even more empathy than ingroup members when they suffer a misfortune. Furthermore, no intergroup empathy study of which we are aware has assessed empathy for positive events, which demonstrably varies as a function of group membership. The current fMRI study investigates whether mere stereotypes are sufficient to modulate empathic responses to other people's good and bad fortunes, how these modulations manifest in the brain, and whether these affective and neural responses relate to endorsing harm against different outgroup targets. Participants report that they feel least bad when misfortunes befall envied targets and worst when misfortunes befall pitied targets, as compared with ingroup targets. Participants are also least willing to endorse harming pitied targets, despite pitied targets being outgroup members. However, those participants who exhibit increased activation in functionally defined insula/middle frontal gyrus when viewing pity targets experience positive events not only report feeling worse about those events but also more willing to harm pity targets in a tradeoff scenario. Similarly, increased activation in anatomically defined bilateral anterior insula, in response to positive events, predicts increased willingness to harm envy targets, but decreased willingness to harm ingroup targets, above and beyond self-reported affect in response to the events. Stereotypes' specific content and not just outgroup membership modulates empathic responses and related behavioral consequences including harm.

Affiliations: MIT, Princeton University

Keywords: empathy, schadenfreude, stereotypes, fMRI

Effects of chronic ER α and ER β agonists on a socially transmitted food preference in ovariectomized CD1 mice

Author: Amy E. Clipperton-Allen, Véronique R. Roussel, Ho L. Ying, Kristina V. Mikloska, and Elena Choleris

Abstract: The ability to learn from conspecifics, thus reducing the reliance on risky trial-and-error learning, is one of the advantages of social life. The social transmission of food preferences (STFP) paradigm assesses a specifically social type of learning, in which "observer" mice interact with "demonstrators" that have eaten a novel food, and then prefer that food when given a subsequent choice test. Previously, we have demonstrated the involvement of estrogens in this paradigm: acute pre-acquisition administration of EB or estrogen receptor beta (ER β) agonist and chronic administration of estradiol benzoate (EB) prolonged the preference for the demonstrated food, while this preference was blocked by acute administration of ER α agonist (Clipperton et al., 2008, *Neuropsychopharmacology* 33: 2362-2375). Effects of estrogenic compounds are often assessed using chronic rather than acute treatments. It is unknown how the STFP is affected by chronic application of ER α or ER β agonists. In the current study, ovariectomized (ovx) observer mice received Silastic capsules containing ER α agonist PPT (3 μ g, 6 μ g, 12 μ g, or 24 μ g per capsule), ER β agonist DPN (3 μ g, 6 μ g, 12 μ g, or 24 μ g per capsule), sesame oil vehicle, or no implant 9-17 days prior to testing. Following a 30 min interaction with a demonstrator that had just consumed either cocoa- or cinnamon-flavoured rodent chow, observers were given an 8h choice test in which the two flavours (both novel to the observer) were continuously available. Preliminary results indicate that both chronic agonist treatments prolonged the preference for the demonstrator's food to a duration similar to that seen with acute and chronic EB and with acute pre-acquisition administration of an ER β agonist, suggesting that the long-term exposure to these compounds may result in a loss of specificity, or that there is an interaction between ER α and ER β when both are activated. Additionally, our current and previous results suggest that ER β effects may prevail over those of ER α in the STFP. Supported by NSERC.

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Keywords: estrogen, estrogen receptors, social learning

***Sex chromosome gene effects on juvenile social and anxiety behaviors: Implications for Turner's Syndrome**

Authors: Kimberly Cox, Alex Eschenroeder, and Emilie Rissman

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Abstract: Turner's Syndrome is an aneuploid disease characterized by partial or total loss of an X chromosome. This disease causes physical abnormalities, infertility, heightened anxiety, learning deficits, and problems with social cognition. Several mouse models of Turner Syndrome (including XO mice and XY* X mice) exist, but, while there have been studies on cognitive deficits in adult XO mice (Davies et al., 2007) and anxiety in adult XY*X mice (Isles et al., 2004), there are very few studies on social behavior in these models, and none investigating behavior in juveniles. Social behavioral effects of Turner's syndrome are first apparent in children. Because estrogen levels are low at this time we hypothesize that these behaviors are not the result of low hormone levels as are some of the adult behaviors. We utilized juvenile Y* mice (1X females and 2X females) to investigate the social and anxiety behavioral phenotypes that are relevant to Turner Syndrome. We hypothesized that 1X females would differ from 2X females in social and anxiety tasks, and that these differences would correlate with gene expression differences in relevant brain regions. We tested several cohorts of female Y* mice on postnatal day 21 (PN21) in either a dyadic social interaction task, a social preference test, social conditioned place preference task, or an elevated plus maze. In addition, one final group was used for quantitative real time PCR. Brains were collected on PN21 and punches were taken from the amygdala, preoptic area, bed nucleus of the stria terminalis, and lateral septum. We assayed these tissues for regional expression of genes that escape X-inactivation, as well as other candidate genes. In the dyadic interaction task, 1X females investigated their partners more than 2X females ($p < 0.03$), but were less social overall than 2X females ($p < 0.0006$). In the social preference test, 1X females showed a trend ($p = 0.083$) for spending less time with an unfamiliar mouse than 2X females. No differences were found between 1X and 2X females in the social conditioned place preference task; however, in the elevated plus maze, 1X females tended to spend more time in the closed arms than 2X females ($p = 0.068$). In the amygdala of P21 females, we noted several gene expression differences: 2X females had increased expression of Ddx3x, Eif2s3x, Kdm6a, and Kdm5c as compared to 1X females. These results show that juvenile 1X females have altered social and anxiety behavior, and several X chromosome genes that escape inactivation may influence these behaviors.

Affiliation: University of Virginia

Keywords: sex chromosomes, x inactivation, juvenile, social behavior, anxiety

**Awarded the Society for Social Neuroscience 2011 Student Research Award*

Neural reactivation links unconscious thought to improved decision making

Author: David Creswell, James Bursley, and Ajay Satpute

Abstract: Unconscious processes have been shown to facilitate many higher-level human behaviors. For example, brief periods of unconscious thought improve the quality of a decision when that decision is complex in nature (e.g., choosing a car to purchase from a set of cars with various positive and negative characteristics). Numerous studies have shown the superiority of unconscious thought over conscious thought or making an immediate decision on complex decision tasks. Here we reveal a mechanism for how the brain guides such unconscious thought in decision making. In a functional magnetic resonance imaging (fMRI) experiment, we found that the same regions active during the encoding of complex decision information (right dorsolateral prefrontal cortex and bilateral intermediate visual cortex) continue to be active during a subsequent two-minute unconscious thought period, during which an unrelated n-back distractor task was performed. This effect, which we refer to as unconscious neural reactivation, was predictive of improved behavioral decision making during a retrieval period following the n-back task. Further, neurally reactivated regions were shown to be functionally connected, as revealed by a psychophysiological interaction (PPI) analysis. A second decision making experiment that did not involve fMRI provided supporting evidence that unconscious thought can be blocked by behaviorally co-opting unconscious neural reactivation areas. Specifically, by replacing the n-back distractor task with an additional information encoding task, which should impair neurally reactivated regions' ability to process the originally encoded information, we were able to eliminate the behavioral performance benefit conferred by the performance of a distractor task.

Affiliations: Carnegie Mellon University; Columbia University

Keywords: unconscious thought, decision making, unconscious neural reactivation, neural reactivation

Life chances: A model system for social neuroscience

Author: Jeff Davis

Abstract: This poster presents the potential utility of the concept of "life chances" as a model system. Model systems are integral to the development of social neuroscience as a means of overcoming inherent limitations on the study of social phenomena not readily subjected to experimentation. Through the use of model systems, such as loneliness and ostracism, social neuroscientists have already gained significant insights about core sociological processes and their impact on behavior. A focus on life chances can potentially yield additional insights on larger sociological dynamics. "Life chances" is a concept deeply rooted in sociological theory and research, originating in the writings of Max Weber. Life chances generally refer to the social and economic opportunities an individual is likely to experience over the life course. Perceived life chances strongly reflect an individual's current and future socioeconomic status. Qualitative sociological research has suggested that perceived life chances weigh heavily in the decisions of youth and adults alike. Furthermore, the influence of perceived life chances on decision making might underlie some highly complex sociological dynamics such as behaviors which reproduce social inequality over generations. Social neuroscience research can illuminate crucial mechanisms of inequality as well as contributing significantly to the development of measurements of perceived life chances.

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Affiliation: California State University, Long Beach

Keywords: sociology, life chances, social inequality

A polymorphic microsatellite element upstream of the vole *Avpr1a* gene contributes to both individual and species differences in brain AVPR1A expression

Authors: Zoe R. Donaldson and Larry J. Young

Abstract: Socially monogamous prairie voles and promiscuous meadow voles display striking differences in social behavior that are mediated, at least in part, by differences in neural expression of the vasopressin V1a receptor (AVPR1A). In addition, individual variation in AVPR1A expression in the brain has been linked to individual variation in social behavior in prairie voles. However, the genetic elements responsible for driving both species and individual differences in AVPR1A expression patterns have not been fully identified. To begin to explore the genetic mechanisms contributing to these differences in vivo, we have focused on dissecting the roles of the proximal 5' flanking region and highly variable microsatellite element in the vole *Avpr1a* gene, a region that has been linked to variation in expression patterns and behavior. To achieve this goal, we created three lines of knock-in mice. In all three, 3.5 kb of the mouse *Avpr1a* 5' flanking region was replaced by prairie vole sequence, but each line differed only with regard to the microsatellite element – either from meadow vole or the prairie vole long or prairie vole short variants. We hypothesized that all of the mouse lines would express AVPR1A in a pattern more similar to prairie voles than mice. We further hypothesized that the meadow vole and prairie lines would show more robust differences in expression than the long versus short lines. Contrary to our prediction, the expression pattern of AVPR1A was largely consistent with that of wildtype mice in all three lines, suggesting that the profound species differences in neuropeptide receptor expression between vole and mouse are conferred by mechanisms distal to the 3.5 kb 5' flanking region. However, our data do confirm that both species differences and intra-species variation in microsatellite structure contribute to variation in *Avpr1a* expression. The mice with the prairie vole microsatellite had higher levels of V1aR in the thalamus, central amygdala, and dentate gyrus, compared to the mice with the meadow vole microsatellite ($p < 0.05$). These differences are consistent with those observed between prairie and meadow voles. Furthermore, mice carrying the long prairie vole variant of the microsatellite displayed higher levels of AVPR1A binding in the dentate gyrus than did mice with the short prairie vole variant ($p < 0.05$). This work provides direct evidence that variation in the vole *Avpr1a* microsatellite modulates V1aR patterns within the brain, potentially providing an evolutionary mechanism underlying V1a-dependent behavioral diversity both within and between these species.

Affiliations: Columbia University, Emory University

Keywords: vasopressin, vole, social behavior, V1a receptor

From neural responses to population behavior: Neural focus group predicts population level media effects

Authors: Emily B. Falk, Elliot T. Berkman, and Matthew D. Lieberman

Abstract: Can neural responses to persuasive messages predict individual behavior change? Can the neural responses of a small group of individuals predict the behavior of larger groups of people (e.g. at the city or state level)? We will present data addressing these questions using a “brain-as-predictor” approach. Prior research demonstrates that individual and group behaviors can be predicted using neural activity recorded in response to public health messages. More specifically, neural activity in an a priori region of interest in medial prefrontal cortex (MPFC, BA10) during exposure to persuasive messages predicted behavior change above and beyond self-report measures (such as intentions and self-efficacy to change behavior). The present study builds directly on prior work in our lab in which we explored a behavior of relatively low motivational relevance (sunscreen use) and predicted individual behavior change over one week, and a follow-up study in which we predicted a behavior of high motivational relevance (smokers trying to quit) over a longer period of time (one month); in this context, neural signals more than doubled the variance explained by traditional self-report measures alone. Here, we will present results from an investigation in which neural activity in response to different mass media campaigns predicted the media campaigns' relative success at changing behavior at the population level, significantly above chance levels. By contrast, the same participants' self-reported projections of campaign efficacy did not predict the relative success of the campaigns at the population level. Our results highlight the use of the brain-as-predictor analysis approach, in which neural signals from a priori regions of interest are used to predict real-world outcomes of importance over weeks or months; furthermore, we extend the brain-as-predictor approach from predicting individual difference outcomes to show that neural signals not only predict individual behavior change, but may also predict population-level health behaviors. Finally, 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 models of persuasion and behavior change.

Affiliations: University of Michigan, University of Oregon, University of California, Los Angeles

Keywords: fMRI, health, media, persuasion

Modes of processing and challenge and threat in the presence or absence of others

Authors: Ricardo Fonseca, Alexandre Fernandes, Jim Blascovich, and Teresa Garcia-Marques

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Abstract: Within a comprehensive perspective of human behavior we present data that suggests that cognitive processing is accompanied by specific motivational states of challenge and threat, being this effect amplified by basic social contexts, like mere presence. Our framework brings together evidence from social cognition and psychophysiology and relates it with a classic effect of social psychology. Specifically, we integrated the familiarity as a regulation mechanism model (Garcia-Marques, 1999; Garcia-Marques & Mackie, 2001, 2007) with the biopsychosocial model of challenge and threat (Tomaka et al, 1991; Blascovich, 2008), within a social facilitation setting. This integrated approach originated two main assumptions that were tested in this investigation. The first one derives from the assumption that familiarity moderates information-processing modes (Garcia-Marques & Mackie, 2001, 2007) and that familiarity increases psychophysiological state of challenge (Blascovich et al, 1993; 1999). Based on this, we hypothesized that non-analytic processing would be associated to cardiovascular challenge. We tested this hypothesis on experiment 1 using a persuasion paradigm. Participants assigned to a familiar or unfamiliar condition were asked to read a strong or weak persuasive message and then asked to list their thoughts to a video-camera while their physiological responses were recorded. As expected, results demonstrated that those, assigned to a familiar condition, generated thoughts that reflect non-analytic processing and exhibited a cardiovascular pattern of challenge. Conversely, those assigned to an unfamiliar condition generated the types of thoughts associated to analytic processing and exhibited a cardiovascular pattern of threat. Based on these results, we raised the subsidiary hypothesis that challenge could have a direct impact on information-processing. Thus, on experiment 2 we eliminated the familiarity path and induced challenge and threat prior to information-processing task. Our results made the previously found association clearer. Participants assigned to a challenge condition processed persuasive information non-analytically, whereas participants assigned to a threat condition processed it more analytically. The second assumption derived from our framework suggests an amplification role played by the presence of others. Based on Blascovich et al.'s work (1999) we expected that the effects of challenge and threat on information-processing to be more strongly observed when participants perform in the presence of other, than when they perform alone. To test this hypothesis, we replicated experiment 1 and 2 adding a manipulation of presence vs. absence of others. Results seem to support an amplification effect, such as the effects observed in the previous experiments were only significant when others were present in the experimental situation, but not when participants were alone. These results are interpreted in terms of the cognitive characteristics associated with challenge that typically trigger non-analytic processing, namely accessibility and ease. Further interpretations are also provided in order to explore if the stimulus that signals the cognitive system to engage in non-analytic processing is a pure cognitive or motivational one. Implications for the FARM model, the BPS model and social facilitation are discussed within an integrated perspective of human behavior.

Affiliations: ISPA - Instituto Universitário; University of California, Santa Barbara

Keywords: cardiovascular responses, familiarity, information processing, mere presence

Sustained nucleus accumbens activation predicts self-reported psychological well-being

Authors: Aaron S. Heller, Carien M. van Reekum, Stacey M. Schaefer, Carol D. Ryff, and Richard J. Davidson

Abstract: Psychological well-being (PWB) is often defined as fulfillment and meaning in life. PWB is characterized by resilience to mental illness, and preliminary evidence suggests that high levels of PWB confer protection against morbidity and mortality. Further, it has been argued that the ability to sustain engagement of the neural circuitry involved in the regulation of positive affect may be particularly indicative of this type of PWB. This suggests that a greater understanding of the dynamics of the neural mechanisms underlying the generation and regulation of positive affect has important consequences for PWB and by extension, health broadly. Two areas of particular relevance in the generation and regulation of positive affect are the Nucleus Accumbens (NAcc) and the Prefrontal Cortex (PFC). We previously found that depressed participants demonstrate reduced sustained engagement of the NAcc and NAcc-PFC connectivity when utilizing cognitive reappraisal to increase positive affect, as compared with healthy controls (Heller et al., 2009). We additionally found that in the depressed group, individual differences in sustained NAcc activity were related to self-reported positive affect such that individuals demonstrating more sustained NAcc activity were those reporting higher levels of positive affect. Here, in a large sample (n=64) of adults from a large age range (38-79 years), we examined whether sustained NAcc activity in response to positive stimuli correlated with individual differences in PWB. Indeed, (at $p < .05$ corrected for multiple comparisons across the brain) those individuals who demonstrated sustained NAcc activity to positive stimuli across the scan session were those with higher levels of PWB. This relationship remained significant after controlling for age, sex, and grey-matter probability. Further, sustained NAcc activity in response to negative and neutral stimuli did not predict PWB, suggesting that the relationship between sustained NAcc activity in response to positive images and PWB is specific to positive stimuli.

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Keywords: positive affect, emotion regulation, well-being, nucleus accumbens

Beyond human intentions: A statistical Multi-Level Kernel Density fMRI analysis towards social neuroscience

Authors: Elsa Juan, Francesco Bianchi-Demicheli, Chris Frum, James Lewis, and Stephanie Ortigue

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Abstract: A key question in psychology concerns the mechanisms allowing for efficient social interactions. Although significant advances in our understanding of the neural basis of action observation and intention understanding have been made in the last few decades by demonstrating a specific involvement of the “action observation network” (AON), which is located in an inferior fronto-parietal network (FPN) and includes a subset of areas that are associated within the putative human mirror neuron system (hMNS; a system that is active when one does something or observes someone else acting), these have been largely based on experimental studies in which people have been considered as strictly isolated entities. However, we spend much more of our time performing actions in the context of interpersonal interactions. Thus, there is a crucial need to better understand the neural basis during the understanding of actions performed in an interpersonal context. To elucidate the brain network that is specific to understanding intentions of other people, we performed a retrospective review of several fMRI studies that have been done on decoding intentions performed by strangers, and compared this brain network to that evoked by stimuli related to a significant other with whom participants were passionately in love. Using a statistical Multi-Level Kernel Density analysis (MKDA) of functional brain images derived from 28 fMRI paradigms (18 on intention understanding; 10 on passionate love) including a total of 491 participants, we unraveled the uniqueness of the neural basis of intention understanding. The reported group-averaged data from each paradigm were all converted to a common Talairach coordinate space (AFNI-Talairach). Results from the MKDA analysis revealed that understanding the intentions of strangers involved specifically the right inferior frontal gyrus, left superior temporal sulcus, and bilateral parietal lobules ($p < .001$, corrected). On the other hand, passionate love differentially involved the ventral tegmental area, the anterior insula, bilateral parietal lobules and more specifically the left angular gyrus ($p < .001$). Together those activations clearly identify the brain networks that characterize each one of these cognitive functions, and so set the brain patterns that should be targeted as common brain networks during an intention inference task involving actions performed by a significant partner (rather than actions of strangers). From these results, and according to the self-expansion mirror theory of love, one may consider the brain networks mediating intention understanding of one’s significant partner as being an additive set of functions from both love and intention understanding, which opens critical avenues for better understanding the neurobiology of the loving mind during embodied cognition.

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Keywords: love, intention understanding, fmri, neuroimaging

Terror management in the brain: Shedding light on the neuronal basis of existential threat processing and regulation

Authors: Johannes Klackl, Eva Jonas, and Martin Kronbichler

Abstract: Terror Management Theory (TMT, Greenberg, et al., 1990) postulates that self-esteem and the identification with cultural worldviews and ingroups enable people to protect themselves against the existential terror that results from a conflict between the desire to survive and the knowledge that death is inevitable. Although a great deal of evidence supports the idea of self-esteem and worldviews as protective constructs, ‘the terror itself has been difficult to find’ (DeWall & Baumeister, 2007, p. 984). To be more precise, there is no evidence that reminders of mortality induce stronger self-reported negative affect than other aversive, but death-unrelated topics. This is somewhat surprising given TMT’s conception of a pervasive and overwhelming potential for existential anxiety inherent in the awareness of mortality. In the present studies, participants read neutral, positive, death-related and unpleasant (but death-unrelated) written material. Across two ERP studies, death-related words, compared to unpleasant words, led to an increased late positive potential (LPP) at 600 to 800ms after stimulus onset (death-related and negative words did not differ with respect to arousal and valence). The magnitude of the LPP is associated with the inherent behavioral significance of stimuli and indexes emotional processing. This suggests that death-related stimuli might indeed elicit stronger affective reactions than people are conscious of or ready to admit. In an fMRI study, participants made arousal judgments on visually presented death-related negative, death-unrelated negative and neutral sentences. Compared with neutral sentences, both types of negative sentences activated regions which were previously associated with emotional processing, such as posterior cingulate, precuneus, putamen and caudate nucleus. Although reliable death > negative effects were absent, self-esteem negatively predicted death > negative activation in lateral prefrontal cortex (LPFC) when processing death-related sentences compared to negative sentences, indexing thought suppression and emotion regulation. This finding supports the proposition of TMT that self-esteem is a buffer against existential terror. To summarize, these studies show that neurophysiological and neuroimaging methods can contribute to research on the emotional aspects of existential threat, a field in which self-report measures of emotion have been inconclusive. Future work will address the question of whether the obtained neurophysiological effects are indeed specific to death-related content or whether they can be generalized to other threats. Threats to personal control, for instance, are currently debated as a potential alternative explanation for effects of mortality salience on ingroup support and defense (Fritsche, Jonas, & Fankhänel, 2008) and might elicit similar effects.

DeWall, C. N., & Baumeister, R. F. (2007). From terror to joy: automatic tuning to positive affective information following mortality salience. *Psychological Science*, 18(11), 984-990.

Fritsche, I., Jonas, E., & Fankhänel, T. (2008). The role of control motivation in mortality salience effects on ingroup support and defense. *Journal of Personality and Social Psychology*, 95(3), 524-541.

Greenberg, J., Pyszczynski, T., Solomon, S., Rosenblatt, A., Veeder, M., Kirkland, S., et al. (1990). Evidence for Terror Management Theory II: The Effects of Mortality Salience on Reactions to Those Who Threaten or Bolster the Cultural Worldview. *Journal of Personality and Social Psychology*, 58(2), 308-318.

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Keywords: existential threat, terror management theory, mortality salience, emotion, EEG, fMRI

***Body image and the medial prefrontal cortex**

Authors: Rachel Kramer, Stella Tambone, Heather Soder, and Kelly Jordan

Abstract: Defining and understanding the underlying correlates of the self has been a major research goal within the field of psychology. There is wide support that the frontal cortex is a predominant brain region related to the self. Furthermore, refining the specific functions within the frontal cortex has helped us define what the self is. For example, it is now well established that both medial and right lateralized networks are critical in forming the cognitive constructs of the physical self. Similarly, it has been discovered through extensive research in social psychology that one's own physical appraisal is influenced from external sources such as the media (i.e. social comparison theory). Sex differences are readily apparent in research of this type such with research suggesting that females are more influenced and less satisfied with their own physical appearance. The current study was designed to further understand how self-reflection relates to brain activation according to one's body image while viewing ideal versus non-ideal images. Using a Repetitive Transcranial Magnetic Stimulation (rTMS) paradigm, it was expected that women and men would exhibit both behavioral and neurological differences while viewing these images. It was found that females were less satisfied than males when comparing their images to non-ideal image. During rTMS stimulation, women also exhibited greater decreases in dissatisfaction than men when rTMS was applied over the Medial Prefrontal Cortex (MPFC) in comparison to sham. Furthermore, by manipulating masculine ideal images more accurately (making the ideal image a muscular male), male responses became more female-like. Taken together, our data indicate that the MPFC is critical for reflective evaluation of one's own self when compared to culturally defined ideal images. These findings warrant further research within clinical neuropsychology for populations that have severe dissatisfaction with their bodies such as those with eating or body dysmorphic disorders. The findings of this research also suggest that women and men react less differently to ideal images when special attention is paid to what an ideal image actually is.

Affiliations: Cognitive Neuroimaging Laboratory, Montclair State University

Keywords: rTMS, body image, medial prefrontal cortex

**Awarded the Society for Social Neuroscience 2011 Student Research Award*

Functional MRI reveals neural substrates of emotion and lateralized activation while viewing affective pictures varying in valence and arousal

Authors: Xiaonan Liu and Renlai Zhou

Abstract: Functional magnetic resonance imaging (fMRI) was used to measure the effects of viewing pleasant and unpleasant pictures varying in valence and arousal on brain activation in a block design experiment. Eighteen subjects attended four experimental blocks of viewing pictures that were positive (high valence) high arousal, negative (low valence) high arousal, positive (high valence) low arousal, and negative (low valence) low arousal. The picture viewing blocks were alternated with four control blocks of viewing crosshairs while fMRI scans were taken. The brain mapping data from the difference images between viewing emotional pictures and crosshairs revealed that all picture viewing conditions activated brain structures in the occipital cortex, including the right cuneus and left lingual gyrus. Furthermore, both negative high arousal pictures and positive high arousal pictures elicited activation of the left and right inferior frontal gyrus, the left frontal subgyral, and the right superior temporal gyrus, with the condition of viewing negative high arousal pictures additionally activating the left and right medial frontal gyrus, and right precuneus. Further analysis on the difference fMRI images revealed that under low arousal conditions, viewing negative pictures induced significantly higher neural activity than viewing positive pictures in the left sides of the insula, medial frontal gyrus, cingulate gyrus, middle frontal gyrus, superior frontal gyrus, inferior frontal gyrus, and postcentral gyrus, and in the right side of the medial frontal gyrus, inferior frontal gyrus, and right middle temporal gyrus. However, under high arousal conditions, viewing negative pictures induced significantly higher neural activity than viewing positive pictures exclusively in the left sides of the insula, putamen, parahippocampal gyrus, and amygdala.

Affiliations: Carnegie Mellon University, Beijing Normal University

Keywords: fMRI, emotion, brain lateralization

Validation of a quantitative measure of social motivation in mice using an operant conditioning paradigm

Authors: Loren Martin, Hannah Sample, Hannah Neal, Sydnee Esquibel, Christina Painton, and Angela Schoonover

Abstract: Much advancement has been made in the understanding and treatment of human disease through studies on animal models. For human disorders involving abnormal social behavior such as autism, research on mouse models will benefit from the development of novel assays of complex social behavior including social motivation. The goal of this research is to develop and validate new tasks of social motivation and social avoidance for mouse models of autism and other disorders involving social deficits. The proposed tasks involve the use of original operant conditioning paradigms programmed through a computer system that will allow a test mouse to control access to

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another mouse within an operant box. The access to the stimulus mouse will serve as a social reward for mice with prosocial tendencies but may serve as an aversive stimulus for mice with nonsocial tendencies. Research has been carried out with the C57BL/6J (B6) mouse, a prosocial inbred mouse strain, and on the BTBR T + tf/J (BTBR) mouse, an inbred mouse strain with well-documented social deficits. Comparisons were made between mouse strains and between individually- and group-housed B6 mice. In the first paradigm, the test mice were trained to press a lever for a social reward in the form of access to an unfamiliar stimulus mouse for 15 sec. The social reward was set on a progressive ratio schedule with a step size of three. The number of lever presses achieved in the final trial of a testing session (breakpoint) was used as an index of social motivation. In the second paradigm, motivation for a food reward was compared to a social reward. The mice were conditioned to associate one lever consistently with a food reward and another consistently with the same social reward described in the previous paradigm. All 12 B6 mice tested thus far (6 group-housed and 6 individually-housed) acquired the learned association with most of them reaching the criterion (10 rewarded lever presses per session for 3 consecutive sessions) by the 9th shaping session. On the other hand, the BTBR mice struggled to learn the task. Only 2 of 4 BTBR mice tested thus far acquired the task, each reaching criterion in 14 and 23 shaping sessions. Mice that acquired the task were tested over 20 sessions with asymptotic performance observed for the last 10 sessions. Group comparisons were therefore made using the mean breakpoint over the last 10 test sessions. Results indicated that there was no difference in social motivation between group-housed and individually-housed B6 mice for both paradigms. However, early results indicate that the BTBR mice may display reduced social motivation compared to the B6 mice in this task. The 2 group-housed BTBR mice had a mean breakpoint of 7.5 lever-presses compared to 15.3 for the 6 group-housed B6 mice. Overall, our preliminary results suggest that these operant conditioning paradigms may be valuable tools to assess social motivation in various mouse strains including purported models of autism.

Affiliation: Azusa Pacific University

Keywords: autism, mouse models, social motivation, operant conditioning

Adult affective, immune, and reproductive responses are altered following adolescent sex

Authors: John Morris and Randy Nelson

Abstract: Early life experiences have a lasting imprint on physiology and behavior. Adolescence is a critical developmental period when neural circuitry is heavily remodeled, and experiences during this period can permanently alter growth and development. In human studies, sex experienced during adolescence can increase susceptibility to mental disorders, modify immune function, and alter stress reactivity. In this study we evaluated the impact of a salient social interaction, specifically sexual experience, on adult behavioral, immunological, and reproductive outcome in hamsters. At birth, male Siberian hamsters were randomly assigned to one of three groups: (1) sexual contact with an ovariectomized, estrogen-primed, adult female during puberty at postnatal day 40 (P40), (2) sexual contact with an ovariectomized, estrogen-primed, adult female in adulthood at postnatal day 80 (P80), or (3) no sexual contact. At 120 days of age, hamsters underwent behavioral testing, and cell-mediated immune responses (delayed type hypersensitivity; DTH) were assessed. Compared to hamsters with no sexual experience or adult sexual experience, hamsters with adolescent sexual experience displayed markedly increased DTH responses, as well as elevated anxiety and depressive-like behavioral responses. These animals also exhibited reductions in overall body mass and accessory reproductive tissue mass. Taken together, these results suggest that early adolescent sexual experience has long-term effects on affective responses, enduring effects on adult immune function, as well as lasting effects on reproductive tissue. This work may be useful in understanding the long-term physical and mental health outcomes of adolescent sex in humans.

Affiliation: Ohio State University

Keyword: neuroscience

Genetic variation in the oxytocin receptor is associated with alterations in perceived social isolation, social rejection, and psychological stress reactivity: A population based study in older individuals

Authors: Greg J. Norman, Louise C. Hawkey, Aaron Ball, Maike Luhmann, Steve W. Cole, Gary G. Berntson, and John T. Cacioppo

Abstract: The neuropeptide oxytocin has been implicated in a wide range of social processes, such as pair bonding, social anxiety, and social judgment and decision making, that may contribute to normal adjustment and psychiatric states. Indeed, pharmacological administration of oxytocin has previously been associated with in-group trust and out-group hostility as well as diminished social threat perception and increased theory of mind. Consistent with the pharmacological manipulation studies mentioned above, recent work suggests that single nucleotide polymorphisms (SNPs) in the oxytocin receptor is associated with numerous social-affective processes. The present study sought to explore the effects of genetic variation in the oxytocin receptor (SNP; rs53576) on levels of perceived social isolation, sensitivity to social rejection, and stress reactivity to psychological stress in a population based study of older individuals. Results revealed that males who were homozygous for the G allele showed the highest levels of perceived social isolation and showed significantly higher levels of sympathetic cardiac control following a psychological stressor. In contrast, females who were homozygous for the G allele were significantly more affected by social rejection, as measured by pre-post changes in negativity scores, and they showed significantly smaller parasympathetic withdrawal in response to psychological stress. These data, combined with the growing literature, suggest that variation in the oxytocin receptor system has important effects on social-affective processes related to social isolation, social rejection and stress reactivity.

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Keywords: oxytocin, social isolation

The correlation of empathizing-systemizing with political party and political affiliation

Authors: Barbara Oakley, Barbara Penprase, Dana Driscoll, and Rueben Ternes

Abstract: This study examines the correlation between brain laterality issues and the left-right political schism seen in today's political environment in the United States. We investigate this using two tests developed by Simon Baron-Cohen and his colleagues—the Empathy Quotient (EQ) and the Systemizing Quotient-Revised (SQ-R)—as a self-reported measure of underlying brain laterality issues. Empathizing is thought to involve the drive to identify and respond with “appropriate” emotion to another person's emotions and thoughts. Systemizing involves “the drive to analyze, understand, predict, control and construct rule-based systems.” Because responses to these tests are closely related to gender, we included gender in our analysis. To explore this issue, the EQ and SQ-R surveys were used to study the relationship between political party and empathizing-systemizing characteristics of 1,676 undergraduate students at a Midwestern university in the United States. Specifically, we sought answers to the following two questions: 1. Are there differences in EQ and SQ-R scores based on political affiliation (e.g. liberal, conservative), and gender? 2. Are there differences in EQ and SQ-R and scores by political party (e.g. Democrat, Republican, Tea Party), and gender? **Methods:** In our study, students were invited by approximately 85 professors across campus to participate in the EQ and SQ-R surveys online—they were offered extra credit for their participation. In addition to the EQ and SQ-R portions of the survey, the demographic portion of the survey included two questions about each student's political identity including their “General political outlook” (liberal to conservative spectrum) and political party affiliation. One-way ANOVAs were used to test whether or not EQ and SQ-R scores were related to general political outlook for both males and females. Students who did not answer the optional questions related to politics were excluded from the ANOVA analysis. **Summary of Results:** Results indicate statistically significant differences in both EQ and SQ-R scores by political affiliation for women, but not for men, though differences in EQ scores for men approached statistical significance. Liberal women tend to have higher EQ scores. This score seems to increase the stronger the tendency towards liberalism becomes. For SQ scores, the more extreme the political leaning becomes, the higher the SQ score becomes. This appears to be accurate for both respondents that are “very liberal” and “very conservative.” As the political leaning tends more towards a neutral political affiliation, the SQ score decreases. Much like women, EQ scores for men increase as identification with liberalism increases, but the results for men only approach statistical significance. Unlike women, men seem to display no relationship between SQ-R scores and political affiliation. Along similar lines, the ANOVA results suggest that there are significant differentiation in EQ and SQ-R scores for party identification for women, but not for men. **Conclusions:** Empathizing and systemizing characteristics may form a new way to model the complex connection between genotype, neurological phenotype, and voting patterns on specific issues.

Affiliation: Oakland University, Rochester, MI

Keywords: empathizing, ideology, laterality, political attitudes, political temperament, politics, systemizing

Sex differences in social interaction and gene expression following social stress in male and female California mice

Authors: Veronica N. Orr, Michael Q. Steinman, Sarah A. Laredo, Elizabeth Y. Takahashi, Andrea L. Silva, and Brian C. Trainor

Abstract: Psychosocial stress is known to trigger affective psychiatric disorders. Although social stress is one of the most commonly used models to study psychiatric disorders, its effects are often limited to experiments in male rodents due to a lack of inter-female aggression. We overcame this limitation by studying the California mouse (*Peromyscus californicus*), as both males and females demonstrate territorial aggression towards same sex intruders. We studied the molecular and behavioral responses in to social defeat in males and females that were either gonadectomized or recipients of sham surgical procedures. Four weeks post-surgery, mice were exposed to three consecutive days of social defeat against a resident mouse of the same sex or handling control. A month following defeat, the mice were tested in a social interaction test. We found that social defeat had no effect on male social interaction behavior, regardless of gonadal status. Conversely, we observed that intact females exposed to social stressed spent more time in the corners of the apparatus as opposed to in the interaction zone, an indicator of social withdrawal and anxiety-like behavior. Ovariectomy weakened this effect in females, but did not eliminate it. Real-time PCR analysis of brain micropunch samples showed that both social stress and castration independently reduced expression of brain-derived neurotrophic factor (BDNF) mRNA in the bed nucleus of the stria terminalis (BNST). BDNF is a nerve growth factor that can have both anxiogenic or anxiolytic effects depending on the region of expression in the brain. The role of BDNF in the BNST has not been studied specifically, but many studies implicate the BNST as an important mediator of anxiety-like behavior in rodents and humans. In C57Bl6 mice, a subpopulation of individuals respond to social defeat with changes in gene expression within the ventral tegmental area that prevent the social withdrawal phenotype. Our results suggest that a decrease in BDNF gene expression in the BNST in male California mice could have similar protective effects. No changes in BDNF mRNA were observed

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in the paraventricular nucleus (PVN). Interestingly, we also found that females had more oxytocin (OT) mRNA in the PVN, but no effects of stress were observed. OT has been implicated in buffering the effects of stress via down-regulation of corticotrophin releasing hormone (CRH) release from the PVN. Changes in OT gene expression do not correspond with the observed behavioral response, since females showed susceptibility to social stress. However, this does not eliminate the possibility of changes in receptor regulation or OT neuronal activity. These data suggest that further study of BDNF in the BNST could provide insights into mechanisms of resilience in male California mice. Supported by NIMH R21MH090392-02, R01MH085069-02S1

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Keyword: stress

Comparison of the effects of simple mirror therapy with task-oriented mirror therapy on the affected upper extremity function in stroke patients

Authors: Young-Rim Paik, Su-Kyoung Kim, Jae-Shin Lee, and Byoung-Jin Jeon

Abstract: The purpose of this research is to provide common method for rehabilitation of stroke patients by comparing effective programs such as simple mirror therapy and task-oriented mirror therapy. The single-subject experimental research of ABA' design against to 4 each different stroke patient is used. There are total 23 sessions. Three out of whole sessions which is baseline 1 process did not apply with mirror therapy. 15 out of the total is intervention sessions. From those 15 sessions, group 1 use simple mirror therapy. Group 2 apply with task-oriented mirror therapy. Both groups performed a therapy once per day for 30 minutes period. Five out of total sessions which is baseline 2 process did not apply with mirror therapy again. To measure changes in upper extremity function, a subject in each session perform Box and Block Test, Cube Carry and Card Turning. In addition, the subjects was measured by Fugl-Meyer Assessment 4 times. The result of this study were as follows. The upper extremity function of the subjects were all increased after mirror therapy. However, group 1, which is applied with simple mirror therapy, decrease in upper extremity function during baseline 2. Group 2, which is applied with task-oriented mirror therapy, continue improving in upper extremity function while baseline 2 is performed. Mirror therapy effectively enhances upper extremity function in stroke patients. Task-oriented mirror therapy among all mirror programs will improve recovery of the upper extremity function and more effective treatments for the stroke patients. In conclusion, task-oriented mirror therapy will be proposed as the better and more effective treatment. The research on generalized improvements in activities of daily living with Task-oriented mirror therapy should be studied in the future.

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Keywords: mirror neuron, mirror therapy, stroke, task-oriented approach, upper extremity function

Spatio-temporal dynamics of intention understanding in friendship: An electrical brain imaging study in dyads with "shared representations" of actions

Authors: Nisa Patel and Stephanie Ortigue

Abstract: A growing body of research demonstrates congruence between observed actions and integrated templates of past self-related motor experiences facilitates intention understanding of other people. Recently, this facilitation effect has been observed for significant others, who had high levels of emotional bond and self-other closeness (IOS) with the observers. Little is known, however, about the spatio-temporal dynamics of this kind of facilitation mechanisms in a population with varying levels of dyadic emotional bonds and IOS. To address this question, we tested 24 sorority sisters with a strong dyadic emotional bond (friendship) and varying levels of IOS. Combining high-density 128-channel electroencephalogram recordings with a standard behavioral intention inference task (IIT), we investigated participants' electrical brain dynamics for intention understanding of other people. During the IIT, participants were presented three-frame video-clips. In each video-clip, the first frame (T0) showed two objects (e.g., a bottle of water and a cup) in a neutral setting; the second frame (T1) showed an agent's hand interacting with one of the two objects (e.g., bottle); and the final frame (T2) showed that agent's hand carrying out an intentional (i.e. pouring water in the cup) or non-intentional (i.e. pouring water outside of the cup) action. Four types of agents carried out these actions (i.e., the participant, the participant's best friend, the president of the participant's sorority, or a same-sex stranger). The participants were instructed to detect whether the agent was acting intentionally or non-intentionally. Behavioral results showed a ceiling effect for accuracy. Analyses of reaction times showed that participants were significantly faster at recognizing intentional actions compared to non-intentional actions, independently of the agent type. Interestingly, there was, however, a negative correlation between the reaction times for decoding non-intentional actions and the IOS levels between the participants and their best friends ($r = -.42$; $p < .04$), suggesting that the higher the IOS level the participants reported between themselves and their best friends, the faster they decoded their non-intentional actions. Electrophysiological results extended these behavioral findings. Group-averaged visual evoked potentials for friends' non-intentional actions were distinguished from friends'

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intentional actions over the N200 period, notably from 124 to 198 ms after T1 onset. Over this time period, friends' non-intentional action processing was characterized by a significant scalp potential field ($p = .005$). Although both conditions showed the recruitment of a distributed network known to mediate intention understanding (including activations in the IFG, pSTS, and IPL) over time, LORETA source estimation of that specific scalp potential field revealed a more left-lateralized current source density maximum in the middle temporal gyrus (MTG). The specific recruitment of MTG for understanding friends' non-intentional actions reinforces its involvement in social perception, and suggests MTG may play a crucial role for error detection of intentions performed by individuals with whom participants share high IOS levels. These findings support the hypothesis that complex cognitive processing for intention understanding occurs much faster than previously thought and open new perspectives with respect to the role of stored shared representation in visual processing of motor actions in social settings.

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Keywords: electrical brain imaging, social neuroscience, embodied cognition, friendship, self-expansion model, intention understanding, mirror neuron system

Sex differences in scan patterns to dynamic bimodal species-specific vocalizations: A study in rhesus macaques

Authors: Christa Payne and Jocelyne Bachevalier

Abstract: Crossmodal integration of audio/visual information is vital for recognition, interpretation, and appropriate reaction to social signals. Work in nonhuman primates has been largely limited to crossmodal matching tasks (e.g. Parr, *Anim Cogn* 2004, 7:171) or focused on the evolutionary basis of audiovisual speech (e.g., Ghazanfar & Logothetis, *Nature* 2003, 423:937). Here, we examined how rhesus macaques process bimodal species-specific vocalizations using eye tracking. Six adult rhesus monkeys (3M, 3F) were presented two side-by-side videos of unknown male conspecifics emitting different vocalizations (i.e., coo, grunt, scream, threat), with the audio signal matching one of the videos. The percentage of time animals looked to the congruent videos was used to assess crossmodal integration ability and the percentages of time spent looking at each of the six a priori ROIs (eyes, mouth, and rest of each stimulus video) were used to characterize scanning patterns. Across all trials, animals looked more to the congruent video ($p = 0.044$), confirming reports that rhesus monkeys spontaneously integrate conspecific vocalizations (Ghazanfar & Logothetis, 2003). Scanning patterns showed that monkeys looked more to the eye and mouth regions than the rest of the stimuli (eyes > other: $p = 0.002$; mouth > other: $p = 0.005$), and looked more to the eyes of the congruent than of the incongruent videos ($p = 0.033$). Males and females displayed slightly different scanning patterns. For the congruent video, females looked longer to the eye than mouth regions ($p = 0.011$), but this distinction was not seen in males. Looking to the eye region of the congruent video did not vary across sex, but males looked longer to the mouth region than females ($p = 0.051$). Studies in humans demonstrate that, when looking at videos of someone talking, people preferentially attend to the eyes over the mouth both during passive viewing and when instructed to assess emotion-related cues (Klin et al., *Arch Gen Psychiatry* 2002, 59:809; Lansing & McConkie, *J Speech Lang Hear Res* 1999, 42:526). Thus, greater viewing of the eye as compared to the mouth regions in female monkeys may indicate heightened attentiveness to vocalization valence, whereas equal viewing of eye and mouth in male monkeys suggest that in addition to emotional valence, male monkeys may attend to other social cues (e.g. dominance status). Interestingly, the greater sensitivity to the emotional aspects of species-typical communication in female monkeys parallels recent findings in humans indicating that women process crossmodal emotion expressions more efficiently than men (Collignon et al., *Neuropsychologia* 2010, 4:220).

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Keywords: crossmodal integration, sex differences, eye-tracking, rhesus macaques, socio-emotional behavior

Oxtr KO mice display social deficits in semi-natural visible burrow systems

Authors: Roger L. H. Pobbe, Brandon L. Pearson, Erwin B. Defensor, Valerie J. Bolivar, D. Caroline Blanchard, W. Scott Young III, and Robert J. Blanchard

Abstract: A wealth of studies has implicated oxytocin (Oxt) and oxytocin receptors (Oxtr) in the central mediation of social behaviors and social memory in several rodent species. It has been suggested that a failure in this system contribute to deficits in social interaction that characterize autism spectrum disorders. The current study was carried out to further analyze the expression of social behaviors in transgenic mice that lack the ability to synthesize the oxytocin receptor itself, Oxtr knockout (KO) mice. Prior studies revealed that juvenile Oxtr KO mice emitted fewer ultrasonic vocalizations than wild type (WT) littermates in response to social isolation, and adult Oxtr KO mice showed impairment in social recognition, in tasks specifically designed to assess these behaviors. The Visible Burrow System (VBS) is a semi-natural habitat in which groups of mice or rats live for extended periods in situations affording "burrows" based

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on those constructed in nature, as well as “open space”; maintained under a 12:12 hr. light/dark cycle. Same-genotype groups of 3 adult male Oxtr WT or KO mice were maintained in VBS for 4 days, with video recordings of each group for 24 hrs/colony (total = 144 hrs) over this period. Time sampling indicated that Oxtr KO mice showed robust reductions in frontal approach, huddling, allogrooming, and flight, with more time spent alone, and in self-grooming. These results were corroborated in the three-chambered test: in contrast to WT, male Oxtr KO mice failed to spend more time in the side of the test box containing the unfamiliar CD-1 mouse. Overall, the present data indicates that Oxtr KO mice display consistent social deficits in a semi-natural situation in which behaviors and a behavioral time budget are self-generated.

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Keywords: autism, social behavior, mouse models

Immune deficiency influences juvenile behaviors in mice

Authors: Kayla Quarterman, Kimberly Cox, and Emilie Rissman

Abstract: Severe Combined Immunodeficiency (SCID) mice are frequently used for immunological research, however, few behaviors have been studied in these mice. Although SCIDs grow and develop normally, they have impaired learning in comparison to wild type counterparts, and this can be rescued with T cell replacement (Brynskikh et al., 2008, Kipnis et al., 2004). It has been hypothesized that immune deficiency may be linked to autism spectrum disorders (Ashwood et al., 2006). To test whether social behaviors are altered in mice with severe immune deficiency, male SCID and wild-type (WT) C57BL/6J mice were tested for social and anxiety behaviors between postnatal days 21 and 27 (after weaning but before puberty onset) in an elevated plus maze, social preference task, and social recognition task. In the elevated plus maze, SCID mice (N=8) spent more time in the closed arms ($p=0.01$) and less time in the distal portion of the open arms than C57BL/6 wild type males (N=9, $p=.04$). When tested with an adult male in the social preference task, SCID males (N=6) spent more time in the center of a three chambered box ($p=0.01$) and more time sniffing the adult male stimulus mouse than WT mice ($p=0.008$). Conversely, the WT mice (N=9) tended to spend more time in the empty chamber than the SCID mice. Finally, in the social recognition task with an adult ovariectomized female as the stimulus animal, there was a main effect of trial ($p < 0.00001$) and an interaction of strain and trial ($p=0.047$). Post-hoc comparisons revealed that the wild type C57BL/6J mice (N=9) habituated to the stimulus and dishabituated to a new stimulus. The SCID mice (N=8) also habituated, but not as strongly, and did not demonstrate a significant increase in investigation when a novel stimulus mouse was introduced following habituation. To assess main olfactory function, we tested the same males in the hidden food task when they were adults. Latencies to find a hidden food pellet were not different between adult SCID and C57BL/6J males, suggesting that SCID olfaction is intact. These results suggest that immunodeficiency can alter juvenile mouse behavior, by increasing anxiety and decreasing social recognition. Given the fact that SCID mice are T cell deficient, and T cell replacement has been established to improve learning behavior, we are currently replacing T cells in SCID mice and repeating the behavioral tests to determine whether or not this will modify some or all of the behavioral differences detected in this set of tasks between juvenile SCID and C57BL/6 wild type mice.

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Keywords: autism, immunity, behavior

Look at this: The neural correlates of joint attention during a face-to-face communicative game

Authors: Elizabeth Redcay, David Dodell-Feder, Mario Kleiner, and Rebecca Saxe

Abstract: When engaging in joint attention, one person directs another person's attention to an object or topic (Initiating Joint Attention, IJA), and the second person's attention follows (Responding to Joint Attention, RJA). As such, joint attention must occur within the context of a social interaction. This ability emerges late in the first year of life and is critical to social-cognitive and language development; yet the neural bases for this pivotal skill remain largely understudied. This paucity of research is likely due to challenge in acquiring functional neuroimaging data during a naturalistic social interaction. To identify the neural bases of both IJA and RJA we implemented a dual-video set-up that allowed for a real-time face-to-face interaction between subject and experimenter via video during fMRI data collection. Data were collected from thirty-two healthy typical adults (mean 24 yrs \pm 5, 19 male). In each trial, participants either followed the experimenter's gaze to a target (RJA) or cued the experimenter to look at the target (IJA). A control condition, solo attention (SA), was included in which the subject shifted gaze to a target while the experimenter closed her eyes. Trials were presented in blocked order with five trials per block and four repetitions of each block type (i.e. IJA, RJA, SA). Mixed block/event-related analyses were conducted. Events for joint attention conditions (IJA and RJA) were periods in which both participant and experimenter were sharing attention on the target. Events during solo attention conditions were periods in which only the participant attended to the target. These events were identified through post-scan coding of videos acquired from both subject and experimenter during the joint attention task. RJA events elicited greater activation in bilateral posterior superior temporal sulcus (pSTS) and medial prefrontal cortex than the SA control events, while IJA events elicited greater activation in dorsal medial prefrontal cortex (dMPFC) and bilateral intraparietal sulcus than SA. Conjunction analyses revealed overlap only in the dorsal medial prefrontal cortex for IJA and RJA as compared to SA. This novel

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experimental set-up allowed for the identification of the neural bases of both initiating and responding to joint attention and suggests that whether one is the initiator or responder, the dMPFC is selectively recruited during triadic attention.

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Keywords: joint attention, social interaction, fmri, social cognition

Effect of intranasal oxytocin and vasopressin on cooperative behavior and brain activity in men

Authors: James Rilling, Ashley DeMarco, Patrick Hackett, Richmond Thompson, Beate Ditzen, Rajan Patel, and Giuspee Pagnoni

Abstract: The neural mechanisms supporting social bonds between adult men remain uncertain. In this double-blind, placebo-controlled study, we investigate the impact of intranasally administered oxytocin (OT) and vasopressin (AVP) on behavior and brain activity among men in the context of an iterated Prisoner's Dilemma game, which models a real-life social situation. 91 men from the Emory University community between the ages of 18 and 22 (mean = 20.2) were randomized to receive intranasal OT (n=27), intranasal AVP (n=27) or intranasal placebo (n=36) and were then imaged with fMRI as they interacted with both assumed human and computer partners in a sequential-choice, iterated Prisoner's Dilemma game. fMRI results show that OT increases the caudate nucleus response to reciprocated cooperation, which may augment the reward of reciprocated cooperation and/or facilitate learning that another person can be trusted. OT also enhances left amygdala activation in response to reciprocated cooperation and suppresses right amygdala activation in response to unreciprocated cooperation. Behaviorally, OT was associated with increased rates of cooperation following unreciprocated cooperation in the previous round. Behavioral effects of AVP were context-specific. Although there was a trend for AVP to decrease cooperation in situations of uncertainty, AVP strongly increased cooperation in response to a cooperative gesture by the partner. In response to reciprocated cooperation, AVP increased activation in a region spanning known vasopressin circuitry implicated in affiliative behaviors in other species. Finally, both OT and AVP increase amygdala functional connectivity with the anterior insula, which may increase the amygdala's ability to elicit visceral somatic markers that guide decision making. These findings extend our knowledge of the neural and behavioral effects of OT and AVP to the context of genuine social interactions.

Affiliations: Emory University, Bowdoin College, University of Zurich, University of Modena

Keywords: oxytocin, vasopressin, cooperation

Electrophysiological indexes of opposite vs. same sex face processing

Authors: Federica Riva, Alberto Zani, and Alice Mado Proverbio

Abstract: Human faces provide important social information about others. The response to faces is modulated by factors such as attention, visual imagery, and emotions. Some behavioral and imaging studies suggest that human adults prefer to look at attractive faces of the opposite sex than attractive faces of the same sex. However, electrophysiological studies on differences between opposite vs. same sex face perception are sparse. The aim of the present study was to investigate whether and how early a bias occurs in the processing of the opposite-sex in comparison with the same-sex faces. Particularly, we were interested in detecting electrophysiological indexes specific of opposite-sex and same-sex face processing. ERPs were recorded from 128 channels in 40 (20 males) right-handed volunteer university students engaged in a secondary perceptual task. Face stimuli consisted of 130 pictures of attractive adult male and female faces (ranging from 18 to 50 years of age) and target stimuli consisted of 44 pictures without humans representing landscape and urban sceneries. Stimuli were balanced in terms of picture size and average luminance and were presented for 800 ms with an Inter Stimuli Interval (ISI) of 1200 ms. The amplitude and the latency of the ERP components of interest were analysed using analysis of variance. Source reconstruction analyses by swLORETA algorithm were also computed. Two main ERP components were found, one specific for opposite-sex face perception and the other one for same-sex face perception. In particular, ERP data showed a larger and earlier centro-parietal N400 (350-500 ms) in response to faces of the opposite than of the same sex. At a later stage, between 590 and 720 ms, an occipito-temporal LP was found to be larger for faces of the same than of the opposite sex. The swLORETA linear inverse solution showed a greater activation of the face-related areas (FG, BA37, BA20/21) and of the limbic areas (the Parahippocampal Gyrus and the Cingulate Gyrus) in response to the opposite-sex faces than the same-sex faces. Thus, the results of this study showed how faces of the same sex and of the opposite sex are differently processed. Indeed, we found two different electrophysiological indexes for the two category of stimuli. The N400 component, found to be earlier and of greater amplitude for opposite-sex face perception, is indicative of a faster and deeper processing of this category. Therefore, this suggests that faces of the opposite sex draw more attention and probably have a higher emotive impact. Data derived from the source reconstruction analyses support this interpretation, as a greater activation of the face-related brain areas and of the limbic areas were found in response to the opposite-sex faces than to the same-sex faces. The subsequent LP component, of greater amplitude in response to same-sex faces, indicates that the processing of these faces occurs at a later stage. Finally, the present study provides evidence of two electrophysiological indexes, the N400 and the LP, specific for opposite-sex vs. same-sex face processing.

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Keyword: face processing

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Hijacking freewill: Transcranial magnetic stimulation and decision making

Authors: Heather Soder, Kelly Jordan, Racher Kramer, and Julian Keenan

Abstract: The determinism vs. libertarianism debate has been raging among philosophers for centuries. Within the libertarian view point, one can weigh an intention or urge and choose whether or not to act upon such an urge. Within the last two decades, this view point has come under significant scrutiny. Research on free will has suggested the possibility that free will does not exist and that our conscious intentions are already made for us before we are even aware that they have been made. Such research has also suggested that conscious intention is actually a result of preparatory brain activity. In fact, it has been found that by monitoring neural activity an outside observer is privy to an intention prior to the participant himself. Data suggest that Supplementary Motor Area (SMA) and the Parietal lobe are involved in conscious intention of motor and speech planning. Many of these studies followed the Libet(1985) paradigm, where participants are asked to watch a ticking clock and to remember the time where they first felt the urge to respond to a forced task. Significant brain activity is typically found before the onset of the participants' "conscious intention", suggesting preparatory brain activity or the "readiness potential." The current study examined conscious intention by making the setting more realistic. In this study, participants were asked to choose between two neutral, similar pictures. They were instructed to use their right or left hand respectively to press a button indicating which picture they preferred. Participants were also asked why they choose a certain picture over the other after every ten trials. Using an rTMS paradigm, it was hypothesized that the participants' decisions would be influenced and that they would have no insight that rTMS was usurping their free will. When rTMS was placed over the SMA, the participants were more likely to press the button ipsilateral to the stimulation. Also, the participants came up with responses to explain why they chose a certain picture that did not differ from non rTMS trials. These results indicate that conscious decision making can be influenced via base neural manipulation. The data suggest further that free will can be manipulated without participant awareness. While far from closing the debate on determinism, these data do suggest that free will is more fragile than once imagined.

Affiliation: Cognitive Neuroimaging Laboratory, Montclair State University

Keywords: free will, TMS, SMA, determinism

Common and distinct neural representation of arousal during anticipatory and appraisal phases of social evaluation

Authors: Leah Somerville, Rebecca Jones, Natasha Mehta, and Juan Molina

Abstract: Contexts of social evaluation, such as job interviews and meetings with unfamiliar colleagues, are potent sources of emotional arousal in everyday life. However, anticipation of the social exchange is sometimes described as more challenging than the event itself. In this study, peripheral autonomic arousal (GSR) and fMRI recordings were used to distinguish arousal-based and neural responses to anticipatory and evaluatory phases of social appraisal. 35 adult participants underwent a social evaluation induction task. They were led to believe that a supposed video camera inside of the fMRI head coil was projecting their image to a same-sex peer, serving as the evaluation condition. During other timepoints, they believed that the camera was 'warming up' and the evaluation was imminent, serving as an anticipatory comparison with visual presentation largely held constant. Self-report data showed that both anticipatory and evaluatory phases evoked heightened excitement and nervousness, and the evaluation period generated heightened arousal (GSR) relative to the anticipatory period. Group imaging results demonstrated that both shared and distinct neural responses supported social anticipation and evaluation. Common areas of heightened activity during both periods, relative to rest, were largely localized to subcortical regions (dorsal and ventral striatum, bed nucleus of the stria terminalis) shown to modulate sustained affect, contingency learning, and reward processing. Cortical regions including the insular cortex demonstrated interactions between task phase and habituation rates over the course of the experiment. Specifically, the insular cortex showed robust engagement bilaterally during anticipation in early phases of the experiment that habituated rapidly. However, during the social evaluation phase, the insula response maintained or increased in its magnitude over time. These findings suggest shared representation of social anticipation and evaluation, while the enhanced arousal associated with evaluation is paralleled by persistent engagement of arousal- and emotion-based neural circuitry.

Affiliations: Sackler Institute, Weill Cornell Medical College

Keywords: social anticipation, social evaluation, fMRI, psychophysiology

Epigenetic modifications in the regulation of maternal experience in mice

Authors: Danielle S. Stolzenberg, Jacqueline Stevens, and Emilie F. Rissman

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In numerous mammalian species experience interacting with offspring facilitates future maternal responding. In rodents, although parturitional hormones facilitate maternal responding, the facilitatory effects of maternal experience on subsequent maternal care depend on mother-infant interaction. We have recently found that experience with pups induces long-lasting effects on subsequent maternal care in spontaneously maternal C57BL/6J (B6) mice. Importantly, subtle differences in the amount of pup experience affect maternal care. For example, whereas 2 days of pup experience (2 hours/day) promoted retrieval behavior in the familiar home cage, at least 4 days of pup experience was necessary for females to retrieve pups on the novel T-maze. One mechanism through which experience-dependent behavioral modifications are regulated is epigenetic histone acetylation. Addition of acetyl groups by histone acetyltransferases (HATs) to the histone proteins around which DNA is wrapped increases the sensitivity of DNA to transcriptional regulation. Experience-dependent behavioral modifications have been linked to epigenetic modifications, however, how these mechanisms mediate experience-dependent effects on maternal care is untested. In support of the idea that experience-dependent effects on maternal responsiveness are mediated, at least in part, by epigenetic modifications, maternal experience-dependent increases in maternal care are associated with increased expression of the HAT CREB-binding protein (CBP). Further, brief periods of infant exposure that do not affect subsequent maternal care are potentiated by Sodium Butyrate (SB), a drug that enhances experience-induced histone acetylation. These data suggest that histone acetylation promotes maternal responsiveness via transcription of genes that increase maternal responsiveness. This work has been supported by NIH T32 training grant # DK007646 and R01 MH057759.

Affiliation: University of Virginia

Keywords: maternal behavior, HDAC inhibitor

Identification of potentially etiologic copy number variations in adults with intellectual disability and autistic spectrum disorders using array Comparative Genomic Hybridization

Authors: Arshya Vahabzadeh, Christa Lese Martin, Daniel Moreno-De-Luca, and Joseph Cubells

Abstract: *Introduction:* Autism spectrum disorders are understood to have a particularly high heritability recognized as being over 80%. There is emerging evidence from genomic studies suggesting that copy number variations (CNVs) in stretches of DNA are strongly associated with a range of behavioral and psychiatric conditions including autism spectrum disorders. Current evidence suggests that upwards of 10% of patients carrying autism spectrum diagnoses carry genomic CNVs likely to play an etiologic role in their clinical syndromes. It appears that certain copy number variations such as that found in 16p11.2 and in 1q21.1 deletion syndromes may give rise to both intellectual disability and autism spectrum disorders (ASD). Additionally these syndromes may present with a host of clinically detectable dysmorphic features such as microcephaly, deep set eyes, and low set ears. In this project we aim to determine if specific features including dysmorphic features and congenital abnormalities could be associated with CNV related ASD. *Method:* We performed a retrospective chart review of a case series of adults, referred for treatment at a tertiary-care clinic serving adults with ASD, and referred for genomic evaluation by array Comparative Genomic Hybridization (aCGH). We sought to identify whether specific clinical features reported to associate with CNV-related ASD were present in each case. These features included (i) an ASD diagnosis; (ii) intellectual disability; (iii) strong family history of ASD or other neuro-developmental disorder; (iv) facial dysmorphism; (v) congenital anomaly. *Results:* A total of 19 individuals were identified consisting of 14 males (74%) and 5 females (26%) with a mean age of 27.5 years (range 18-52). A total of 8 Genetic Analyses were not available at the time of abstract submission. A total of 8 out of the 11 (73%) who had genetic results available, demonstrated the presence of CNVs on microarray analysis. Further results highlight 2 individuals having long arm deletions of chromosome 15, 2 male individuals having deletions on the X chromosome (1 short arm and 1 long arm) and another individual demonstrating a copy number change of unclear clinical significance in the 5q13.2 region, which includes the Spinal Muscular Atrophy (SMA) gene combined with a gain involving the short arm of chromosome 6. *Conclusions:* Application of aCGH in a clinical setting in adults with intellectual disability and autism spectrum disorders identifies potentially etiologic CNVs. Although larger samples are necessary to support definitive conclusions, associated clinical features appear to increase the likelihood of identifying such CNVs.

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Keywords: autism spectrum disorders, intellectual disability, common number variations

Type 1 and 2 corticotropin releasing factor receptor distributions in *Scotinomys teguina*

Authors: Gerard Wallace, Ondi Crino, and Steve Phelps

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Abstract: Stress coping style is thought to influence a variety of behaviors in different domains by altering an individual's sensitivity to risk. In Central American singing mice, *Scotinomys teguina*, males emit long stereotyped songs that serve to attract mates and deter rivals, but are also likely to attract predators. Wild caught males exhibit suites of behavioral traits in the open field maze that correlate with glucocorticoid release, as well as with the likelihood a male will spontaneously sing. The corticotropin-releasing factor (CRF) system is generally recognized as an important regulator of anxiety-related behaviors, and its receptors exhibit species-specific patterns of forebrain distribution. We sought to explore whether corticotropin-releasing hormone might contribute to these correlated traits as it does in other species of mammals. In the current study we first describe the distribution of CRFRs in the forebrain of *S. teguina*. Brains were collected from two populations of wild *S. teguina* males that underwent open field testing. Receptor expression was assayed by autoradiography in brains of 33 animals from the in coronal sections spanning from the rostral pole to the superior colliculus. Two autoradiography protocols were used to assay CRFR distributions. [125I-Tyr0]-sauvagine, a CRFR agonist that binds both type 1 and 2 receptors was used to detect total CRFR receptor expression. [125I-Tyr0]-sauvagine in combination with an excess unlabeled CP-154,526, a CRFR 1 antagonist, were used to detect CRFR 2 binding. CRFR 1 expression was determined by subtracting the CRFR 2 expression from total CRFR expression. Specificity of binding was assessed by competing with excess unlabeled sauvagine. CRFR 1 and CRFR 2 binding was present in both hippocampus and amygdala, structures related to stress perception and regulation. Further, high levels of CRFR 1 and/or CRFR 2 binding were detected in amygdala, choroid plexus, angular cortex, prefrontal cortex, piriform cortex, lateral septum. Both CRFR1 and CRFR2 binding in the dentate gyrus, and CRFR 2 binding in CA1 were significantly associated with several measures of stress reactivity.

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Keywords: stress, personality, fear, singing mice, rodent, communication

Social dominance behavior and threat orienting in young adult monkeys is modulated by fluoxetine during early adolescence

Authors: Bo Zhang, Pamela Noble, Jeremy Kruger, Stephen Suomi, Daniel Pine, and Eric Nelson

Abstract: Late childhood and early adolescence is a time when dramatic changes in social behavior occur. The peri-pubertal period is also a developmental period which sees a marked increase in the incidence of mood and anxiety disorders which are often associated with social behavior. Selective serotonin reuptake inhibitors (SSRI) such as fluoxetine are a common treatment for anxiety and mood disorders in both adults and children, and clinical trials have demonstrated their efficacy. However the effects of chronic SSRI administration on development have not been fully explored. In the present study, we assessed the effects of chronic fluoxetine treatment on social behavior of adolescent and young adult monkeys both during treatment and following a washout period. Thirty-two male rhesus monkeys were randomly assigned to either peer rearing (PR) or mother rearing (MR) conditions for the first 6 months of life. MR monkeys were reared with mothers and other peers in a large social group while PR monkeys were removed from their mothers soon after birth and reared with a small group of peers. At 6 months of life both groups had identical social housing conditions. Between 2-3 years of age half of each group was treated with fluoxetine 3mg/kg/day. Social behavior was assessed both during and after treatment with a series of exposures to a novel individual and varied rearing and treatment histories. Fluoxetine treatment significantly reduced the expression of dominance behaviors during treatment and this pattern persisted in the post-treatment period. In the post-treatment period, drug treated monkeys received more dominance displays by partner than untreated animals. Attention orienting to social threat stimuli was also assessed in the post-treatment period with eyetracking methodology, and fluoxetine was found to modulate threat orienting behavior as well. These results suggest that fluoxetine exposure during early adolescence may have long term consequences on threat orienting behavior and may influence the development of social behavior in rhesus monkeys.

Affiliations: National Institute of Mental Health, National Institute of Child Health and Human Development

Keywords: ssri, social dominance, development

The Society for Social Neuroscience

Announcements

2012 Annual Meeting

The 2012 Annual Meeting of the Society for Social Neuroscience will be held in New Orleans, Louisiana, in advance of the Society for Neuroscience 2012 Annual Meeting (October 2012). More information will soon be available on the Society for Social Neuroscience website, www.s4sn.org.

Board of Directors Ballot

Nominations were received for two new members to serve on the Society for Social Neuroscience Board of Directors, beginning with the 2012 Annual Meeting. Following the 2011 Annual Meeting in Washington, D.C., a ballot will be distributed electronically to all members to elect these two new board members. The Society for Social Neuroscience bylaws require that the Board of Directors be comprised of members from at least three continents, and this will be taken into consideration when constituting the election ballot. The newly elected board members will replace two current members whose terms are ending this coming year. The Board of Directors plays an important advisory role for Society for Social Neuroscience leadership and plays a critical role in the success of the organization.

The Society for Social Neuroscience

Announcements

Call for Nominations: Early Career Award for Contributions to Social Neuroscience

The Society for Social Neuroscience has established this award to recognize Early Career Contributions to Social Neuroscience. Distinguished Early Career Scientific Contributions can manifest in various ways, including the formation of new approaches or paradigms within a field of neuroscience and the development or advancement of research that cuts across fields of neuroscience. Two such awards will be given, one for human research and one for animal research. The Society for Social Neuroscience Award winners will be representative of the most creative and promising investigators in the field of social neuroscience and will embody the future of social neuroscience through their cutting edge ideas and novel research. The Society for Social Neuroscience Awards will be given annually and will be conferred at the Society for Social Neuroscience meeting.

Nominations are now open for 2012 Early Career Award recipients.

Eligibility: Nominees for the Early Career Award must have completed their Ph.D. within five years of the date of the annual meeting at which the award would be conferred. Individuals who have completed their PhD after November 2007 are eligible.

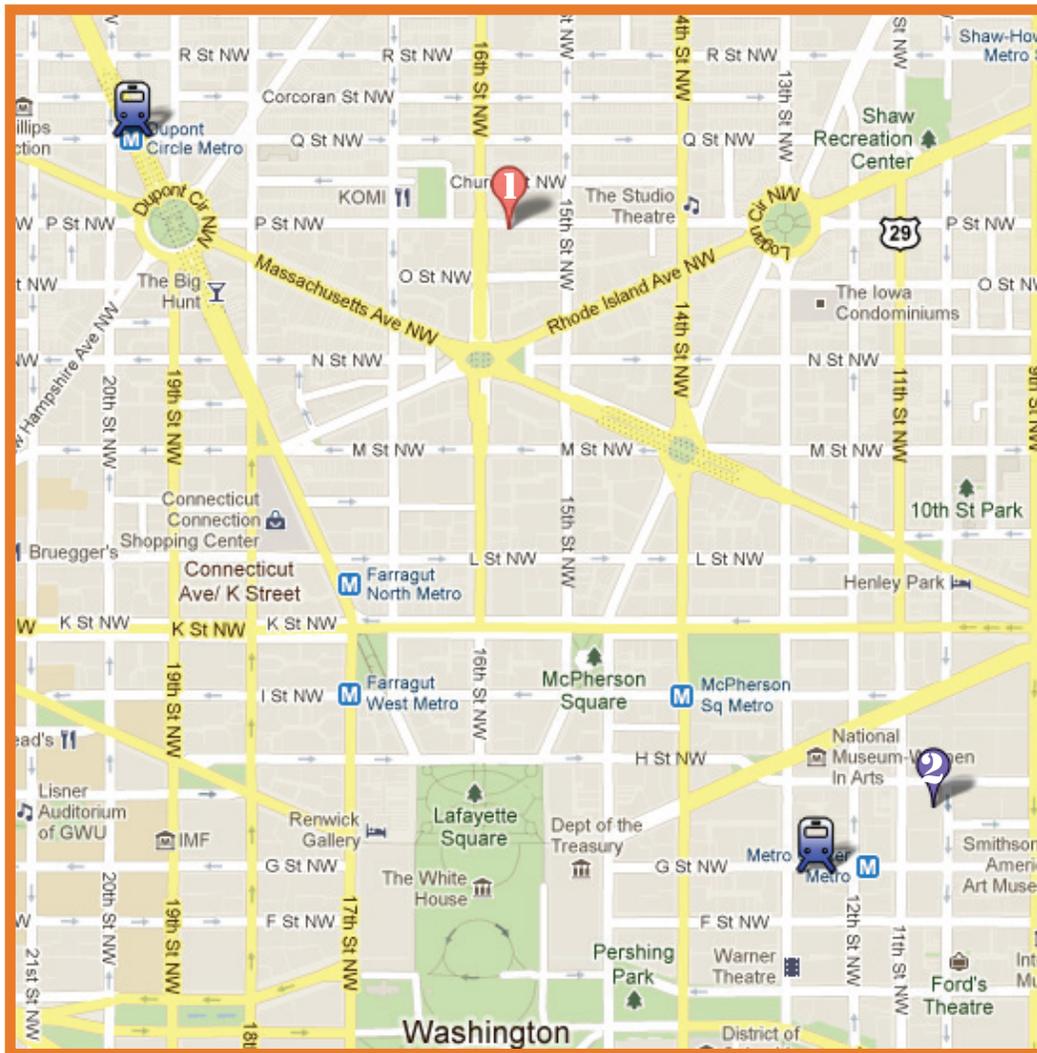
Award winners must be able to attend the 2012 Annual Meeting in New Orleans, Louisiana, to present their research during the Awards symposium.

Selection Criteria: Selection criteria for the award include: (1) Is the research characterized by rigorous and innovative scientific methods? (2) Does the research build upon existing neuroscience in scholarly ways? (3) Is the research having scientific impact? (4) Is the research novel and creative? (5) Does the research have the potential to transform how we think about social neuroscience?

Nomination Materials: Nominations should be submitted by email to AwardsCommittee@s4sn.org, and should include a letter of nomination, the nominee's current CV, electronic reprints or links to the nominee's work, indicating the most important contributions to social neuroscience, and two letters of recommendation, at least one of which is from a member of the Society for Social Neuroscience. The deadline for submissions is **August 1, 2012**.

The Society for Social Neuroscience 2011 Annual Meeting

Map and Travel Information



Meeting Locations:

1 Thursday, November 10, 2011
The Carnegie Institution for Science
1530 P Street NW
Washington, D.C., USA 20005
Nearest Metro Station: Red Line (Glenmont/Shady Grove)- Dupont Circle

2 Thursday, November 10, and Friday, November 11, 2011
The Grand Hyatt Washington
1000 H Street NW,
Washington, D.C., USA 20001
Nearest Metro Station: Red Line (Glenmont/Shady Grove)- Metro Center

