



escan

3rd conference

june 23-26, 2016, Porto

# Program

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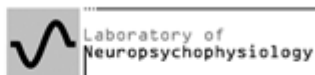
### Information (more details on the conference website: [www.escan2016.eu](http://www.escan2016.eu))

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- **Conference Venue:** Porto Palácio Congress & Spa Hotel, Av. Boavista, 1269, 4100-130 Porto  
<https://goo.gl/maps/KDq62QLFAqF2>
- **Pre-conference Workshops:** Faculdade de Psicologia e de Ciências da Educação da Universidade do Porto (FPCEUP), Rua Alfredo Allen, 4200-135 Porto  
<https://goo.gl/maps/67waZuXDeEH2>
- **Welcome Reception:** Câmara Municipal do Porto, Praça General Humberto Delgado, 4049 - 001 Porto  
<https://goo.gl/maps/48EaJeE5iNF2>
- **Conference Dinner:** Restaurante Casa da Música, Av. da Boavista, 604-610, 4149-071 Porto  
<https://goo.gl/maps/Q3eYL7fwdgK2>

A very warm 'thank you' to our sponsors and partners!

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Thursday, 23 June 2016

9:00-16:00 Pre-conference workshop(s) @FPCEUP
16:00-16:45 Meeting @FPCEUP
17:00-18:15 Welcome reception @Câmara Municipal do Porto (City Hall)

Friday, 24 June 2016

8:30-9:15 <b>Registration</b>		
9:15-9:30 <b>Opening</b>		
9:30-10:30 <b>Keynote: Ray J. Dolan – A Neuroscience Perspective on Interpersonal Interactions</b> ( <i>Porto room</i> )		
10:30-11:00 <i>Coffee break</i>		
11:00-12:30 <b>Symposia session 1</b>		
<p><b>Symposium (<i>Porto room</i>)</b>                  Movement Preparation, Timing, Spontaneous Fluctuations, Free Will: What is the Bereitschaftspotential?  <b>Chair(s):</b> Rolf Verleger (Germany)</p> <p>The SMA and cingulate cortex sustain premovement activity in readiness for action: An EEG-fMRI study  <i>Ross Cunnington, Vinh Nguyen, Michael Breakspear</i></p> <p>First-person approaches in the Libet-task: Conscious intention and its neural substrates  <i>Han-Gue Jo, Thilo Hinterberger, Marc Wittmann, Stefan Schmidt</i></p> <p>Neural precursors of decisions that matter – an ERP study of the role of consciousness in deliberate and random choices  <i>Liad Mudrik, Uri Maoz, Ram Rivlin, Gideon Yaffe, Ralph Adolphs, Christoph Koch</i></p> <p>Time to move again? The BP as indicator of an internal clock  <i>Rolf Verleger, Mechthild Haake, Kamila Śmigajewicz</i></p> <p>Neuroontology of the BP: paradigm and distributional analyses comparing precursors of endogenous and instructed movement  <i>Patrick Haggard, Nima Khalighinejad, Andrea Desanti, Aaron Schurger</i></p>	<p><b>Symposium (<i>Douro Norte room</i>)</b>                  Attentional Bias, Attentional Control and Emotional Vulnerability: Understanding Causal Mechanisms in Health and Mental Well-Being  <b>Chair(s):</b> Tatjana Aue (Switzerland), Hadas Okon-Singer (Israel)</p> <p>State anxiety creates attention-like modulations of early sensory processing in V1  <i>Gilles Pourtois</i></p> <p>Tuning Down the Hedonic Brain: Working Memory Load Reduces Neural Responses to Food Rewards  <i>Lotte F. van Dillen</i></p> <p>Training attentional control to reduce anxiety and depressive vulnerability  <i>Nazanin Derakshan</i></p> <p>The interplay of expectancies and attention in the processing of threat: (Lack of) evidence from behavior, fMRI, and autonomic nervous system activity  <i>Tatjana Aue</i></p> <p>Attention Bias in Anxiety and Depression: Discussing Differences and Similarities  <i>Hadas Okon-Singer</i></p>	<p><b>Symposium (<i>Douro Sul room</i>)</b>                  Detection of Social Signals and its Immediate Impact on Social Cognition  <b>Chair(s):</b> Atsushi Senju (UK)</p> <p>Top-down and bottom-up interaction in attentional capture by threatening stimuli  <i>Nicolas Burra</i></p> <p>Privileged orienting to direct gaze and its reliance on low spatial frequency information  <i>Inês Mares, Marie L. Smith, Mark H. Johnson, Miguel Leal-Rato, Isabel Pavão Martins, Atsushi Senju</i></p> <p>How does eye contact enhance bodily self-awareness?  <i>Matias Baltazar, Julie Grèzes, Jean-Luc Picq, Laurence Conty</i></p> <p>Social attention enhances bodily self-awareness  <i>Nesrine Hazem, Laurence Conty, Morgan Beareneaut, Matias Baltazar, Nathalie George</i></p> <p>Social orienting in gaze leading: A mechanism for shared attention  <i>S. Gareth Edwards, Lisa J. Stephenson, Mario Dalmaso, Andrew P. Bayliss</i></p>
12:30-13:30 <i>Lunch</i>		

13:30-14:30 **Poster session 1** (3 Rios room)

14:30-16:00 **Symposia session 2**

**Symposium (Porto room)**

How Emotions Drive Attention and Decision Making

**Chair(s):** Henk van Steenbergen (Netherlands)

The interplay between value and confidence in decision making

*Mathias Pessiglione, Alizée Lopez, Emmanuelle Bioud, Raphaëlle Abitbol, Maël Lebreton*

Social influences in human decision-making

*Jan Gläscher, Lei Zhang*

Anticipating losses in a monetary incentive task increases the selectivity of encoding

*D. Clewett, R. Huang, R. Velasco, T. H. Lee, M. Mather*

The neural encoding of outcomes and its role in action control

*Henk van Steenbergen*

The role of outcome anticipation and evaluation in cue-elicited behaviour

*Sanne de Wit*

**Symposium (Douro Norte room)**

Using ERPs: From Research on Healthy Populations to Clinical Applications

**Chair(s):** Salvatore Campanella (Belgium), Henrique Sequeira (France)

A developmental perspective on emotion processing from body expressions and the voice

*Peiwen Yeh, Elena Geangu, Vincent Reid*

Emotional vision: data from ERPs studies

*Henrique Sequeira, Jacques Honoré*

Event-Related-Potentials to Emotional Stimuli in Children with Externalizing and Internalizing Psychopathology

*Georgia Chronaki, Graeme Fairchild, Nicholas Benikos, Samantha Broyd, Matthew Garner, Margaret Thompson, Julie Hadwin, Edmund J. S. Sonuga-Barke*

Emotional automatic deviance-detection in Autism spectrum Disorder

*Marie Gomot*

The P300 and the NoGo-P300 event-related potentials: biological markers of abstinence vs. relapse in alcohol dependence?

*Salvatore Campanella, Elisa Schroder, Catherine Hanak, Charles Komreich, Paul Verbanck*

**Symposium (Douro Sul room)**

Close Human Relationships: From Infancy to Adulthood

**Chair(s):** Lara Maister (UK)

In Deference to the Other: A Working Model of Differential Neural Processing for Close and Familiar Others

*Ryan Murray*

The Relational Body: Shared body representations between romantic partners

*Lara Maister, Manos Tsakiris*

Dopamine mediates human maternal bonding.

A behavioral PET-fMRI study

*Shir Atzil, Ciprian Catana, Ruth Feldman, Jacob Hokker, Lisa Feldman Barrett*

Hormonal and personality correlates of women's responses to infant facial cues

*Amanda Hahn, Lisa DeBruine, Dave Perrett, Benedict Jones*

16:00-16:30 *Coffee break*

16:30-18:00 **Symposia session 3**

**Symposium (Porto room)**

Affective Modulation of Perception and Attention, and the Potential Embedded Contribution of Action Processes

**Chair(s):** Julie Grèzes, Stéphanie Dubal (France)

How emotional arousal contributes to visual perception

*Stéphanie Dubal, Kenneth Knoblauch, Mariam Chammat*

Emotional arousal increases the gain on neural representations

*Mara Mather, Tae-Ho Lee, Steven Greening, Allison Ponzio, David Clewett*

Effects of threatening facial expressions on attention and action-related decisions within realistic social context

*Julie Grèzes, Marwa El Zein, Emma Vilarem*

The Influence of Threat on the Oculomotor System

*Manon Mulckhuysse*

**Symposium (Douro Norte room)**

Electroencephalographic Advancements in the Study of Pain and of its Cognitive and Affective Modulations

**Chair(s):** Elia Valentini (UK)

Does sustained pain induce crossmodal central sensitization?

*D. M. Torta, E. N. van den Broeke, Filbrich L., J. Lambert, V. Legrain, A. Mouraux*

Impact of reminders of death on pain and sensory representation as measured by electroencephalographic activity in healthy individuals

*Elia Valentini, Katharina Koch, Valentina Nicolardi*

Inter- and intraindividual variability of pain perception

*Enrico Schulz*

Common opioidergic modulation of first-hand experience and empathy for pain: neural evidence from event-related potentials

*M. Rütgen, E.-M. Seidel, A. Gartus, I. Rieckensky, C. Lamm*

**Symposium (Douro Sul room)**

Eye-to-Eye Social Cognition: A Theme and Variations

**Chair(s):** Jari Hietanen (Finland)

Effect of early social experience on the development of eye gaze processing in infants of blind parents

*Atsushi Senju*

Eye contact does not feel the same for everyone: the effects of personality and social anxiety

*Jari K. Hietanen*

Using Live Face-to-Face fMRI to Investigate the Social Brain in Autism

*Laura A. Harrison, J. Michael Tyszka, Jed Elison, Ralph Adolphs*

From face to hand: attentional bias towards expressive hands in social anxiety

*Mariska E. Kret, Jeroen J. Stekelenburg, Beatrice de Gelder, Karin Roelofs*

18:00-19:00 **ESCAN young researcher award talk: Matthew Apps – Neurocomputational basis of social signals in the anterior cingulate cortex (Porto room)**

9:30-10:30 <b>Keynote: Roberto Zatorre – From Perception to Pleasure: Music and its Neural Substrates</b> ( <i>Porto room</i> )		
10:30-11:00 <i>Coffee break</i>		
11:00-12:30 <b>Symposia session 4</b>		
<p><b>Symposium (<i>Porto room</i>)</b>  Non Invasive Brain Stimulation Induces Transient Changes in Neural Activity and Behaviour: Evidence Across Three Stimulation Methods  <b>Chair(s):</b> Maimu Rehbein, Markus Junghöfer (Germany)</p> <p>Non-invasive brain stimulation in psychiatry  <i>Andreas J. Fallgatter, Thomas Dresler, Ann-Christine Ehlis, Christian Plewnia</i></p> <p>Shifting emotion regulation – opposite effects of inhibitory and excitatory prefrontal cortex stimulation  <i>Markus Junghöfer, Swantje Notzon, Christian Steinberg, Peter Zwanzger</i></p> <p>Noninvasive stimulation of the medial prefrontal cortex enhances pleasant scene processing  <i>Constantin Winker, Dean Sabatinelli, Maimu Rehbein, Markus Junghöfer</i></p> <p>Effects of focal transcranial static magnetic fields over the brain in humans  <i>Antonio Oliviero, Laura Mordillo-Mateos, Vanesa Soto-León</i></p> <p>The use of transcranial static magnetic field stimulation (tsms) for inducing transient changes in neural activity and behavior  <i>Javier J. González-Rosa, Pablo Ortega San Miguel, Carlos Nieto-Doval, Clara Suárez, Bryan A. Strange</i></p>	<p><b>Symposium (<i>Douro Norte room</i>)</b>  How are Emotions and the Self Related? Evidence from Affective, Cognitive, Behavioral and Clinical Neuroscience  <b>Chair(s):</b> Cornelia Herbert (Germany), Georg Northoff (Canada)</p> <p>The look inside: Processing and evaluation of self-related emotional stimuli in healthy participants, persons in love and patients with affective and psychotic disorders  <i>Cornelia Herbert</i></p> <p>fMRI investigations of bodily self-awareness in non-psychiatric, alexithymic and depressed individuals – support for a relationship between emotions and the self  <i>Christine Wiebking</i></p> <p>Perspective of the Self in Laughter Perception  <i>Dirk Wildgruber</i></p> <p>Face-to-face: Implicit variation of personal relevance in face perception  <i>Florian Bublitzky</i></p> <p>It's all in your head: how putative sender identity modulates the processing of self-related emotional statements  <i>Johanna Kissler</i></p>	<p><b>Symposium (<i>Douro Sul room</i>)</b>  Brain and Heart Responses to Cognitive and Social Feedback Processing  <b>Chair(s):</b> Gilles Pourtois (Belgium), Maurits van der Molen (Netherlands)</p> <p>Beyond effects of valence and expectancy during performance monitoring: amplitude modulations of the FRN by goal relevance  <i>Gilles Pourtois</i></p> <p>Funny Kittens: Influence of affective stimuli on performance monitoring  <i>Roland Nigbur, Markus Ullsperger</i></p> <p>Social evaluative feedback processing in the brain: Electrocortical sensitivity to unexpected peer rejection  <i>Melle J. W. van der Molen, Laura M. S. Dekkers, Michiel P. Westenberg, Ferdinand M. van der Veen, Maurits W. van der Molen</i></p> <p>Social anxiety is characterized by negatively biased learning about performance and the self  <i>Leonie Koban, Rebecca Schneider, Yoni K. Ashar, Jessica R. Andrews-Hanna, Lauren Landy, David A. Moscovitch, Tor D. Wager, Joanna J. Arch</i></p> <p>The heart responds to cognitive and social feedback  <i>Maurits van der Molen, Riek Somsen, Eveline Crone, Bregtje Gunther Moor</i></p>
12:30-13:30 <i>Lunch</i>		

13:30-14:30 <b>Poster session 2</b> (3 Rios room)		
14:30-16:00 <b>Symposia session 5</b>		
<p><b>Symposium (Porto room)</b> Interceptive Mechanisms in Cognitive Neuroscience: Embodied Emotion and Social Cognition <b>Chair(s):</b> Ruben Azevedo, Sarah Garfinkel (UK)</p> <p>Meta-Analysis of BOLD fMRI Correlates of Interoception <i>Stefan M. Schulz</i></p> <p>Racial bias in a heartbeat: cardiac afferent activity modulates the expression of racial stereotypes <i>Ruben T. Azevedo, Sarah Garfinkel, Hugo D. Critchley, Manos Tsakiris</i></p> <p>Neural responses to heartbeats in the default network encode the self in spontaneous thoughts <i>Mariana Babo-Rebello, Craig G. Richter, Catherine Tallon-Baudry</i></p> <p>Altered dimensions of interoception in Autism and Schizophrenia <i>Sarah N. Garfinkel, Geoff Davies, Charlotte L. Rae, Anil K. Seth, Kathryn Greenwood, Hugo D. Critchley</i></p> <p>Cognitive evaluation of interoceptive information and negative health outcomes <i>Stefan Sütterlin, Ricardo G. Lugo, Sven C. Mueller, Stefan M. Schulz, Raymonde Scheuren.</i></p>	<p><b>Symposium (Douro Norte room)</b> How Expectations and Learning Shape the Experience of Aversive Stimuli: From Behavior to Brain Mechanisms <b>Chair(s):</b> Marieke Jepma (Netherlands), Leonie Koban, Stephan Geuter (USA)</p> <p>Learned pain cues bias somatosensory processing at the threatened body location <i>Stefaan Van Damme, Amanda Clauwaert, Charlotte Vanden Bulcke, Geert Crombez</i></p> <p>The appetitive side of pain and its learning effect <i>Marta Andreatta</i></p> <p>Self-reinforcing expectancy effects on pain: contributions of descending pain modulation and biased learning <i>Marieke Jepma</i></p> <p>Separate brain mediators of social influence and conditioned cue effects on pain <i>Leonie Koban, Tor D. Wager</i></p> <p>From Intensity Coding to Predictive Coding in Pain Processing <i>Stephan Geuter, Sabrina Boll, Falk Eippert, Christian Büchel</i></p>	<p><b>Symposium (Douro Sul room)</b> Social Cognition and Affective Neuroscience from a Female Perspective: the Impact of Sex Hormones <b>Chair(s):</b> Belinda Pletzer (Austria), Birgit Derntl (Germany)</p> <p>The influence of menstrual cycle and androstadienone on female stress reactions <i>Dixon Chung, Felix Peisen, Lydia Kogler, Sina Radke, Bruce I. Turetsky, Jessica Freiherr, Birgit Derntl</i></p> <p>Hormonal contraceptives alter the brain structural correlates of face processing <i>Belinda Pletzer</i></p> <p>Hormonal contraceptive influence on emotion processing <i>Inger Sundström Poromaa</i></p> <p>Changes in emotional conflict processing &amp; stress across the menstrual cycle <i>Julia Sacher</i></p>
16:00-16:30 <i>Coffee break</i>		
16:30-18:00 <b>Symposia session 6</b>		
<p><b>Symposium (Porto room)</b> Avoidance and Reversal of Conditioned Fear: Processes and Paradoxes <b>Chair(s):</b> Paul Pauli (Germany), Johanna Baas (Netherlands)</p> <p>Avoidance behavior in humans is resistant to extinction and triggers return of fear <i>Johanna Baas</i></p> <p>Learning processes underlying avoidance of negative outcomes <i>Marta Andreatta</i></p> <p>Impaired use of vmPFC safety signaling in Obsessive Compulsive Disorder disrupts flexible responding to threat <i>Annemiek Apergis-Schoute</i></p> <p>Limited generalization effects of exposure-based therapy on avoidance behavior in patients with panic disorder and agoraphobia <i>Jan Richter, Alfons Hamm</i></p>	<p><b>Symposium (Douro Norte room)</b> Bad Brains: Prejudice, Immorality, and Other Nefarious Behaviours <b>Chair(s):</b> Lasana T. Harris (UK/Netherlands)</p> <p>The impact of minimal group membership on the processing of others' emotional signals <i>Julie Grèzes</i></p> <p>Brain substrates of biased fear learning and social interaction in an intergroup context <i>Tanaz Molapour, Armita Golkar, Carlos David Navarrete, Jan Haaker, Andreas Olsson</i></p> <p>Dehumanised Perception: How the Social Context Promotes Inhumane Behaviour <i>Lasana T. Harris</i></p>	<p><b>Symposium (Douro Sul room)</b> New Evidence on the Role of the Cerebellum in Social Cognition <b>Chair(s):</b> Frank Van Overwalle (Belgium)</p> <p>Is the cerebellum involved in social cognition? Novel meta-analytic and multi-study connectivity findings <i>Frank Van Overwalle, Peter Mariën</i></p> <p>The cerebellum is involved in sequences processing and prediction: a TMS study <i>C. Ferrari, L. Casiraghi, V. Oldrati S. Bergonzoli, Z. Cattaneo, T. Vecchi</i></p> <p>Emotion and Theory of Mind in Schizophrenia: Investigating the Role of the Cerebellum <i>Gary Donohoe, Omar Mothersill</i></p> <p>Cerebellar functional connectivity and social behavior in patients with Autism Spectrum Disorders <i>Giusy Olivito, Maria Leggio</i></p>
18:00-19:00 <b>ESCAN general assembly</b> (Porto room)		
20:00-(...) <i>Conference dinner @Casa da Música</i>		

9:00-10:00 <b>Keynote lecture: José Morais – Literacy in context</b> ( <i>Porto room</i> )		
10:00-10:30 <i>Coffee break</i>		
10:30-11:45 Symposia session 7		
<p><b>Symposium (<i>Porto room</i>)</b> Novel Perspectives in Social Cognitive Neuroscience</p> <p><b>Chair(s):</b> Claus Lamm (Austria)</p> <p>Toward a second-person neuroscience: New developments in social neuroscience and implications for the transdiagnostic study of the neurobiology of psychiatric disorders <i>Leonhard Schilbach</i></p> <p>The phenomenon of placebo empathy analgesia: multimethod evidence for shared representations between first-hand experience and empathy for pain <i>Markus Rütgen</i></p> <p>Understanding Self-Other Processes in Social Cognition from behavioural and non-invasive brain stimulation studies <i>Idalmis Santiesteban</i></p> <p>When affect sharing and self-other distinction fail: understanding emotional egocentricity bias from a clinical and developmental perspective <i>Giorgia Silani</i></p>	<p><b>Symposium (<i>Douro Norte room</i>)</b> Neurobiological Underpinnings of Freeze-Fight-Flight Behaviour in Humans</p> <p><b>Chair(s):</b> Karin Roelofs, Mahur M. Hashemi (Netherlands)</p> <p>Dynamics of defensive behaviour during freezing and active avoidance <i>Alfons O. Hamm</i></p> <p>Contextual control over conditioned defensive responses: convergence of body immobility and fear-potentiated startle <i>Vanessa A. van Ast</i></p> <p>Hyperpotentiation of Defensive Neurophysiological Reflexes to Imminent Threat after Basolateral Amygdala Damage in Humans <i>David Terburg</i></p> <p>Neural mechanisms controlling defensive actions during acute threat <i>M. M. Hashemi</i></p>	<p><b>Symposium (<i>Douro Sul room</i>)</b> The Neuroaesthetics of People</p> <p><b>Chair(s):</b> Beatriz Calvo-Merino, Guido Orgs (UK)</p> <p>The Emotional Homunculus: Evidence for Somatotopic Empathy <i>Alejandra Sel, Manos Tsakiris, Bettina Forster, Beatriz Calvo-Merino</i></p> <p>The shaping of aesthetic preferences by experience <i>Louise P. Kirsch, Emily S. Cross</i></p> <p>Reshaping the body aesthetics brain: behavioral and transcranial magnetic stimulation studies of body exposure effects in healthy individuals and patients with Anorexia Nervosa <i>Cosimo Urgesi</i></p> <p>Joint action aesthetics <i>Guido Orgs, Staci Vicary</i></p>
11:45-13:00 Symposia session 8		
<p><b>Symposium (<i>Porto room</i>)</b> Neural and Cognitive Mechanisms of Human Social Interactions</p> <p><b>Chair(s):</b> Antonia Hamilton (UK)</p> <p>Neural Mechanisms of Intersubjectivity <i>Kai Vogeley</i></p> <p>Neural and social processes in the imitation of hand action trajectories <i>Paul Forbes, Dom Oliver, Antonia Hamilton</i></p> <p>Differential role of spatial attention on motor resonance and complementary actions <i>Sonia Betti, Umberto Castiello, Luisa Sartori</i></p> <p>Causal contribution of the parietal lobe in human-avatar and human-human (interpersonal) motor interactions <i>Matteo Candidi, Lucia Maria Sacheli, Vanessa Era, Loredana Canzano, Gaetano Tieri, Marco Gandolfo, Salvatore Maria Aglioti</i></p>	<p><b>Symposium (<i>Douro Norte room</i>)</b> On the Emotional Melody of the Voice: A Multi-Method Approach</p> <p><b>Chair(s):</b> Ana P. Pinheiro (Portugal), Sonja A. Kotz (UK/Germany)</p> <p>Brain signatures of encoding vocal emotions <i>Sonja A. Kotz</i></p> <p>Continuous vs. discrete cerebral representations of vocal emotions <i>Pascal Belin</i></p> <p>Emotional Prosody Perception in Healthy Ageing – Evidence from ERPs and recognition rates <i>Silke Paulmann</i></p> <p>Prediction of emotion in the vocal brain <i>Ana P. Pinheiro</i></p>	<p><b>Symposium (<i>Douro Sul room</i>)</b> Response Inhibition: Neural Mechanisms of Motor Suppression and Adjustment</p> <p><b>Chair(s):</b> Leon Kenemans (Netherlands)</p> <p>Inhibition after errors: the role of a neural mechanism for global motor suppression <i>Jan R. Wessel</i></p> <p>Distinct neural pathways underlying response inhibition revealed by fMRI <i>Leah Maizey, Chris Allen, C. John Evans, Nils Muhlert, Frederick Verbruggen, Christopher D. Chambers</i></p> <p>The role of attention in proactive response inhibition <i>Zachary Langford, C. Nico Boehler</i></p> <p>Frontal P3 as a generic inhibition mechanism <i>J. Leon Kenemans, Ivo Heitland</i></p>
13:00-13:15 <b>Best Student Abstract and Posters Awards and Closing</b> ( <i>Porto room</i> )		

## Poster Session 1 (24-06-2016) – Poster listing (P1 to P136 + P262)

### **P1 - 'Attending to Your Therapist': How Perceived Sender Expertise Amplifies Cerebral Processing of Emotional Language Feedback**

Sebastian Schindler, Johanna Maria Kissler

### **P3 - A Conflict Monitoring Account of the Control Mechanisms Involved in Dual-Tasking**

Michał Olszanowski, Arnaud Szmalec, Maria Teresa Bajo

### **P5 - A Neural Link between Affective Understanding and Interpersonal Attraction**

Silke Anders, John-Dylan Haynes, Thomas Ethofer

### **P6 - A Neurogenetic Approach to Attachment Disordered Behaviors: Processing of Face Familiarity in Institutionalized Children and Children with WS**

Alberto Crego, Ana Mesquita, Adriana Sampaio, Jay Belsky, Ana Osório, Elena Garayzabal, Isabel Soares

### **P7 - A Novel Tool of the Trade for Scan? Mapping the Interplay of Facial Emotion Processing and Executive Functioning with the Emotional Card Sorting Test**

Elisa Kreienkamp, Ute Habel, Frank Schneider, Katharina Pauly, Nils Kohn

### **P8 - A Systematic Review of Social Cognition in Dysexecutive Mild Cognitive Impairment**

Joana Melo e Castro, Carina Fernandes, Fernando Ferreira-Santos, João Marques-Teixeira

### **P9 - Acknowledging the Elephant in the Room: Empirical Insights into the Relation between Arithmetic and Reading Fluency**

Marta Martins, São Luis Castro

### **P10 - Action-Sound Coincidence and Contingency Related ERP Attenuations Reflect Different Processes**

János Horváth, Iria SanMiguel

### **P11 - Activation of Psychophysiological Responses with a Virtual Reality Program for the Treatment of Social Anxiety**

Francisco Esteves, Nadja Isberg, Marie-France Larsson, Ana P. Cláudio, Beatriz Carmo, Augusta Gaspar

### **P12 - Activity Patterns in Motor Regions of Chronic Stroke Patients for Action Observation, Execution, and Imitation**

Panthea Heydari, Sook-Lei Liew, Hanna Damasio, Carolee Winstein, Lisa Aziz-Zadeh

### **P13 - Adaptation and Change-Detection: The Two Sides of the Same Coin**

István Czigler

### **P14 - Adolescents with ASD Integrate Contextual Cues to Decode Threat-Related Emotions but Do They Use These Emotions to Adapt Their Behaviour?**

Christina Ioannou, Coralie Chevallier, Marwa El Zein, Valentin Wyart, Emma Vilarem, Frédérique Amsellem, Richard Delorme, Julie Grèzes

### **P15 - Advantage of Anxiety for Selective Attention under High Load and Threat**

Shasha Morel, Stephanie Dubal

### **P16 - Affective Face Processing under Predictable and Unpredictable Threat**

Isabelle A. G. Klinkenberg, Maimu A. Rehbein, Christian Steinberg, Markus Junghöfer

### **P17 - Age-Related aspects of Progressive Expectation Formation in the Balloon Analogue Risk Task**

Zsófia Kardos, Andrea Kóbor, Ádám Takács, Brigitta Tóth, Roland Boha, Bálint File, Márk Molnár

### **P18 - Effects of Aging on the Brain Electrical Activity Associated with the Involuntary Processing of Irrelevant Auditory Stimuli and the Reorienting of Attention to Target Visual Stimuli**

Kenia Correa-Jaraba, Susana Cid-Fernández, Mónica Lindín, Fernando Díaz

### **P19 - Alexithymia and Changes in Salience Network Functional Connectivity**

Lejla Colic, Liliana Ramona Demenescu, Meng Li, Martin Walter

### **P20 - Alexithymia Decreases Emotional Brain Responses to Social but Not to Monetary Rewards**

Katharina Sophia Goerlich, Mikhail Votinov, Sarah Groppe, Lina Winkler, Katja N. Spreckelmeyer, Ute Habel, Gerhard Gründer, Anna Gossen

### **P21 - Alexithymia in Eating Disorders: Specific Brain Networks**

Caglio M. Maria, D'Agata Federico, Caroppo Paola, Amianto Federico, Spalatro Angela, Bergui Mauro, Lavagnino Luca, Rigbi Dario, Abbate-Daga Giovanni, Pinessi Lorenzo, Mortara Paolo, Fassino Secondo

### **P23 - Altered Brain Oxidative Metabolism in a Rodent Neurodevelopmental Model of Schizophrenia**

Hector Gonzalez-Pardo, Nelida M. Conejo, Marta Mendez-Couz, Jorge L. Arias

### **P25 - Altering Developing Neurophysiology with Working Memory Training**

Duncan Astle

### **P26 - An ERP Study of Preoccupation Related Biases in Body Size Processing**

Helen Uusberg, Krista Peet, Andero Uusberg, Kirsti Akkermann

### **P27 - An Event-Based Account of Conformity**

Diana Kim, Bernhard Hommel

### **P28 - An Overarching Versus Fractionated Role of the rTPJ in Attention and Social Interaction**

S. C. Krall

### **P30 - Anxiety Dissociates the Adaptive Functions of Sensory and Motor Response Enhancements to Social Threats**

Marwa El Zein, Valentin Wyart, Julie Grèzes

### **P31 - Associative Learning of Stimulus Relations in a CPT-Like Task. An EEG Study**

Edmund Wascher

### **P32 - Associative Memory for Emotional Words in Communicative Context – The Effects of Emotional Congruency and Basic Emotions**

Monika Riegel, Marek Wypych, Malgorzata Wierzbna, Michał Szczepanik, Katarzyna Jednoróg, Patrik Vuilleumier, Artur Marchewka

### **P34 - Automatic Processing of Emotions in Obesity: Neural Correlates and the Role of Binge Eating Disorder**

Joana Fernandes, Fernando Ferreira-Santos, Sandra Torres

### **P35 - Beware the Serpent: The Advantage of Evolutionary-Relevant Stimuli in Accessing Visual Awareness**

Nuno Gomes, Samuel Silva, Carlos F. Silva, Sandra C. Soares

### **P36 - Body Odors from Anxious Individuals Influence Behavioral and Psychophysiological Responses for Dynamic Emotional Faces in Naïve Recipients**

Sandra C. Soares, Marta Rocha, Valentina Parma, Johan Lundstrom

### **P37 - Body Postures Impact on Mental Representations of In- and Outgroup Faces**

Hannah Metzler, Michèle Chadwick, Julie Grèzes

### **P38 - Brain Correlates of Expression-Related Change Detection**

Marianne Latinus, Judith Charpentier, Frédéric Andersson, Klara Kovarski, Agathe Saby, Emmanuelle Houy-Durand, Marie Gomot

### **P40 - Brain Responses to Vowel Change in Finnish Dyslexic Children as a Signature of Phonological Processing**

Paaavo H.T. Leppänen, Natalia Louell, Najla Azaiez, Kaisa Lohvansuu, Jarmo A. Hämäläinen

### **P42 - Cancer Patients Show Higher Anxiety Levels Compared with Non Cancer Patients Just before Undergoing Surgery**

Rafael Bravo, José María Tena, Lierni Ugartemendia, Ana B. Rodríguez, María Luisa Sanabria

### **P43 - Cardiac Autonomic Correlates of Fear and Disgust Chemosignals**

Jacqueline Ferreira, Mats Olsson, Valentina Parma, Marta Oliveira, Laura Alho, Gabriela Ramos, Joana Raposo, Carlos Silva, Sandra Cristina Soares

### **P44 - Co-Regulation between Romantic Partners as Expressed through Cardiac Synchrony**

Patrícia Oliveira-Silva, Joana Coutinho, Marta Barbosa, Wolfgang Tschacher

### **P45 - Cognitive Effort in Anxiety: Evidence from Pupillary Responses and Slow-Wave Cortical Potentials**

Piril Hepsomali, Simon P Liversedge, Julie A Hadwin, Federica Degno, Matthew Garner

### **P46 - Cognitive Phenotype of SCA36 ('Costa Da Morte Ataxia')**

R. Martínez-Regueiro, M. Arias, B. Quintáns, J. Pardo, P. Aguiar, M. Garcia-Murias, Z. Yáñez T., T. Labella Caballero, J. Cortés, A. Carracedo, M.J. Sobrido, M. Fernández-Prieto

### **P47 - Cognitive Reinterpretation or Just Cognitive Elaboration: What Decreases Emotional Responses during Reappraisal?**

Tomasz Stanislaw Ligeza, Miroslaw Wyczesany

### **P48 - Using Language for Social Interaction: Communication Mechanisms Promote Recovery from Chronic Aphasia**

Benjamin Stahl, Bettina Mohr, Felix Dreyer, Guglielmo Lucchese, Friedemann Pulvermüller

### **P49 - Comparison of Two Short Periods of Maternal Separation on Adolescent Rat Social Behavior and Drug Reward**

M. Nogueira, J. Bravo, C.J. Alves, A. Mesquita, T. Summavielle, L. de Sousa, A. Magalhães

### **P50 - Compliance Instead of Flexibility? How Cognitive Control during Visual Search Is Altered in Elderly People**

Christine Mertes, Edmund Wascher, Daniel Schneider

### **P51 - Conditioned Excitation and Inhibition for Threat and Safety Cues in Human Visual Cortex**

Stephan Moratti, Tamara Giménez-Fernández, Constantino Méndez-Bértolo, Francisco de Vicente-Perez

### **P52 - Conflict Resolution Skills: Are We Capable of Being Concordant?**

Ana Filipa Moreno, Patrícia Oliveira Silva, Kristin Perrone McGovern

### **P54 - Controlled and Automatic Functions in Risk-Taking Behavior**

Adam Takacs, Andrea Kóbor, Karolina Janacsek, Ferenc Honbolygó, Zsófia Kardos, Dezso Nemeth

### **P55 - Creative Boost – Unleashing Creativity Using TDCS in Japan**

Tal Ivancovsky, Jenny Kurman, Hiroaki Morio, Simone Shamay Tsoory

### **P56 - Deconstructing Exogenous Attention to Fear: Behavioral and Electrophysiological Correlates**

Sandra C. Soares, Dominique Kessel, María Hernández-Lorca, María J. García-Rubio, Paulo Rodrigues, Nuno Gomes, Luis Carretié

### **P57 - Different Cortical Mechanisms for Spatial and Feature-Based Attention in Visual Working Memory: A TMS Study**

Anna Heuer, Anna Schubö, John Douglas Crawford

### **P58 - Disentangling the Effects of Regulating Positive and Negative Emotions in Depression - An fMRI Study**

Leonie Löffler, Sina Radke, Birgit Derntl

### **P59 - Dismissing Attachment Characteristics Dynamically Modulate Brain Networks Subserving Social Aversion**

Anna Linda Krause, Viola Borhardt, Meng Li, Marie-José van Tol, Liliana Ramona Demenescu, Bernhard Strauß, Anna Buchheim, Coraline Metzger, Tobias Nolte, Martin Walter

### **P61 - Dissociable Mirroring of Deceptive Intention and Kinematic Alterations into the Observers Motor System during Action Observation**

Alessandra Finisguerra, Lucia Amoruso, Stergios Makris, Cosimo Urgesi

### **P62 - Do We Fail to Remember or Succeed to Forget? – An fMRI Study of Intentional Memory within the Discrete Emotion Framework**

Malgorzata Wierzbna, Monika Riegel, Katarzyna Jednoróg, Anna Grabowska, Artur Marchewka

### **P63 - Does Neuroticism Affect Morning Cortisol Release in Healthy Older People?**

Puig-Perez, S., Almela, M., Pulpulos, M. M., Hidalgo, V., Salvador, A.

### **P64 - Does Pain Interfere with Attentional Capacity in Fibromyalgia Patients? An ERP Study Using An Auditory Oddball Paradigm**

Paloma Barjola, Susana Cardoso, Virginia Guerra, Irene Peláez, Francisco Gómez-Esquer, Francisco Mercado

### **P65 - Does Self Equal Value? An fMRI Study on the Neural Distinction of Self- and Value-Related Processing in VMPFC**

Christin Scholz, Nicole Cooper, Emily B. Falk



- P66 - Does the Preparation of a Pain-Related Movement Enhance Somatosensory Processing?**  
Amanda Clauwaert, Lieven Danneels, Jessica Van Oosterwijck, Stefaan Van Damme
- P68 - Dual-Hemispheric TDCS Shutdown the Effect of Anodal TDCS over the Right Inferior Frontal Gyrus on Proactive and Reactive Prepotent Response Inhibition**  
Patrícia Pereira, Daniela Vieira, Alberto Lema, Filipa Ribeiro, Cátia Fernandes, Jorge Leite, Sandra Carvalho
- P69 - Dynamic Disconnection of the Supplementary Motor Area after Processing of Dismissive Biographic Narratives**  
Viola Borchardt, Anna Linda Krause, Meng Li, Marie-José van Tol, Liliana Ramona Demenescu, Anna Buchheim, Coraline Metzger, Catherine Sweeney-Reed, Tobias Nolte, Anton Lord, Martin Walter
- P70 - Dynamics of Local Field Potential Power of Subthalamic Nucleus in Relation to Scalp Recorded Electrical Activity of Resting Human Brain**  
Alena Damborská, Christoph Michel, Marek Baláz, Ivan Rektor<sup>1</sup> Serge Vuilleumoz
- P71 - Early Effects of Emotions associated to Human Faces in Event-Related Brain Potentials**  
Wiebke Hammerschmidt, Annekathrin Schacht
- P73 - EEG Responses to Auditory Vs. Visual Artificial Grammar Learning**  
Susana Silva, São Luis Castro, Karl Magnus Petersson
- P77 - Effects of Binge Drinking on Regional White Matter: A Preliminary MRI Study**  
Sonia S. Sousa, Adriana Sampaio, Paulo Marques, Alberto Crego
- P78 - Effects of Excessive Violent Game Playing on Recognition: An Event Related Brain Potential Study**  
Dicle Capan, Can Soyulu, Metehan Irak
- P79 - Effects of Goal Relevance on Performance Monitoring Revealed Using Event-Related Brain Potentials (ERPs)**  
Wioleta Walentowska, Agnes Moors, Katharina Paul, Gilles Pourtois
- P81 - Effects of Social Threat on Attention and Action Selection in a Realistic Social Context**  
Vilarem, E., Armony, J. L., Grèzes, J.
- P82 - Effects of Stress on Neural Processes Underlying Empathy and Their Relation to Prosocial Behavior**  
Livia Tomova
- P83 - Effects of Testosterone on Experimentally Induced Aggression**  
Ute Habel
- P84 - Effects of the Extract from the Fruit Hull of Mangosteen on Acetylcholinesterase Activity and Memory of Healthy and Scopolamine-Induced Amnesic Rats**  
Rungrudee Srisawat, Walaiporn Tongjaroenbuangam, Naiyana Nontamart
- P85 - Effects of Time on Task and Pauses on EEG Spectral Power**  
Stefan Arnau, Edmund Wascher
- P86 - Effects of Volume Level and Emotional Content on Spoken Word Processing**  
Annika Grass, Mareike Bayer, Annekathrin Schacht
- P87 - Electrocortical Effects of Reappraisal Are Attenuated during Additional Attentional Task**  
Tomasz Stanislaw Ligeza, Mirosław Wyczesany
- P88 - Electroencephalographic Evidence of Altered Top-Down Attentional Modulation in Fibromyalgia Patients during a Working Memory Task**  
Alberto González-Villar, Marina Pidal-Miranda, Manuel Arias, Dolores Rodríguez-Salgado, María Teresa Carrillo-de-la-Peña
- P89 - Emotion Comprehension and Recognition in Drug-Resistant Temporal Lobe Epilepsy**  
Olivia Zaborowska, Aleksandra Bala, Marta Szantoch, Andrzej Rysz, Andrzej Marchel
- P91 - Emotional and Cognitive Modulation of Pain - An EEG Localization and Effective Connectivity Study on Pain Catastrophizing**  
Magdalena A. Ferdek, Clementina M. van Rijn, Joukje M. Oosterman, Mirosław Wyczesany
- P93 - Emotional Processing in Preschool Children: Magnetoencephalographic Correlates**  
Ida Wessing, Jenny Grün, Georg Romer, Markus Junghöfer
- P94 - Emotional Responses to Expressive Affective Body Movement (Dance) and Music in Adults with and Without Autism Spectrum Disorder**  
Sebastian B. Gaigg, Julia F. Christensen, Beatriz Calvo-Merino
- P95 - Emotions in Institutionalized Young Children with Special Needs**  
Anastasiia S. Gorn, Maria Y. Solodunova
- P96 - Emotions Perception in Parkinsonian Patients: A Study on Facial Expressions and Music**  
Claudio Lucchiarini, Andrea Botturi
- P97 - Enabling Effect of D2:D4 and Competitiveness in the Outcome of Competition**  
Diana Abad-Tortosa, Adrián Alacreu-Crespo, Jesús Úbeda-Contreras, Raquel Costa, Alicia Salvador, Miguel A. Serrano
- P98 - ERP Correlates of Implicit Probabilistic Sequence Learning**  
Andrea Kóbor, Ádám Takács, Karolina Janacsek, Zsófia Kardos, Brigitta Tóth, Csenge Török, Zsófia Zavec, Márk Molnár, Dezso Nemeth
- P99 - Executive Functions in High Functioning ASD**  
A. Alonso-González, Adriana Sampaio, M. Resches, R. Martínez-Regueiro, L. Gómez-Guerrero, S. Gómez, A. Carracedo, M. Fernández-Prieto
- P100 - Executive Functions in Obsessive Compulsive Disorder**  
A. Pampin Alfonso, A. Alonso-González, R. Martínez-Regueiro, M. Páramo Fernández, Á. Carracedo, M. Fernández Prieto
- P101 - Facial Electromyographic Activity in Response to Social Feedback during Metacognitive Judgments: A Cross-Cultural Study**  
Jacquot A., Eskenazi T., Itakura S., Ueno, M., Sales-Vuilleumin E., Senju A., Proust J., Conty L.
- P102 - Fearful Facial Crowds Influence the N170 of Target Face Processing in Individuals with Schizophrenia and Healthy Controls**  
Barbara Schulte Holthausen, Christina Regenbogen, Thilo Kellermann, Frank Schneider, J. Christopher Edgar, Bruce Turetsky, Ute Habel
- P103 - Feedback Processing during Performance on the Halstead Category Test and Its Relation to Externalizing Behavior**  
Isabel M. Santos, Ana R. Teixeira, Ana M. Tomé, Ana T. Pereira, Paulo Rodrigues, Paula Vagos, Jorge Costa, Mariana L. Carrito, Beatriz Oliveira, Nick DeFilippis, Carlos F. Silva
- P104 - fMRI Exploration of Empathy Networks in Eating Disorders**  
Federico D'Agata
- P105 - fMRI Neurofeedback Enhances Cognitive Reappraisal in Post-Traumatic Stress Disorder**  
Jana Zweerings, Miriam Dyck, Pegah Sarkheil, Martin Klasen, Mikhail Zvyagintsev, Guido Flatten, Klaus Mathiak
- P106 - From Virtual to Robotic Representations of the Human Body: Behavioural, Physiological and Bci Studies Using Immersive Technologies**  
Tidoni Emmanuele, Abu-Alqumsan Mohammad, Gergondet Pierre, Leonardis Daniele
- P108 - Functional Neuroimaging of Value-Based Biases in Emotion Perception: Exploring (Sub)Optimality and the Role of Autistic Traits**  
Hanna Thaler, Katrine Filttenborg, Jakob Hohwy, Joshua C. Skewes
- P110 - Gaze Contact Effects on Social Preference and Face Recognition in Alzheimer's Disease**  
Lopis, Desirée, Baltazar, Matias, Geronikola, Nikoletta, Beau cousin, Virginie, Conty, Laurence
- P111 - Go-N2 and Nogo-N2 Event-Related Potential Components as Biomarkers of Amnesic Mild Cognitive Impairment**  
Susana Cid-Fernández, Mónica Lindín, Fernando Díaz
- P112 - Happy and Blind to Response Errors? Insights from Error-Related Brain Potentials**  
Katharina Paul, Wioleta Walentowska, Jasmina Bakic, Thibaut Dondaine, Gilles Pourtois
- P113 - Heartfelt Self: Cardio-Visual Stimulation Affects Self-Face Recognition and Interceptive Cortical Processing**  
Alejandra Sel, Ruben Azevedo, Manos Tsakiris
- P114 - Here's a Happy Ending, Nothing Is Forever: Subjective, Physiological and Neurological Effects of Mindful Attention**  
Sarah De Coninck, Frank Van Overwalle, Peter Mariën
- P115 - Higher Intuition Is Related to Worse Cardiovascular Recovery to Competition**  
Adrián Alacreu-Crespo, Diana Abad-Tortosa, Raquel Costa, Alicia Salvador, Miguel A. Serrano
- P117 - How Accurately Do Listeners Recognize Emotions from Nonverbal Short Vocalizations?**  
Paula Castiájo, Ana Pinheiro
- P118 - How Deep Is Implicit Perspective Taking? Evidence from fMRI Repetition Priming**  
Matthias Schurz, Matthias G. Tholen, Andrew Surtees, Dana Samson, Josef Perner
- P119 - How Different Early Periods of Maternal Separation Affect Maternal Behaviour and Dams Anxiety?**  
Renata Lopes Alves, Cecilia Juliana Alves, Teresa Summavielle, Liliana de Sousa, Fernando Barbosa, Ana Magalhães
- P120 - How Imitation Affects Empathy and Prosocial Behavior: The Role of Movement Congruency and Temporal Contingency**  
Jasminka Majdandžić, Birgit Rauchbauer, Gernot Gergler, Marina Maksimova, Jakub Chromec, Christoph Huber-Huber, Claus Lamm
- P121 - Sex Differences in Neuroendocrine Responses to Social Exclusion**  
Sina Radke, Eva-Maria Seidel, Roland Doubela, Hanna Thaler, Hannah Metzler, Ilse Krysin-Exner, Ewald Moser, Ute Habel, Birgit Derntl
- P123 - Impact of the Duration of Epilepsy on Cognitive Evolution in Patients with Drug-Resistant Epilepsy**  
Irene Cano, Vicente Enrique Villanueva, Asier Gómez, Esperanza González-Bono
- P127 - Impulsivity and Automatic Change Detection**  
Kairi Kreegipuu, Nele Pöldver, Annika Kask, Kertu Saar, Jüri Allik, Risto Näätänen
- P130 - Individual Variation of the CPCPD1 (ED13) Gene Involved in Intracellular Choline Metabolism Modulates Selective Attention in the Elderly**  
Patrick D. Gajewski, Christoph van Thriel, Meinolf Blaszkewicz, Jan G. Hengstler, Klaus Golka, Michael Falkenstein
- P131 - Infants' Neural Responses to Peer's Cry and Laughter: A Link to the Predisposition for Negative Emotionality**  
Maria Magdalena Crespo Llado, Elena Geangu
- P132 - Influence of Disgust and Fear on Long-Term Memory – An fMRI Study with the Use of the Nencki Affective Word List (NAWL)**  
Monika Riegel, Małgorzata Wierzbą, Katarzyna Jednoróg, Anna Grabowska, Artur Marchewka
- P133 - Influence of Lexical Context on MMN in Recognition Linguistic Stimuli: An ERP-Study**  
Memetova K., Aleksandrov, A.
- P134 - Intertemporal Choices: A Comprehensive Review of Its Neurobiological Bases**  
Diana Moreira, Marta Pinto, Fernando Almeida, Susana Barros, Fernando Barbosa
- P135 - Intrinsic Networks Underlying Successful Emotion Regulation of Angry Faces**  
Carmen Morawetz, Tanja Kellermann, Lydia Kogler, Sina Radke, Jens Blechert, Birgit Derntl
- P136 - Investigating the Neural Basis of the Autobiographical Self: An Event-Related Potential (ERP) Study**  
Helder F. Araujo, Johan Boillat, Jonas Kaplan, Assal Habibi, Hanna Damasio, Antonio Damasio
- P262 - Tracking Facial Trustworthiness and Reward during a Trust Game: An fMRI Study**  
Sara Dias dos Santos, Inês Almeida, Miguel Castelo-Branco

## Poster Session 2 (25-06-2016) – Poster listing (P138 to P274)

### **P138 - Is Social Feedback Special? Neuronal Correlates of Social and Non-Social Feedback Stimuli**

Daniela M. Pfabigan, Marianne Gittenberger, Claus Lamm

### **P139 - Is Stress Making Us Less Empathetic?**

Sara Reis, Francisco Magalhães Almeida, Eugénia Fernandes, Maria Manuel Pinhal, Bárbara Nobre, Patrícia Oliveira-Silva

### **P140 - Is the Processing of Face Familiarity and Emotional Expression Dependent on the Task?: Evidence from Event-Related Potentials**

Marina Palazova, Birgit Stürmer

### **P141 - It's in Your Eyes: Novel Approaches to Study the Neural Mechanisms of Gaze-Based Social Interactions**

Leonhard Schilbach

### **P142 - Knowing Where to Listen Reduces Age-Related Impairments of Attention Switching: ERP Evidence from a Dynamic Speech-Perception Task**

Stephan Getzmann, Edmund Wascher

### **P144 - Learning Novel Action- and Object-Related Words – An fMRI Study**

Max Garagnani, Evgeniya Kirilina, Friedemann Pulvermüller

### **P145 - Atypical Approach of Threatening Facial Expressions in Young Adults with High Levels of Early Life Stress**

Elizabeth Kirkham, Liat Levita

### **P146 - Meaning Maintenance in the Brain: Evidence that assimilation of Perceptual Anomalies Relies on Alpha-Mediated Gating in Frontoparietal Areas**

Stefan Reif, Johannes Klackl, Travis Proulx, Eva Jonas

### **P147 - Measuring Self-Other Sharing and Self-Other Distinction as Distinct Dimensions of Empathy**

Henryk Bukowski, Giorgia Silani, Federica Riva, Livia Tomova, Claus Lamm

### **P149 - Mirror Neuron System Activity Patterns in Chronic Stroke Patients during Action Observation, Execution, and Imitation**

Panthea Heydari

### **P150 - Mirroring Multiple Agents: Motor Resonance during Action Observation Is Modulated by the Number of Agents**

Emiel Cracco, Lize De Coster, Michael Andres, Marcel Brass

### **P151 - Modality-Specific Processing of Natural and Artificial Entities**

Georgette Argiris, Davide Crepaldi, Raffaella Rumiati

### **P152 - Modulation of the Neuronal Response to Depictions of Others in Pain through Stress-Related Chemosignals**

Matthias Hoenen, Katrin T. Lübke, Bettina M. Pause

### **P153 - Modulatory Effects of Testosterone in Risk and Reward Processing**

Lisa Wagels, Mikhail Votinov, Benjamin Clemens, Frank Schneider, Ute Habel

### **P154 - Motivation before Emotion: EEG Correlates of Incentive and Hedonic Effects on Affective Action Tendencies**

Andero Uusberg

### **P155 - Motor Cortex Involvement in offline Effector Recognition**

Katherine R. Naish, Sukhvinder S. Obhi

### **P156 - Motor Modulation during Action Observation: What Is It For, and Can We Control It?**

Katherine R. Naish, Sukhvinder S. Obhi

### **P157 - Movies as Naturalistic Stimuli in fMRI Study Focused on Temperamental Differences**

Maria Bierzynska, Anna Kozak, Pamela Sobczak, Maksymilian Bielecki, Keerthana Karunakaran, Bharat Biswal, Jan Strelau, Malgorzata Kossut

### **P158 - Mu Rhythm Modulation as a Neuromarker for Socio-Emotional Interaction – An MEG Study**

Fanny Lachat, Daniel Lundqvist

### **P159 - Mu Rhythms, Mirroring, and Autism: An Interventionist Approach**

Jamie Pineda

### **P160 - Need for Cognitive Closure and Processing of Emotionally Ambiguous Interpersonal Stimuli: An fMRI Pilot Study**

Petra Zemánková, Martin Gajdoš, Jan Širůček, Tomáš Kašpárek, Martin Bareš

### **P161 - Neural and Behavioral Evaluation of a New Emotional and Non-Emotional Video Stimuli Database**

Emily Kilroy, Laura Harrison, Sarah Gimbel, Sharon Cermak, Lisa Aziz-Zadeh

### **P162 - Neural Correlates of Reactive Aggression in Healthy Women & Female BPD Patients**

Katja Bertsch, Marlene Krauch, Macià Buades, Ulrike M. Krämer

### **P163 - Neural Indicators of Interpersonal Anger as Cause and Consequence of Combat-Training Stress Symptoms**

Gadi Gilam, Talma Hendler

### **P164 - Neural Mechanisms of Controlling Emotions: A Meta-Analysis of fMRI Studies on Emotion Regulation in Humans**

Carmen Morawetz, Stefan Bode, Hauke Heekeren

### **P165 - Neural Mechanisms of Emotional Conflict Processing during Cooperative Decisions**

Sonia Alguacil, Paloma Díaz, María Ruz

### **P167 - Neural Responses to Long-Lasting Slow Touch**

Chantal Tricoli, Uta Sailer, Gisela Häggblad, Håkan Olausson, Ilona Croy

### **P168 - Neurobiological Basis of Emotional Memory Retrieval in Violent Game Addiction**

Can Soylu, Dicle Capan, Metehan Irak

### **P170 - Nonconscious Emotion Influences on Decision Making: Disentangling the Effects of Arousal and Valence**

Isabel B. Fonseca, Margarida Cipriano, Ana Marques, Miguel Baiao

### **P171 - On the Temporal Characteristics of Retro-Cue Induced Visuo-Spatial Working Memory Updating: Evidence by Event-Related Parameters of the EEG**

Daniel Schneider, Christine Mertes, Edmund Wascher

### **P172 - Orienting Toward Fearful Eyes Involves the Fronto-Parietal Network of Attention**

Nathalie George, Nicolas Burra

### **P173 - Parents' Influence on the Sexual Processing**

Sofia Rocha, Sofia Scigliano, Ana Carolina Oliveira, Eugénia Fernandes, Patrícia Oliveira-Silva

### **P174 - Passionate Love and Differences in OXTR Polymorphism Influence the Ability to Discriminate between Self- and Other-Referenced Emotions**

Friedrich Meixner, Cornelia Herbert

### **P175 - Patterns of Brain and Cardiac Activity during Solving Rule Discovery and Rule Application Tasks**

Malgorzata Wordecha, Andrzej Rynkiewicz, Tomasz Oleksy, Anna Kępkowicz, Adrianna Majewska, Aleksandra Pstragowska, Marek Wypych, Artur Marchewka, Tytus Sosnowski

### **P176 - Perceived Quality of Life Is Modulated by Negative Affect, Depression and Anxiety, in Patients with a Diagnosis of Drug-Resistant Epilepsy**

Irene Cano, Vicente Enrique Villanueva, Mercedes Garcés, Esperanza González-Bono

### **P178 - Person Memory Codes in Ventral MPFC: Knowledge Representations?**

Elien Heleven, Frank Van Overwalle

### **P179 - Personal and Irresistible: Preliminary Data on the Peripheral Physiological Correlates of Preferred Food Cues Processing in Healthy Women**

Rafael Delgado, Laura Miccoli, Carmen Gervilla, María Lozano, Sandra Herrera, Pedro Guerra, Francesco Versace, Vera Ferrari, Laura Krutman, Sonia Rodríguez-Ruiz, Jaime Vila, M.Carmen Fernández-Santaella

### **P180 - Personal Relevance Increases Pupillary Responses and Emotion Effects in Event-Related Potentials**

Mareike Bayer, Katja Ruthmann, Annekathrin Schacht

### **P181 - Personality Determinants of Social Cognition: Introducing a Person-Centred Approach to Social Neuroscience Research**

Kristína Czekóová, Daniel J. Shaw, Beáta Špiláková

### **P182 - Physiological Synchrony in Electrodermal Activity during a Couple's Interaction Task**

Joana Coutinho, Patrícia Oliveira-Silva, Diogo Correia, Wolfgang Tschacher

### **P183 - Placebo Empathy Analgesia: An Indirect Effect of Trial Design?**

Jessie Adriaense

### **P184 - Playing Violent Video Games and Its Relation with Working Memory: An Event-Related Brain Potential Study**

Metehan Irak, Can Soylu, Dicle Capan

### **P185 - Predictors of Infant Positive, Negative and Self-Direct Coping during Still-Face**

Marina Fuentes, Pedro Lopes dos Santos, Joana Lopes, Edward Tronick, Marjorie Beeghly

### **P186 - Processing of Internal and External Signals in Response Speed Evaluation**

Christian Valt, Birgit Stürmer

### **P187 - Psychopathy and Non-Linear Processing of Facial Expressions of Emotion**

Mariana R. Pereira, Tiago O. Paiva, Pedro R. Almeida, Fernando Ferreira-Santos, João Marques-Teixeira, Fernando Barbosa

### **P188 - Psychosocial Stress Effects on Hormonal Response and Cognitive Function in Subjects with Higher and Lower Psychopathy Scores: The Role of Sex**

Laura Espin López, Jesús Gómez-Amor, Alicia Salvador, João Marques-Teixeira, F. Barbosa

### **P189 - Pupil Mimicry-Trust Linkage Is Modulated by Oxytocin**

Mariska Kret

### **P190 - Pupillary and Electrophysiological Correlates of Inhibitory Control and Cognitive Effort in Anxiety**

Piril Hepsomali, Simon P. Liversedge, Julie A. Hadwin, Federica Degno, Matthew Garner

### **P191 - Putting Action in Context: Facilitatory and Inhibitory (In)Congruency Effects on Motor Resonance**

Lucia Amoroso

### **P195 - Reading More Than One Mental State**

Ceylan Ozdem, Frank Van Overwalle

### **P196 - Reduced Delta and Theta Oscillations in Young Binge Drinkers during a Go/Nogo Task**

López-Caneda, E. Correias, A. Carbia, C. González-Villar, A. Rodríguez Holguín, S. Maestú, F. Cadaveira, F

### **P197 - Reliability and Validity of the Composite Scale on Morningness - European Portuguese Version, in Adolescents and Young Adults**

Ana A. Gomes, Vanessa Costa, Diana Couto, Daniel Ruivo Marques, José Augusto Leitão, José Tavares, Maria Helena Azevedo, Carlos Fernandes da Silva

### **P198 - Reversed Laterality of Occipito-Temporal ERPs to Faces Vs Hands**

Miguel Granja Espirito Santo, Octavian Maxim, Martin Schürmann

### **P200 - Reward and Loss Related Time Distortions in the Temporal Bisection Task**

Richard Naar, Maria Tamm, Kairi Kreegipuu, James Gross, Andero Uusberg

### **P201 - Reward Expectancy Modulates Primary Motor Cortex Excitability during Task Preparation**

Carsten Bundt, Elger Abrahamse, Senne Braem, Marcel Brass, Wim Notebaert

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Paolo Garlasco, Corrado Corradi-dell'Acqua, Francesco Foroni, Raffaella I. Rumiati

### **P203 - Role of the Subgenual Anterior Cingulate and Anterior Insula Cortices in Social Exclusion in Relation to Depression**

Anna Fall, Philippe Fossati, Philippe Ravassard, Rolando Meloni, Jean-Yves Rotge

### **P204 - Selective Attention to Emotional Words: Parallel and Interactive Effects in Visual Cortex**

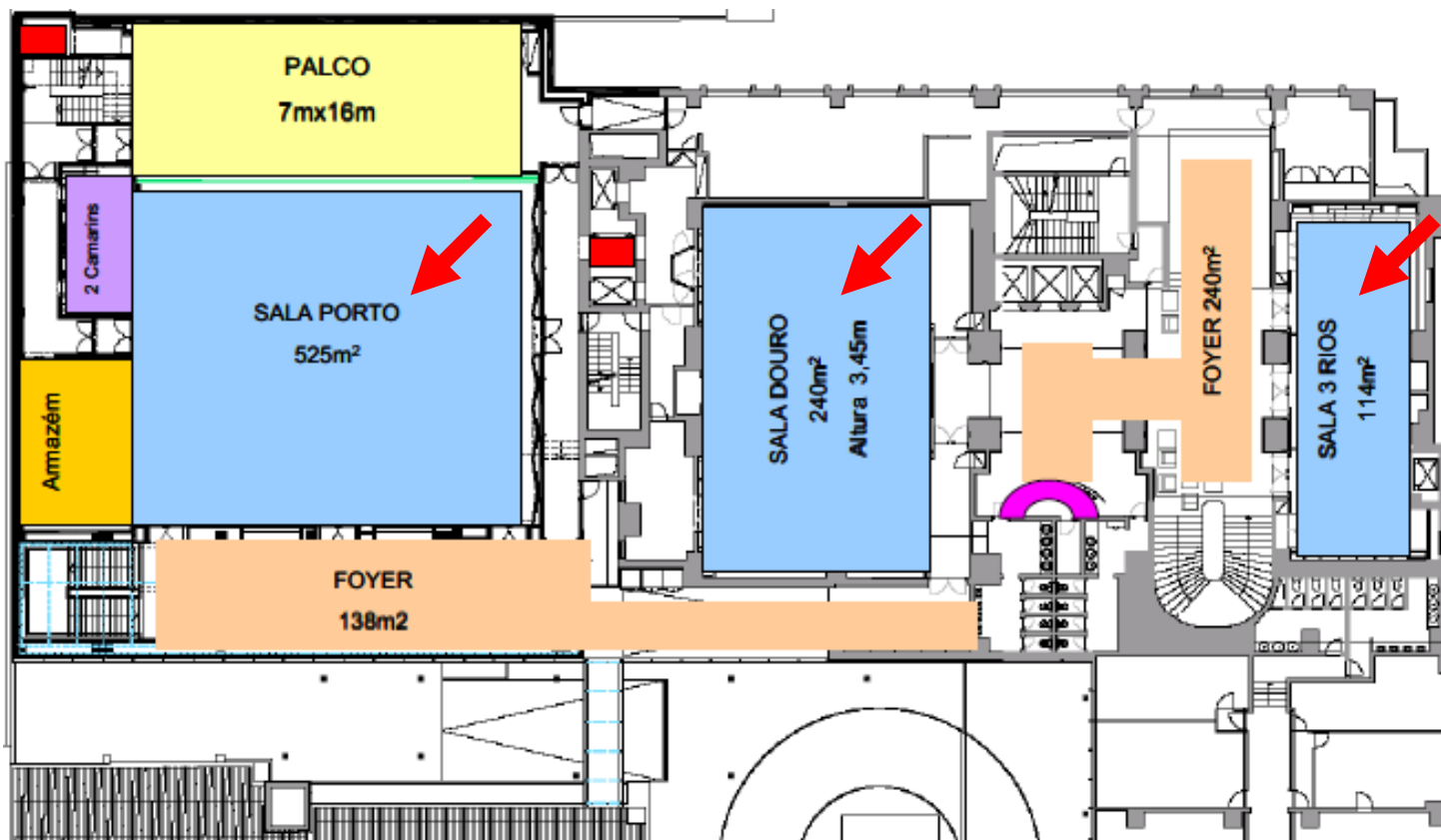
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Christin Scholz, Elisa C. Baek, Matthew B. O'Donnell, Hyun Suk Kim, Joseph N. Cappella
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Daniel J. Shaw, Kristina Czekóová, Petr Klimeš, Jan Chládek, Robert Roman, Milan Brázdil
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- P272 - White Matter Integrity in Anxiety-Relevant Brain Networks**  
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- P273 - You Make Me Lose It! Diffusion of Responsibility & Sense of Agency**  
Frederike Beyer, Nura Sidarus, Sofia Bonicalzi, Patrick Haggard
- P274 - You Use the Right for "Nothing" in Number Transcoding**  
Silvia Benavides-Varela, Laura Passarini, Brian Butterworth, Giuseppe Rolma, Francesca Burgio, Marco Pitteri, Francesca Meneghella, Tim Shallice, Carlo Semenza

## Program overview

Thu. 23	Fri. 24	Sat. 25	Sun. 26
	8:30-9:15 Registration		
9:00-16:00 Pre-conference workshop(s) @FPCEUP	9:15-9:30 Opening		9:00-10:00 Keynote lecture: Prof. José Morais (ULB, Belgium)
	9:30-10:30 Keynote lecture: Prof. Ray Dolan (UCL, UK)	9:30-10:30 Keynote lecture: Prof. Roberto Zatorre (MNI, Canada)	
	10:30-11:00 Coffee break	10:30-11:00 Coffee break	10:00-10:30 Coffee break
	11:00-12:30 Symposia session 1	11:00-12:30 Symposia session 4	10:30-11:45 Symposia session 7
	12:30-13:30 Lunch	12:30-13:30 Lunch	11:45-13:00 Symposia session 8
	13:30-14:30 Posters 1	13:30-14:30 Posters 2	13:00-13:15 Closing
	14:30-16:00 Symposia session 2	14:30-16:00 Symposia session 5	
	16:00-16:45 Meeting @FPCEUP	16:00-16:30 Coffee break	16:00-16:30 Coffee break
	16:30-18:00 Symposia session 3	16:30-18:00 Symposia session 6	
17:00-18:15 Welcome reception @Câmara Municipal (City Hall)	18:00-19:00 ESCAN young researcher award lecture	18:00-19:00 ESCAN general assembly	
		20:00-(...) Conference dinner	

## Conference venue floor plan



PORTO PALÁCIO HOTEL - CENTRO DE CONGRESSOS - PLANTA DO PISO 1



escan

3rd conference

june 23–26, 2016, Porto

Abstract Book

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## Welcome message

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Dear participants,

On behalf of the organizing committee of the 3<sup>rd</sup> international conference of the European Society for Cognitive and Affective Neuroscience (ESCAN), it gives us great pleasure to welcome you to Porto.

It is our belief that the proposals selected by Scientific Committee allowed us to offer an excellent scientific programme, with a variety of hot topics, and we are also pleased to have an impressive group of internationally renowned and highly respected keynote speakers.

In addition to the excellent scientific programme, a host of networking opportunities has also been planned for you to discuss current issues with European and world leading researchers.

In fact, more than 300 hundred participants from 28 countries may benefit from a programme offering three keynote lectures, 24 symposia with 90 exciting talks, and 250+ poster presentations.

Another novelty of this 3<sup>rd</sup> conference is the attribution of the ESCAN Young Scientist Award. This award, provided by the ESCAN Board, honours the early achievements of scientists working in the area of Cognitive and Affective Neuroscience and is meant to encourage their further ascendance: congratulations to Dr. Matthew Apps, the recipient of the award, who will present a lecture on his ground-breaking research.

For the reasons above, this conference will surely provide a superb environment for the exchange of scientific knowledge on the latest developments and emerging challenges of the Cognitive and Affective Neurosciences.


Aside from the scientific activities, the city of Porto, an "outstanding urban landscape with a 2,000-year history" (UNESCO), also welcomes you and has much to offer. If you have the opportunity, you will certainly enjoy from a dynamic city with a fascinating blend of tradition – its Historic Centre is a world heritage site – and contemporary way of life.

We wish you a memorable stay in Porto and a very fruitful ESCAN 2016 conference.

The chairs of the organizing committee,



Fernando Barbosa



Fernando Ferreira-Santos

## Information

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### Conference Venue

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← Conference venue

[Porto Palácio Congress & Spa Hotel](#),  
Av. Boavista, 1269, 4100-130 Porto  
(Map: <https://goo.gl/maps/KDq62QLFAqF2>)



Welcome reception →

Câmara Municipal do Porto (City Hall)  
Praça General Humberto Delgado, 4049 - 001 Porto  
(Map: <https://goo.gl/maps/48EaJeE5iNF2>)

### Conference Dinner

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At a walking distance from the conference venue stands the iconic [Casa da Música](#) (literal translation, Home of Music), designed by architect Rem Koolhaas for Porto 2001: European Capital of Culture. Our conference dinner will take place at the top floor of the building, in the award-winning Restaurante Casa da Música

Restaurante Casa da Música, Av. da Boavista, 604-610,  
4149-071 Porto (Map: <https://goo.gl/maps/Q3eYL7fwdgK2>)



### ESCAN 2016 at OSF for Meetings

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We have liaised with the Open Science Framework (<https://osf.io>) to increase the impact of our conference and allow participants to share their work online in the OSF for Meetings platform (<https://osf.io/meetings/>), where your work will automatically receive a citable persistent URL. This service is kindly provided for free by the Center for Open Science (<https://cos.io>) and allows uploading your poster/talk materials, abstract, and additional files to the OSF ESCAN 2016 page.

It is possible to upload your work before, during, and after the conference. Make your science Open: <https://osf.io/view/escan2016/>





## Program overview

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		13:30-14:30 Posters 1	13:30-14:30 Posters 2
	14:30-16:00 Symposia session 2	14:30-16:00 Symposia session 5	
16:00-16:45 Registration and meeting @FPCEUP	16:00-16:30 Coffee break	16:00-16:30 Coffee break	
	16:30-18:00 Symposia session 3	16:30-18:00 Symposia session 6	
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		20:00-(...) Conference dinner	

## Thursday, 23 June 2016

9:00-16:00 Pre-conference workshop(s) @FPCEUP
16:00-16:45 Registration and meeting @FPCEUP
17:00-18:15 Welcome reception @City Hall

8:30-9:15 <b>Registration</b>		
9:15-9:30 <b>Opening</b>		
9:30-10:30 <b>Keynote lecture: Prof. Ray Dolan (UCL, UK) (Porto room)</b> <b>A Neuroscience Perspective on Interpersonal Interactions</b>		
10:30-11:00 <i>Coffee break</i>		
11:00-12:30 <b>Symposia session 1</b>		
<p><b>Symposium (Porto room)</b> Movement Preparation, Timing, Spontaneous Fluctuations, Free Will: What is the Bereitschaftspotential? <b>Chair(s):</b> Rolf Verleger (Germany)</p> <p>The SMA and cingulate cortex sustain premovement activity in readiness for action: An EEG-fMRI study - Ross Cunnington, Vinh Nguyen, Michael Breakspear</p> <p>First-person approaches in the Libet-task: Conscious intention and its neural substrates - Han-Gue Jo, Thilo Hinterberger, Marc Wittmann, Stefan Schmidt</p> <p>Neural precursors of decisions that matter – an ERP study of the role of consciousness in deliberate and random choices - Liad Mudrik, Uri Maoz, Ram Rivlin, Gideon Yaffe, Ralph Adolphs, Christoph Koch</p> <p>Time to move again? The BP as indicator of an internal clock - Rolf Verleger, Mechthild Haake, Kamila Śmigajewicz</p> <p>Neuroontology of the BP: paradigm and distributional analyses comparing precursors of endogenous and instructed movement - Patrick Haggard, Nima Khalighinejad, Andrea Desanti, Aaron Schurger</p>	<p><b>Symposium (Douro Norte room)</b> Attentional Bias, Attentional Control and Emotional Vulnerability: Understanding Causal Mechanisms in Health and Mental Well-Being <b>Chair(s):</b> Tatjana Aue (Switzerland), Hadas Okon-Singer, (Israel)</p> <p>State anxiety creates attention-like modulations of early sensory processing in V1 - Gilles Pourtois</p> <p>Tuning Down the Hedonic Brain: Working Memory Load Reduces Neural Responses to Food Rewards - Lotte F. van Dillen</p> <p>Training attentional control to reduce anxiety and depressive vulnerability - Nazanin Derakshan</p> <p>The interplay of expectancies and attention in the processing of threat: (Lack of) evidence from behavior, fMRI, and autonomic nervous system activity - Tatjana Aue</p> <p>Attention Bias in Anxiety and Depression: Discussing Differences and Similarities - Hadas Okon-Singer</p>	<p><b>Symposium (Douro Sul room)</b> Detection of Social Signals and its Immediate Impact on Social Cognition <b>Chair(s):</b> Atsushi Senju (UK)</p> <p>Top-down and bottom-up interaction in attentional capture by threatening stimuli - Nicolas Burra</p> <p>Privileged orienting to direct gaze and its reliance on low spatial frequency information - Inês Mares, Marie L. Smith, Mark H. Johnson, Miguel Leal-Rato Isabel Pavão Martins, Atsushi Senju</p> <p>How does eye contact enhance bodily self-awareness? - Matias Baltazar, Julie Grèzes, Jean-Luc Picq, Laurence Conty</p> <p>Social attention enhances bodily self-awareness - Nesrine Hazem, Laurence Conty, Morgan Beaurenaut, Matias Baltazar, Nathalie George</p> <p>Social orienting in gaze leading: A mechanism for shared attention - S. Gareth Edwards, Lisa J. Stephenson, Mario Dalmaso, Andrew P. Bayliss</p>
12:30-13:30 <i>Lunch</i>		
13:30-14:30 <b>Poster session 1 (3 Rios room)</b>		
14:30-16:00 <b>Symposia session 2</b>		
<p><b>Symposium (Porto room)</b> How Emotions Drive Attention and Decision Making <b>Chair(s):</b> Henk van Steenbergen (Netherlands)</p> <p>The interplay between value and confidence in decision making - Mathias Pessiglione, Alizée Lopez, Emmanuelle Bioud, Raphaëlle Abitbol, Maël Lebreton</p>	<p><b>Symposium (Douro Norte room)</b> Using ERPs: From Research on Healthy Populations to Clinical Applications <b>Chair(s):</b> Salvatore Campanella (Belgium), Henrique Sequeira (France)</p> <p>A developmental perspective on emotion processing from body expressions and the voice - Peiwen Yeh, Elena Geangu, Vincent Reid</p>	<p><b>Symposium (Douro Sul room)</b> Close Human Relationships: From Infancy to Adulthood <b>Chair(s):</b> Lara Maister (UK)</p> <p>In Deference to the Other: A Working Model of Differential Neural Processing for Close and Familiar Others - Ryan Murray</p> <p>The Relational Body: Shared body representations between romantic</p>

<p>Social influences in human decision-making - Jan Gläscher, Lei Zhang</p> <p>Anticipating losses in a monetary incentive task increases the selectivity of encoding - D. Clewett, R. Huang, R. Velasco, T. H. Lee, M. Mather</p> <p>The neural encoding of outcomes and its role in action control - Henk van Steenbergen</p> <p>The role of outcome anticipation and evaluation in cue-elicited behaviour - Sanne de Wit</p>	<p>Emotional vision: data from ERPs studies - Henrique Sequeira, Jacques Honoré</p> <p>Event-Related-Potentials to Emotional Stimuli in Children with Externalizing and Internalizing Psychopathology - Georgia Chronaki, Graeme Fairchild, Nicholas Benikos, Samantha Broyd, Matthew Garner, Margaret Thompson, Julie Hadwin, Edmund J.S. Sonuga-Barke</p> <p>Emotional automatic deviance-detection in Autism spectrum Disorder - Marie Gomot</p> <p>The P300 and the NoGo-P300 event-related potentials: biological markers of abstinence vs. relapse in alcohol dependence? - Salvatore Campanella, Elisa Schroder, Catherine Hanak, Charles Kornreich, Paul Verbanck</p>	<p>partners - Lara Maister, Manos Tsakiris</p> <p>Dopamine mediates human maternal bonding. A behavioral PET-fMRI study - Shir Atzil, Ciprian Catana, Ruth Feldman, Jacob Hokker, Lisa Feldman Barrett</p> <p>Hormonal and personality correlates of women's responses to infant facial cues - Amanda Hahn, Lisa DeBruine, Dave Perrett, Benedict Jones</p>
<p>16:00-16:30 <i>Coffee break</i></p>		
<p>16:30-18:00 <b>Symposia session 3</b></p>		
<p><b>Symposium (Porto room)</b> Affective Modulation of Perception and Attention, and the Potential Embedded Contribution of Action Processes <b>Chair(s):</b> Julie Grèzes, Stéphanie Dubal (France)</p> <p>How emotional arousal contributes to visual perception - Stéphanie Dubal, Kenneth Knoblauch, Mariam Chammat</p> <p>Emotional arousal increases the gain on neural representations - Mara Mather, Tae-Ho Lee, Steven Greening, Allison Ponzio, David Clewett</p> <p>Effects of threatening facial expressions on attention and action-related decisions within realistic social context - Julie Grèzes, Marwa El Zein, Emma Vilarem.</p> <p>The Influence of Threat on the Oculomotor System - Manon Mulckhuysse</p>	<p><b>Symposium (Douro Norte room)</b> Electroencephalographic Advancements in the Study of Pain and of its Cognitive and Affective Modulations <b>Chair(s):</b> Elia Valentini (UK)</p> <p>Does sustained pain induce crossmodal central sensitization? – D.M. Torta, E. N. Van den Broeke, L. Filbrich, J. Lambert, V. Legrain, A. Mouraux</p> <p>Impact of reminders of death on pain and sensory representation as measured by electroencephalographic activity in healthy individuals - Elia Valentini, Katharina Koch, Valentina Nicolardi</p> <p>Inter- and intraindividual variability of pain perception - Enrico Schulz</p> <p>Common opioidergic modulation of first-hand experience and empathy for pain: neural evidence from event-related potentials - M. Rütgen, E.-M. Seidel, A. Gartus, I. Rieckens, C. Lamm</p>	<p><b>Symposium (Douro Sul room)</b> Eye-to-Eye Social Cognition: A Theme and Variations <b>Chair(s):</b> Jari Hietanen (Finland)</p> <p>Effect of early social experience on the development of eye gaze processing in infants of blind parents - Atsushi Senju</p> <p>Eye contact does not feel the same for everyone: the effects of personality and social anxiety - Jari K. Hietanen</p> <p>Using Live Face-to-Face fMRI to Investigate the Social Brain in Autism - Laura A. Harrison, J. Michael Tyszka, Jed Elison, Ralph Adolphs</p> <p>From face to hand: attentional bias towards expressive hands in social anxiety - Mariska E. Kret, Jeroen J. Stekelenburg, Beatrice de Gelder, Karin Roelofs</p>
<p>18:00-19:00 <b>ESCAN young researcher award talk: Matthew Apps (U. Oxford, UK) (Porto room)</b> <b>Neurocomputational basis of social signals in the anterior cingulate cortex</b></p>		

<p>9:30-10:30 <b>Keynote lecture: Prof. Roberto Zatorre (MNI, Canada) (Porto room)</b>  <b>From Perception to Pleasure: Music and its Neural Substrates</b></p>		
<p>10:30-11:00 <i>Coffee break</i></p>		
<p>11:00-12:30 <b>Symposia session 4</b></p>		
<p><b>Symposium (Porto room)</b>                  Non Invasive Brain Stimulation Induces Transient Changes in Neural Activity and Behaviour: Evidence Across Three Stimulation Methods  <b>Chair(s):</b> Maimu Rehbein, Markus Junghöfer (Germany)</p> <p>Non-invasive brain stimulation in psychiatry - Andreas J. Fallgatter, Thomas Dresler, Ann-Christine Ehlis, Christian Plewnia</p> <p>Shifting emotion regulation – opposite effects of inhibitory and excitatory prefrontal cortex stimulation - Markus Junghöfer, Swantje Notzon, Christian Steinberg, Peter Zwanzger</p> <p>Noninvasive stimulation of the medial prefrontal cortex enhances pleasant scene processing - Constantin Winker, Dean Sabatinelli, Maimu Rehbein, Markus Junghöfer</p> <p>Effects of focal transcranial static magnetic fields over the brain in humans - Antonio Oliviero, Laura Mordillo-Mateos, Vanesa Soto-León</p> <p>The use of transcranial static magnetic field stimulation (tsms) for inducing transient changes in neural activity and behavior - Javier J. González-Rosa, Pablo Ortega San Miguel, Carlos Nieto-Doval, Clara Suárez, Bryan A. Strange</p>	<p><b>Symposium (Douro Norte room)</b>                  How are Emotions and the Self Related? Evidence from Affective, Cognitive, Behavioral and Clinical Neuroscience  <b>Chair(s):</b> Cornelia Herbert (Germany), Georg Northoff (Canada)</p> <p>The look inside: Processing and evaluation of self-related emotional stimuli in healthy participants, persons in love and patients with affective and psychotic disorders - Cornelia Herbert</p> <p>FMRI investigations of bodily self-awareness in non-psychiatric, alexithymic and depressed individuals – support for a relationship between emotions and the self - Christine Wiebking</p> <p>Perspective of the Self in Laughter Perception - Dirk Wildgruber</p> <p>Face-to-face: Implicit variation of personal relevance in face perception - Florian Bublatzky</p> <p>It's all in your head: how putative sender identity modulates the processing of self-related emotional statements - Johanna Kissler</p>	<p><b>Symposium (Douro Sul room)</b>                  Brain and Heart Responses to Cognitive and Social Feedback Processing  <b>Chair(s):</b> Gilles Pourtois (Belgium), Maurits van der Molen (Netherlands)</p> <p>Beyond effects of valence and expectancy during performance monitoring: amplitude modulations of the FRN by goal relevance - Gilles Pourtois</p> <p>Funny Kittens: Influence of affective stimuli on performance monitoring - Roland Nigbur, Markus Ullsperger</p> <p>Social evaluative feedback processing in the brain: Electrocortical sensitivity to unexpected peer rejection - Melle J. W. van der Molen, Laura M. S. Dekkers, Michiel P. Westenberg, Ferdinand M. van der Veen, Maurits W. van der Molen</p> <p>Social anxiety is characterized by negatively biased learning about performance and the self - Leonie Koban, Rebecca Schneider, Yoni K. Ashar, Jessica R. Andrews-Hanna, Lauren Landy, David A. Moscovitch, Tor D. Wager, Joanna J. Arch</p> <p>The heart responds to cognitive and social feedback - Maurits van der Molen, Riek Somsen, Eveline Crone, Bregtje Gunther Moor</p>
<p>12:30-13:30 <i>Lunch</i></p>		
<p>13:30-14:30 <b>Poster session 2 (3 Rios room)</b></p>		
<p>14:30-16:00 <b>Symposia session 5</b></p>		
<p><b>Symposium (Porto room)</b>                  Interoceptive Mechanisms in Cognitive Neuroscience: Embodied Emotion and Social Cognition  <b>Chair(s):</b> Ruben Azevedo, Sarah Garfinkel (UK)</p> <p>Meta-Analysis of BOLD fMRI Correlates of Interoception - Stefan M. Schulz</p>	<p><b>Symposium (Douro Norte room)</b>                  How Expectations and Learning Shape the Experience of Aversive Stimuli: From Behavior to Brain Mechanisms  <b>Chair(s):</b> Marieke Jepma (Netherlands), Leonie Koban, Stephan Geuter (USA)</p>	<p><b>Symposium (Douro Sul room)</b>                  Social Cognition and Affective Neuroscience from a Female Perspective: the Impact of Sex Hormones  <b>Chair(s):</b> Belinda Pletzer (Austria), Birgit Dertfl (Germany)</p> <p>The influence of menstrual cycle and androstadienone on female stress reactions - Dixon Chung, Felix</p>

<p>Racial bias in a heartbeat: cardiac afferent activity modulates the expression of racial stereotypes - Ruben T. Azevedo, Sarah Garfinkel, Hugo D. Critchley, Manos Tsakiris</p> <p>Neural responses to heartbeats in the default network encode the self in spontaneous thoughts - Mariana Babo-Rebello, Craig G. Richter, Catherine Tallon-Baudry</p> <p>Altered dimensions of interoception in Autism and Schizophrenia - Sarah N. Garfinkel, Geoff Davies, Charlotte L. Rae, Anil K. Seth, Kathryn Greenwood, Hugo D. Critchley</p> <p>Cognitive evaluation of interoceptive information and negative health outcomes - Stefan Sütterlin, Ricardo G. Lugo, Sven C. Mueller, Stefan M. Schulz, Raymonde Scheuren.</p>	<p>Learned pain cues bias somatosensory processing at the threatened body location - Stefaan Van Damme, Amanda Clauwaert, Charlotte Vanden Bulcke, Geert Crombez</p> <p>The appetitive side of pain and its learning effect - Marta Andreatta</p> <p>Self-reinforcing expectancy effects on pain: contributions of descending pain modulation and biased learning - Marieke Jepma</p> <p>Separate brain mediators of social influence and conditioned cue effects on pain - Leonie Koban, Tor D. Wager</p> <p>From Intensity Coding to Predictive Coding in Pain Processing - Stephan Geuter, Sabrina Boll, Falk Eippert, Christian Büchel</p>	<p>Peisen, Lydia Kogler, Sina Radke, Bruce I Turetsky, Jessica Freiherr, Birgit Derntl</p> <p>Hormonal contraceptives alter the brain structural correlates of face processing - Belinda Pletzer</p> <p>Hormonal contraceptive influence on emotion processing - Inger Sundström Poromaa</p> <p>Changes in emotional conflict processing &amp; stress across the menstrual cycle - Julia Sacher</p>
<p>16:00-16:30 <i>Coffee break</i></p>		
<p>16:30-18:00 <b>Symposia session 6</b></p>		
<p><b>Symposium (Porto room)</b> Avoidance and Reversal of Conditioned Fear: Processes and Paradoxes <b>Chair(s):</b> Paul Pauli (Germany), Johanna Baas (Netherlands)</p> <p>Avoidance behavior in humans is resistant to extinction and triggers return of fear - Johanna Baas</p> <p>Learning processes underlying avoidance of negative outcomes - Marta Andreatta</p> <p>Impaired use of vmPFC safety signaling in Obsessive Compulsive Disorder disrupts flexible responding to threat - Annemiek Apergis-Schoute</p> <p>Limited generalization effects of exposure-based therapy on avoidance behavior in patients with panic disorder and agoraphobia - Jan Richter, Alfons Hamm</p>	<p><b>Symposium (Douro Norte room)</b> Bad Brains: Prejudice, Immorality, and Other Nefarious Behaviours <b>Chair(s):</b> Lasana T. Harris (UK/Netherlands)</p> <p>The impact of minimal group membership on the processing of others' emotional signals - Julie Grèzes</p> <p>Brain substrates of biased fear learning and social interaction in an intergroup context - Tanaz Molapour, Armita Golkar, Carlos David Navarrete, Jan Haaker, Andreas Olsson</p> <p>Dehumanised Perception: How the Social Context Promotes Inhumane Behaviour - Lasana T. Harris</p>	<p><b>Symposium (Douro Sul room)</b> New Evidence on the Role of the Cerebellum in Social Cognition <b>Chair(s):</b> Frank Van Overwalle (Belgium)</p> <p>Is the cerebellum involved in social cognition? Novel meta-analytic and multi-study connectivity findings - Frank Van Overwalle, Peter Mariën</p> <p>The cerebellum is involved in sequences processing and prediction: a TMS study – C. Ferrari, L. Casiraghi, V. Oldrati S. Bergonzoli, Z. Cattaneo, T. Vecchi</p> <p>Emotion and Theory of Mind in Schizophrenia: Investigating the Role of the Cerebellum - Gary Donohoe, Omar Mothersill</p> <p>Cerebellar functional connectivity and social behavior in patients with Autism Spectrum Disorders - Giusy Olivito, Maria Leggio</p>
<p>18:00-19:00 <b>ESCAN general assembly</b> (Porto room)</p>		
<p>20:00-(...) <i>Conference dinner</i></p>		

<p>9:00-10:00 <b>Keynote lecture: Prof. José Morais (ULB, Belgium) (Porto room)</b>  <b>Literacy in context</b></p>		
<p>10:00-10:30 <i>Coffee break</i></p>		
<p>10:30-11:45 <b>Symposia session 7</b></p>		
<p><b>Symposium (Porto room)</b>          Novel Perspectives in Social Cognitive Neuroscience  <b>Chair(s):</b> Claus Lamm (Austria)</p> <p>Toward a second-person neuroscience: New developments in social neuroscience and implications for the transdiagnostic study of the neurobiology of psychiatric disorders - Leonhard Schilbach</p> <p>The phenomenon of placebo empathy analgesia: multimethod evidence for shared representations between first-hand experience and empathy for pain - Markus Rütgen</p> <p>Understanding Self-Other Processes in Social Cognition from behavioural and non-invasive brain stimulation studies - Idalmis Santiesteban</p> <p>When affect sharing and self-other distinction fail: understanding emotional egocentricity bias from a clinical and developmental perspective - Giorgia Silani</p>	<p><b>Symposium (Douro Norte room)</b>          Neurobiological Underpinnings of Freeze-Fight-Flight Behaviour in Humans  <b>Chair(s):</b> Karin Roelofs, Mahur M. Hashemi (Netherlands)</p> <p>Dynamics of defensive behaviour during freezing and active avoidance - Alfons O. Hamm</p> <p>Contextual control over conditioned defensive responses: convergence of body immobility and fear-potentiated startle - Vanessa A. van Ast</p> <p>Hyperpotentiation of Defensive Neurophysiological Reflexes to Imminent Threat after Basolateral Amygdala Damage in Humans - David Terburg</p> <p>Neural mechanisms controlling defensive actions during acute threat - M. M. Hashemi</p>	<p><b>Symposium (Douro Sul room)</b>          The Neuroaesthetics of People  <b>Chair(s):</b> Beatriz Calvo-Merino, Guido Orgs (UK)</p> <p>The Emotional Homunculus: Evidence for Somatotopic Empathy - Alejandra Sel, Manos Tsakiris, Bettina Forster, Beatriz Calvo-Merino</p> <p>The shaping of aesthetic preferences by experience - Louise P. Kirsch, Emily S. Cross</p> <p>Reshaping the body aesthetics brain: behavioral and transcranial magnetic stimulation studies of body exposure effects in healthy individuals and patients with Anorexia Nervosa - Cosimo Urgesi</p> <p>Joint action aesthetics - Guido Orgs, Staci Vicary</p>
<p>11:45-13:00 <b>Symposia session 8</b></p>		
<p><b>Symposium (Porto room)</b>          Neural and Cognitive Mechanisms of Human Social Interactions  <b>Chair(s):</b> Antonia Hamilton (UK)</p> <p>Neural Mechanisms of Intersubjectivity - Kai Vogeley</p> <p>Neural and social processes in the imitation of hand action trajectories - Paul Forbes, Dom Oliver, Antonia Hamilton</p> <p>Differential role of spatial attention on motor resonance and complementary actions - Sonia Betti, Umberto Castiello, Luisa Sartori</p> <p>Causal contribution of the parietal lobe in human-avatar and human-human (interpersonal) motor interactions - Matteo Candidi, Lucia Maria Sacheli, Vanessa Era, Loredana Canzano, Gaetano Tieri, Marco Gandolfo, Salvatore Maria Aglioti</p>	<p><b>Symposium (Douro Norte room)</b>          On the Emotional Melody of the Voice: A Multi-Method Approach  <b>Chair(s):</b> Ana P. Pinheiro (Portugal), Sonja A. Kotz (UK/Germany)</p> <p>Brain signatures of encoding vocal emotions - Sonja A. Kotz</p> <p>Continuous vs. discrete cerebral representations of vocal emotions - Pascal Belin</p> <p>Emotional Prosody Perception in Healthy Ageing – Evidence from ERPs and recognition rates - Silke Paulmann</p> <p>Prediction of emotion in the vocal brain - Ana P. Pinheiro</p>	<p><b>Symposium (Douro Sul room)</b>          Response Inhibition: Neural Mechanisms of Motor Suppression and Adjustment  <b>Chair(s):</b> Leon Kenemans (Netherlands)</p> <p>Inhibition after errors: the role of a neural mechanism for global motor suppression - Jan R. Wessel</p> <p>Distinct neural pathways underlying response inhibition revealed by fMRI - Leah Maizey, Chris Allen, C. John Evans, Nils Muhlert, Frederick Verbruggen, Christopher D. Chambers</p> <p>The role of attention in proactive response inhibition - Zachary Langford, C. Nico Boehler</p> <p>Frontal P3 as a generic inhibition mechanism - J. Leon Kenemans, Ivo Heitland</p>
<p>13:00-13:15 <b>Best Student Abstract and Posters Awards and Closing (Porto room)</b></p>		



Professor Ray J. Dolan (University College London, UK)

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*Title:*

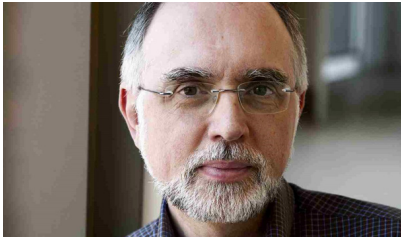
### **A Neuroscience Perspective on Interpersonal Interactions**

*Abstract:*

A governing factor in human social interactions is how we value others. This question has been addressed from a number of perspectives, and here I will present recent data that shows human subjects have an hyperaltruistic disposition towards others. Furthermore, I will show that an altruistic disposition towards others can be predicted by emotional responses to inequity. I will then consider how we learn to make value-based choices for others, and how well these choices reflect the inferred values of others. It turns out that making value based decisions on behalf of another person has a subtle, but quantifiable, impact on our own values. This behavioural effect can be indexed in a plastic effect within the brain's valuation system. I will consider examples that illustrate how these approaches might provide a framework for the development of computational-based assays of social emotions, such as guilt and envy, and common psychopathological dispositions. These in turn can be exploited to probe underlying neurobiological mechanisms and possible help foster a new approach to psychopathology

*Biographical sketch:*

Ray Dolan is Mary Kinross Professor of Neuropsychiatry and Director of the Wellcome Trust Centre for Neuroimaging, at UCL. His research addresses the neurobiology of emotion and decision making, how emotion impacts on cognition and its aberrant expression in disease. He has published over 500 peer reviewed papers is among the most cited scientist in the world in the field of Neuroscience and Behaviour. He has received numerous awards including the Alexander Von Humboldt Research Award (2004), the Minerva Foundation Golden Brain Award (2006), the International Max Planck Research Award (2007) and the Zülch Prize (2013). Between 2010-2014 he has been Visiting Einstein Fellow to the Humboldt University, Berlin. He was elected Fellow of the Academy of Medical Sciences (FMedSci) in 2000, Fellow of the Royal Society (FRS) in 2010 and an External Member of the Max Planck Society (MPS) in 2012. He recently established the first Centre for Computational Psychiatry at UCL, a joint venture with the Max Planck Society (MPS).



*Title:*

**From Perception to Pleasure: Music and its Neural Substrates**

*Keynote kindly sponsored by the ESCAN Board*

*Abstract:*

Music has existed in human societies since prehistory, perhaps in part because it allows expression and regulation of emotion, and evokes pleasure. In this lecture I will present findings from cognitive neuroscience that bear on the question of how we get from perception of sound patterns to pleasurable responses. Specifically I will discuss evidence from our lab concerning the striatal dopaminergic reward system, and its involvement in musical pleasure. I propose that pleasure in music arises from interactions between cortical loops that enable predictions and expectancies to emerge from sound patterns, and subcortical systems responsible for reward and valuation. This model integrates knowledge derived from basic neuroscience of reward mechanisms with independently derived concepts, such as tension and anticipation, from music theory. It may also serve as a way of thinking more broadly about aesthetic rewards.

*Biographical sketch:*

Robert Zatorre is a cognitive neuroscientist at the Montreal Neurological Institute of McGill University. He obtained his PhD in experimental psychology at Brown University in 1981 under the late Peter Eimas and subsequently carried out postdoctoral research at the MNI with Brenda Milner. His principal interests relate to the neural substrate for auditory cognition, with special emphasis on two complex and characteristically human abilities: speech and music. He and his collaborators have published over 250 scientific papers on a variety of topics including pitch perception, musical imagery, absolute pitch, music and emotion, perception of auditory space, and brain plasticity in the blind and the deaf. In 2005 he was named holder of a James McGill chair in Neuroscience. In 2006 he became the founding co-director (together with Isabelle Peretz) of the international laboratory for Brain, Music, and Sound research (BRAMS), a unique multi-university consortium with state-of-the-art facilities dedicated to auditory cognitive neuroscience, funded via a \$13.8M award from the Canada Fund for Innovation. In 2011 he was awarded the IPSEN foundation prize in neuronal plasticity, and in 2013 he won the Knowles prize in hearing research from Northwestern University. He lives in Montreal with his wife and collaborator Virginia Penhune, professor of psychology at Concordia University. He tries to keep up his baroque repertoire on the organ whenever he can get a chance.





*Title:*

**Literacy in context**

*Abstract:*

Literacy has deeply changed the human beings: how they live, communicate, process information, experience the world and themselves, as well as technology and sociopolitical organization. However, literacy varies across many levels and, even today, it is distributed in a highly skewed way at all these levels. The situation of literacy in the world, its evolution, and the reasons of it will be presented. In relation with this, I will first show that universalizing and increasing literacy are aims that can be reached. This question will be considered for alphabetic literacy and as regards both cognition and brain plasticity. Then, I will examine whether and how language in its written form influences spoken language processing. Next, I will look at evidence on how the affective and emotional dimension of language is processed in the brain when conveyed in written vs. spoken form. Finally, I will consider literacy as a cultural tool that improves the many components – social, affective, imaginative, conceptual and aesthetical – of our biologically rooted capacity of making narratives.

*Biographical sketch:*

José Morais is Emeritus Professor of the Université Libre de Bruxelles (ULB), of which he has been head of the Laboratory of Experimental Psychology and dean of the Faculty of Psychological Sciences and Education. Presently he is Invited Professor at the ULB's Centre for Research in Cognition and Neuroscience. Doctor honoris causa of the University of Lisbon, he had been president of the Psychological Sciences committee of the Royal Academy of Belgium. His PhD thesis, in 1978, concerned the relations between speech processing and hemispheric specialization. Since 1979 he has been working on literacy and literacy acquisition. Since the 1980s and in parallel, he has been studying the interactions between literacy on the one hand and speech processing on the other hand. Until now, he has published more than 250 texts in scientific journals (including *Cognition*, *Journal of Experimental Psychology*, *Neuropsychologia*, *Science*, *P.N.A.S.*, *Nature Neuroscience Review*, etc.) and several books, as first author or co-author.

Dr. Matthew Apps (University of Oxford, UK)

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*Title:*

**Neurocomputational basis of social signals in the anterior cingulate cortex**

*Abstract:*

Over the last decade the functional properties of the anterior cingulate cortex (ACC) have become one of the most controversial and fiercely debated of any region of the human brain. On the one hand the ACC is implicated in a broad range of cognitive processes including motivation, cognitive control and pain that guide our own behaviour. In stark contrast however, considerable evidence suggests this region also makes specific contributions to vital socio-cognitive processes such as empathy and the processing of social stimuli. How can these divergent viewpoints be reconciled? Here I present a novel account of the ACC's contribution to social cognition. I provide evidence that only a particular sub-region of the ACC - in the gyrus (ACCg) - processes information specifically about other people and not about ourselves. I highlight that the computational properties of this region allow it to play a crucial role in estimating how motivated other people are and in updating those estimates when further evidence suggests they have been erroneous. Finally, I will present evidence that this new framework can provide insights into the mechanisms underlying social deficits in autism spectrum disorders.

*Biographical sketch:*

Matthew Apps is a cognitive neuroscientist in the Dept. of Experimental Psychology, University of Oxford. His research examines the neural and computational mechanisms underlying motivation, decision-making and social cognition. He obtained an ESRC funded PhD examining the neurocomputational mechanisms underlying social cognition and motivation in 2012 from Royal Holloway, University of London (RHUL) under the supervision of Prof. Narender Ramnani. He remained at RHUL for his first postdoctoral position examining the computational mechanisms that guide our ability to distinguish ourselves from other people in the laboratory of Prof. Manos Tsakiris. In 2013 he moved to Oxford as a postdoctoral researcher on a project examining the neurobiology underlying motivation with Prof. Masud Husain. During this time he was awarded a 2-year fellowship at Somerville College, Oxford. In 2015 he became a principal investigator on a BBSRC Anniversary Future Leader Fellowship grant, with the aim of providing a biological framework for understanding variability in motivation in healthy people and in neurological disorders. More on Dr. Apps' website: [www.mattapps.co.uk](http://www.mattapps.co.uk)

*Symposium title:*

Movement preparation, timing, spontaneous fluctuations, free will: What is the Bereitschaftspotential?

*Chair(s):* Rolf Verleger<sup>1</sup>

<sup>1</sup>University of Lübeck, Germany

*Symposium abstract:*

Hardly any ERP component has been so overcharged with general ideological and philosophical issues as the Bereitschaftspotential (BP; readiness potential RP). Kornhuber & Deecke (1965) assumed that the BP reflects movement preparation induced by free will and, in reverse, Libet et al. (1983) provided evidence that free will, if anything, follows rather than precedes the onset of the BP. This symposium will bring together recent developments in our understanding of the BP which may shed some new light on the free-will debate. After a brief historical introduction by the organizer, *Cunnington* will highlight the interplay of SMA and cingulate cortex in generating the BP and will provide evidence for the BP's role in timing of events. *Jo*, starting from the consideration that the BP adds to spontaneous fluctuations of brain activity, will present research on the subjective perspective of free will, partly based on studying the BP with a meditation expert. *Mudrik*, who has recently criticized dualistic concepts in neuroscience in general and specifically in the BP literature, will present data on the BP's involvement in meaningful vs. arbitrary decisions. *Verleger* will report results of two experiments that ask whether the BP reflects internal timing above all, rather than movement preparation. Finally, *Haggard* will ask the question whether the shape of the BP is an artifact caused by averaging across trials with stochastically varying characteristics, will provide a methodology for testing this question, and will outline possible fruitful consequences of this methodology.

*Talk 1 title:*

The SMA and cingulate cortex sustain premovement activity in readiness for action: An EEG-fMRI study

Ross Cunnington<sup>1</sup>, Vinh Nguyen<sup>1</sup>, Michael Breakspear<sup>1</sup>

<sup>1</sup>Queensland Brain Institute, University of Queensland; and Queensland Institute for Medical Research, Brisbane, Australia

*Abstract:*

Voluntary actions are preceded by increasing neural activity, beginning up to 1-2 s prior to movement, known as the readiness potential or Bereitschaftspotential. While fMRI has revealed key regions that contribute to motor planning processes, including the SMA and cingulate motor areas, the relationship between activity in these regions and the readiness potential is not well understood. We examined this relationship by integrating simultaneously acquired EEG and fMRI through computational modelling, using single-trial analysis and dynamic causal modelling. Mesial motor areas of the SMA and cingulate cortex were highly activated during voluntary movement and activity in the anterior mid cingulate cortex (amCC) was significantly correlated with premovement amplitudes of the readiness potential. Dynamic causal modelling showed that premovement neural activity was associated with reciprocal interactions between the amCC and SMA, with the amCC in particular driving sustained activity of the SMA on trials in which readiness potential

amplitudes were larger. We therefore suggest that reciprocal connections between the SMA and aMCC are important to maintain the sustained activity of the readiness potential before movement, and that initiation of action may then arise from an unstable but self-sustaining system that is primed to be receptive to a small push.

*Talk 2 title:*

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First-person approaches in the Libet-task: Conscious intention and its neural substrates

Han-Gue Jo<sup>1</sup>, Thilo Hinterberger<sup>2</sup>, Marc Wittmann<sup>3</sup>, Stefan Schmidt<sup>1,4</sup>

<sup>1</sup>University Medical Center Freiburg, Freiburg, Germany

<sup>2</sup>University Medical Center Regensburg, Regensburg, Germany

<sup>3</sup>Institute for Frontier Areas of Psychology and Mental Health, Freiburg, Germany

<sup>4</sup>European University Viadrina, Frankfurt (Oder), Germany

*Abstract:*

Although Libet's experiment is highly dependent upon subjective reports, no study has been conducted that focused on a first-person or introspective perspective of the task. We investigated first-person access to inner processes of movement initiation and the underlying brain activities, which contribute to the emergence of voluntary movement (the BP). In addition, differences in Libet-type task performance between experienced meditators and non-meditators were examined while assuming that meditators are more experienced in attending to their inner processes. Results showed that meditators revealed a consistent BP with correlations between subjective intention to act and the BP, but non-meditators did not show this consistency. These findings suggest that compared to non-meditators, meditators are more able to access the emergence of negative deflections of slow cortical potentials (SCPs), which occur in parallel with an inner experience of urge and could have fundamental effects on initiating a voluntary movement with awareness. Our empirical evidence further suggests that the early BP is not a neural correlate of preconscious motor preparation and thus a determinant of action but that it reflects spontaneous neural activity, which influences the subjective experience of intention. We argue that the initiation of a voluntary action is more likely during negative fluctuations of the SCP and that the sampling and averaging of many trials leads to the observed negativity, which we refer to as SCP sampling hypothesis.

*Talk 3 title:*

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Neural precursors of decisions that matter – an ERP study of the role of consciousness in deliberate and random choices

Liad Mudrik\*<sup>1</sup>, Uri Maoz\*<sup>2,3</sup>, Ram Rivlin<sup>4</sup>, Gideon Yaffe<sup>5</sup>, Ralph Adolphs<sup>3</sup>, Christoph Koch<sup>6</sup>

<sup>1</sup>Tel-Aviv University, Tel-Aviv, Israel

<sup>2</sup>University of California, Los Angeles, CA, USA

<sup>3</sup>California Institute of Technology, Pasadena, CA, USA

<sup>4</sup>Hebrew University, Jerusalem, Israel

<sup>5</sup>Yale University, New Haven, CT, USA

<sup>6</sup>Allen Institute for Brain Science, Seattle, WA, USA

\* denotes equal contribution

*Abstract:*

The finding that the Bereitschaftspotential (BP) starts before subjects report consciously deciding to move was famously taken as evidence against free will. Later studies claimed that neural precursors of willed decisions can be found even seconds before decisions are made. Yet in these studies, the voluntary actions were typically arbitrary—unreasoned and bearing no purpose, meaning or consequence. Here, we used EEG to directly compare deliberate and arbitrary decisions in a donation-preference task. Two non-profit organization (NPO) names appeared on the left/right side of the screen, and subjects pressed the left/right button with the corresponding hand. In the deliberate condition, subjects' choice

led to a sizable monetary donation to their NPO of choice. In the arbitrary condition both NPOs received donations, regardless of the choice. BP was found only in meaningless decisions, and was completely absent in meaningful ones. Using a drift-diffusion model we suggest that BP actually represents the accumulation of noise/random fluctuations, which drives meaningless - yet not meaningful - decisions. We further detect a bipolar frontocentral component which indexes the decision process in all conditions, and is influenced by its difficulty.

*Talk 4 title:*

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Time to move again? The BP as indicator of an internal clock

Rolf Verleger<sup>1</sup>, Mechthild Haake<sup>1</sup>, Kamila Śmigajewicz<sup>1</sup>

<sup>1</sup>University of Lübeck, Germany

*Abstract:*

When Bereitschaftspotentials (BPs) are measured, participants are required to voluntarily perform a predefined number of identical movements, separated by predefined minimum intervals. The BP may be related to processing of these temporal constraints: Participants might cope with these task demands by installing a slow rhythm of activation, serving as internal trigger for executing movements in time. The rising phase of this activation might be indicated by the BP. If so, (1) the BP should start earlier before movements when the required minimum interval between movements is prolonged, and (2) the BP should covary with demands on internal timing: decrease when internal timing is less necessary and increase in the other case (realized by regular versus irregular ticking of a clock in one experiment and by the explicit requirement to count vs. not to count the seconds between movements in another experiment). Prediction (1) was confirmed while prediction (2) was not. To further pursue this hypothesis, the process of internal timing might need more rigorous definition.

*Talk 5 title:*

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Neurontology of the BP: paradigm and distributional analyses comparing precursors of endogenous and instructed movement

Patrick Haggard<sup>1</sup>, Nima Khalighinejad<sup>1</sup>, Andrea Desantis<sup>1</sup>, Aaron Schurger<sup>2</sup>

<sup>1</sup>Institute of Cognitive Neuroscience, University College London, UK

<sup>2</sup>Neurospin, CEA, Orsay, France

*Abstract:*

Classical views treat BP like an ERP "component". On this view, regular morphological features of averaged EEG supposedly mark a specific, identifiable neural event. Alternatively, the ramp-like shape of BP might be an artefact of back-averaging, arising from cross-trial averaging of stochastic processes that trigger the onset of each action, rather than marking any fixed neural process. Distribution of EEG values across trials may resolve the controversy. The former view predicts low standard deviation of EEG epochs prior to voluntary actions. Participants waited for an unpredictably occurring dot-motion stimulus, and were rewarded for correct left-right responses to motion direction. They could autonomously decide to skip long waits for the motion stimulus, by executing bilateral keypresses. 'Skip' actions may have some of the endogenous quality that characterizes volition. In a control block, an exogenous instruction to make a bilateral skip keypress was given by unpredictably changing the appearance of the fixation point. Averaged EEG showed BP-like morphology prior to both endogenous and instructed actions. Being time-locked to action, the standard deviation of EEG epochs decreased prior to action. However, the pre-action decrease in EEG standard deviation was more marked for endogenous than for instructed actions, suggesting that neural activity indeed converges

on a fixed pattern prior to voluntary actions. When this convergence occurs could clarify the debate between 'early' and 'late' decisions for voluntary action.

Symposia Session 1 (24-06-2016) – 11:00 Douro Norte room

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*Symposium title:*

Attentional bias, Attentional Control and Emotional Vulnerability: Understanding causal mechanisms in health and mental well-being

Chair(s): Tatjana Aue<sup>1</sup>, Hadas Okon-Singer<sup>2</sup>

<sup>1</sup>University of Lübeck, Germany

<sup>2</sup>University of Haifa, Isra

*Symposium abstract:*

Attention biases to relevant and/or negative information constitute a prominent characteristic of clinical and sub-clinical anxiety and depression. Therefore, understanding the neurophysiological and cognitive mechanisms underlying these biases is of theoretical and clinical importance. Speakers in the current symposium will present and discuss data from healthy participants as well as data related to mental disorders, aiming at achieving a better understanding of deficient networks and mechanisms resulting in attentional abnormalities.

The symposium integrates recent exciting findings from the fields of cognitive psychology, neuroimaging, electrical potentials recording and autonomic measurement, as well as discusses new intervention methods (i.e., adaptive working memory training). Specifically, Gilles Pourtois will present ERP and psychophysiological findings showing an impact of state anxiety on processing in V1; Lotte van Dillen will discuss fMRI data showing how working memory load modulates the neural activation related to rewarding cues; Nazanin Derakshan will discuss data showing that adaptive executive control training alleviates anxiety and depression related vulnerability; Tatjana Aue will present behavioral, fMRI, and autonomic data investigating the link of attention bias with expectancy bias, another prominent maladaptive factor in anxiety; and Hadas Okon-Singer will discuss differences between biases in anxiety and depression using sensitive cognitive paradigms.

These presentations are expected to provide a comprehensive and updated view of attention biases in health and disease states, and shed light on the neurophysiological systems underlying them. In the long term, knowledge developed in this symposium might lead the way to the development of efficient therapeutic interventions.

*Talk 1 title:*

State anxiety creates attention-like modulations of early sensory processing in V1

Gilles Pourtois<sup>1</sup>

<sup>1</sup>Department of Experimental Clinical & Health Psychology, Ghent University, Ghent, Belgium

*Abstract:*

In this presentation, I will review and discuss recent psychophysiological/ERP results suggesting that the earliest wave of activation following stimulus onset in V1 shows gain control effects depending on the specific (negative) affective state of the participant. More specifically, state anxiety shapes early sensory processing (in V1) of unattended and peripheral visual stimuli, in a way which is compatible with the existence of an adaptive attention control mechanism meant to deal with the specific demands imposed by the current negative mood state of the participant. In this framework, early sensory processing in V1 is therefore not encapsulated, but instead, is readily influenced by top-down control mechanisms. Early sensory processing in V1, as measured using scalp ERP methods, can in

turn serve to delineate attentional biases in the early spatial processing of unattended stimuli as a function of state anxiety.

*Talk 2 title:*

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Tuning Down the Hedonic Brain: Working Memory Load Reduces Neural Responses to Food Rewards

Lotte F. van Dillen<sup>1</sup>

<sup>1</sup>Leiden University, The Netherlands

*Abstract:*

This presentation will address the question to what extent hedonic responses to appetitive cues in the environment are reflexive versus cognitively based. The findings of a series of functional magnetic resonance imaging (fMRI) and behavioral studies will be discussed, in which participants categorized high- and low-calorie food stimuli while concurrent working memory load varied (memorizing eight digits versus one digit). In addition, we measured individual differences in sensitivity to food temptations by means of the power of food scale (Lowe et al., 2007). Working memory load was found to suppress the subjective experience of food cravings, as well as impulsive consumption. Neuroimaging findings moreover revealed that exposure to high-calorie compared to low-calorie food stimuli led to increased activation in the nucleus accumbens (NAcc) when working memory load was low but not when it was high. In addition, higher self-reported sensitivity to food temptations related to greater NAcc responsivity to high-calorie versus low-calorie food stimuli, but this relationship was again only apparent when working memory load was low. Finally, connectivity analyses showed that when working memory load was high compared to low, enhanced activity in right dorsolateral prefrontal cortex (DLPFC) was more strongly coupled to NAcc activity, suggesting greater executive control over processing of motivationally salient but task-irrelevant information. Together, these findings thus indicate that loading working memory can tune down the hedonic (brain) response to high-calorie food stimuli, providing further evidence for the cognitive nature of motivation.

*Talk 3 title:*

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Training attentional control to reduce anxiety and depressive vulnerability

Nazanin Derakshan<sup>1</sup>

<sup>1</sup>Centre for Risk and Resilience in Psychopathology, Department of Psychological Sciences Birkbeck University of London, UK

*Abstract:*

Emerging research, from cognitive, neural and behavioural methods, is now identifying attentional control as a central mechanism that can protect against the effects of anxiety and depression on performance. A wealth of research associates anxiety and depressive vulnerability with reduced processing efficiency and impaired attentional control. Capitalising on recent demonstrations that attentional control can be improved using adaptive working memory training, with transferrable related gains to a range of measures, the current talk will review recent findings from adaptive cognitive training protocols that target and boost processing efficiency to reduce anxiety and depressive related vulnerability with the hope of promoting resilience and cognitive flexibility. The implications of such findings in educational and clinical settings will be discussed. Suggestions for using adaptive cognitive training as an adjunct for boosting the efficacy of traditional therapeutic methods that rely on the efficiency of prefrontal functions are made.

*Talk 4 title:*

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The interplay of expectancies and attention in the processing of threat: (Lack of) evidence from behavior, fMRI, and autonomic nervous system activity"

Tatjana Aue<sup>1</sup>

<sup>1</sup>University of Bern, Switzerland

*Abstract:*

Healthy individuals are capable of enhanced processing of aversive information, indexed by facilitated orientation of attention to threat. Such a response is considered to be adaptive in dangerous situations, ensuring personal safety. Phobic individuals, in contrast, show attentional biases in exaggerated form; these individuals are characterized by hyperbolic attention biases even in objectively safe situations or in situations that are characterized by low likelihood of danger. Given that phobic individuals display not only attention biases but also expectancy distortions regarding the likelihood of occurrence of feared situations, we investigated whether attentional and expectancy-related processes might be intimately related. Specifically, we tested whether experimentally induced expectancies about the likelihood of appearance of threatening targets in a search matrix would impact the participants' visual search for these targets. We will present behavioral, fMRI and autonomic nervous system data that are consistent with the idea of an innate fear module that regulates attention to threat, and that is largely impenetrable to variations in prior expectancies; in phobic as in low-fearful participants. Such impenetrability may be essential in safeguarding life in unexpected emergency situations.

*Talk 5 title:*

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Attention Bias in Anxiety and Depression: Discussing Differences and Similarities

Hadas Okon-Singer<sup>1</sup>

<sup>1</sup>Department of Psychology, University of Haifa, Israel

*Abstract:*

Anxiety and depression were both suggested to involve a maladaptive selective attention mechanism, associated with a bias toward negative stimuli (i.e., negativity bias). However, previous studies investigated this negativity bias using distracting information that contains *task-relevant* features. In the study presented here, we used the impact of *task-relevant* vs. *task-irrelevant* features of distracting stimuli among two clinical groups, i.e., patients with anxiety or depression. Corroborating previous findings, anxious patients showed a negativity bias, while depressed patients showed no indication for this bias. Task-relevant, non-emotional information influenced all groups in the same manner. These results indicate that anxiety, but not depression, is associated with an inherent bias towards negative information. These findings will be discussed in the context of previous works, aiming at identifying neuro-cognitive deficiencies that may differ between anxiety and depression.

Symposia Session 1 (24-06-2016) – 11:00 Douro Sul room

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*Symposium title:*

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Detection of social signals and its immediate impact on social cognition

*Chair(s):* Atsushi Senju Birkbeck<sup>1</sup>

<sup>1</sup>University of London

*Symposium abstract:*



One of the defining characters of the social world is its fluid and rapidly changing nature. To adapt to such an environment and achieve efficient social interaction and communication, social cognition needs to be fast, spontaneous and on-line. This symposium presents five talks from budding young cognitive neuroscientists, who study the cognitive and neural mechanisms underlying fast and spontaneous processing of social information, with a shared focus on various aspects of social attention. The first talk (Burra) shows how humans rapidly orient to social relevant signals (e.g. angry face), and how it is modulated by both bottom-up and top-down attention. The second talk (Mares) investigates how humans rapidly orient to another person's attention toward oneself (e.g. direct gaze), and explores the neural mechanisms underlying it. The third talk (Baltazar) also explores how human brains respond to the perceived direct gaze, with the use of fMRI and the focus on self-awareness. The fourth talk (Hazem) further explores the immediate responses to the perception of others social attention, again with the focus on its impact on self-awareness, by investigating the effect of top-down modulation (i.e. the belief of being observed) and the modality of perceived attention to oneself (i.e. visual, auditory and tactile). The final talk (Edwards) reports another unique phenomenon that participants' attention is attracted to another person's face when she followed the participants' gaze, which they coined as the gaze leading effect. These five talks highlight the cognitive and neural mechanisms underlying rapid, spontaneous and on-line processing of perceived social attention, and how these mechanisms could serve as building blocks for natural social interaction and communication.

*Talk 1 title:*

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Top-down and bottom-up interaction in attentional capture by threatening stimuli

Nicolas Burra<sup>1</sup>

<sup>1</sup>Université de Genève, Faculté de Psychologie et Sciences de l'Éducation

*Abstract:*

In visual search task, a selective advantage for threatening stimulus detection is evolutionary advantageous. However, it raises the question how top-down (voluntary) and bottom-up (automatic) attentional processes modulate such preference. Therefore, in several experiments, we manipulated 1) the target and the distractor relevance as well as 2) the perceptual context of the current task. First, in a visual search task, by angry faces, we used electrophysiological correlates of attentional selection (N2pc and Pd) to highlight automatic attentional capture. In some trials, an irrelevant facial expression distractor competes with a target. We demonstrate that an angry irrelevant distractor elicits an attend-to-me signal while a happy distractor does not. Besides, in order to highlight the top-down implication in such an effect, we manipulated the perceptual context in which the task is performed (face vs. shape context). Our data revealed that, in face context, our attentional selection is biased toward abstract face-like stimuli, perceived as angry faces. Critically, such effect is absent in shape context. Taken together, bottom-up and top-down attentional influence is critical and, therefore, should be manipulated carefully in order to investigate attentional capture by threatening stimuli.

*Talk 2 title:*

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Privileged orienting to direct gaze and its reliance on low spatial frequency information

Inês Mares<sup>1</sup>, Marie L. Smith<sup>1,2</sup>, Mark H Johnson<sup>1</sup>, Miguel Leal-Rato<sup>3,4</sup>, Isabel Pavão Martins<sup>4</sup>, Atsushi Senju<sup>1</sup>

<sup>1</sup>Centre for Brain and Cognitive Development, Birkbeck College, University of London

<sup>2</sup>Department of Psychological Sciences, Birkbeck College, University of London

<sup>3</sup>Faculty of Medicine and IMM, University of Lisbon

<sup>4</sup>Language Research Laboratory, Faculty of Medicine and IMM, University of Lisbon

*Abstract:*

Direct gaze has been shown to be preferentially attended and processed from birth to adulthood. Nonetheless it is not known if direct gaze captures attention in a fast pre-attentive manner. Here we analysed direct gaze's attentional capture in two studies. We tested rapid orienting to direct gaze by instructing participants to saccade to peripherally presented faces and buildings. Shorter express saccade latencies were produced for faces in direct gaze when compared to faces with averted gaze or buildings. Furthermore, pre-attentive processing of direct gaze was tested in patients with Hemispatial Neglect. Participants were instructed to cross open eyed pictures either in direct or averted gaze amidst closed eyed distractors. Patients detected more targets with direct than averted gaze, showing that direct gaze can be processed pre-attentively. It has been hypothesized that this rapid and pre-attentive processing of direct gaze depends on a subcortical visual pathway reliant on low spatial frequency (LSF) information. To test this we manipulated the spatial frequency content of gaze shifts in an event related potential (ERP) paradigm, including LSF, high (HSF) and broad spatial frequency (BSF) stimuli. Two face-related ERP peaks were observed, N170 and N240. An effect of spatial frequency for direct gaze discrimination was observed only in the N240 component, where direct gaze discrimination depended on LSF information. Thus, the importance of LSF for the fast and pre-attentive processing of direct gaze observed in the first two studies needs to be further investigated.

*Talk 3 title:*

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How does eye contact enhance bodily self-awareness?

Matias Baltazar<sup>1</sup>, Julies Grèzes<sup>2,3</sup>, Jean-Luc Picq<sup>1</sup>, Laurence Conty<sup>1</sup>

<sup>1</sup>Laboratory of Psychopathology and Neuropsychology (LPN, EA2027), Université Paris 8, Saint-Denis Cedex, France

<sup>2</sup>Département d'Études Cognitives (DEC), Laboratory of Cognitive Neuroscience (LNC), INSERM U960, Paris, France

<sup>3</sup>Centre de Neuroimagerie de Recherche (CENIR), Paris Cedex, France

*Abstract:*

Several stimuli implying a feeling of "being watched" in the perceiver, such as video cameras or the presence of an audience, seem to enhance self-awareness (Silvia and Gendolla, 2001). Accordingly, we have recently shown that the perception of a face displaying direct gaze (that establishes eye contact) led adult participants to accurately rate the intensity of their physiological reactions induced by emotional pictures (Baltazar et al., 2014). We thus demonstrated that human bodily self-awareness becomes more acute when one is subjected to another's gaze. Here, we used fMRI to investigate the neural basis of such an effect. In our protocol, we asked volunteers to rate the intensity of their own physiological reactions induced by the presentation of emotional pictures. Our objective was to investigate the influence of a contextual image (i.e. a cross, a face displaying averted gaze, or a face displaying direct gaze) that preceded each emotional picture on our participant's behaviour and neural activations. Crucially, we recorded participants' skin conductance response (SCR) as an indicator of felt arousal. Just like our previous behavioural study showed, the direct gaze condition led to the highest correlation between ratings and SCRs. The fMRI results point to a greater implication of areas of the brain (i.e. superior colliculus and anterior insula) that bind interoceptive and exteroceptive representations in providing the ratings of intensity in the eye contact condition. This result could explain why these ratings fit the actual bodily responses better under the influence of eye contact.

*Talk 4 title:*

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Social attention enhances bodily self-awareness

Nesrine Hazem<sup>1,2,3</sup>, Laurence Conty<sup>1</sup>, Morgan Beurenaut<sup>1,2</sup>, Matias Baltazar<sup>1</sup>, Nathalie George<sup>2,3,4,5,6</sup>

<sup>1</sup>Laboratory of Psychopathology and Neuropsychology (LPN, EA2027), Paris 8 University, Saint-Denis, France

<sup>2</sup>Institut du Cerveau et de la Moelle épinière (ICM), Social and Affective Neuroscience Laboratory and Centre MEG-EEG, Paris, France

<sup>3</sup>Sorbonne Universités, UPMC Univ Paris 06, UMR\_S 1127, Paris, France

<sup>4</sup>CNRS, UMR 7225, Paris, France

<sup>5</sup>Inserm, U 1127, Paris, France

<sup>6</sup>ENS, Centre MEG-EEG, Paris, France

*Abstract:*

Social contact may be established by gazing at, calling, or touching an interlocutor. These primary cues indicate to the perceiver that he/she is the object of another person's attention. Therefore it has been suggested that they may enhance self-awareness. Accordingly, we recently showed that the perception of a face establishing eye contact enhances bodily self-awareness (Baltazar et al., 2014). Here, we wanted to deepen the understanding of the effect of social attention on self-awareness. First, we investigated whether 'the belief of being the target of another person's attention' may underlie this effect. We demonstrated that the perception of an individual, through an online video connection, wearing see-through sunglasses as compared to obstructed sunglasses or a low-level baseline condition, led participants to rate more accurately the intensity of their bodily reactions in response to emotional pictures, reflecting more acute bodily self-awareness. Second, we investigated if bodily self-awareness may be enhanced by interpersonal contact whatever the sensory modality of this contact. We designed two experiments following a similar method as above but with auditory and tactile contact cues. We showed on a first group of participants more accurate rating of their bodily reaction intensity in response to emotional pictures following the perception of their own name pronounced by another social agent, as compared to control conditions. We are currently implementing the experiment on the tactile sensory modality. Altogether these data provide evidence for the impact of social attention on self-awareness, supporting the notion of the social nature of the self.

*Talk 5 title:*

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Social orienting in gaze leading: A mechanism for shared attention

S. Gareth Edwards<sup>1</sup>, Lisa J. Stephenson<sup>1</sup>, Mario Dalmasso<sup>2</sup>, Andrew P. Bayliss<sup>1</sup>

<sup>1</sup>School of Psychology, University of East Anglia, United Kingdom

<sup>2</sup>Department of Developmental Psychology and Socialisation, University of Padova, Italy

*Abstract:*

The intent to share attention with others has been suggested as especially 'human'. Initiating joint attention (e.g. leading the gaze of others) has been shown to be atypical in autism spectrum condition. Here, we report a novel social orienting response that occurs after viewing averted gaze, showing that when a person looks from one location to an object, attention then shifts towards the face of an individual who has followed that person's gaze to the same object: the gaze leading effect. That is, contrary to a 'gaze following' effect, attention instead orients in the opposite direction to observed gaze. Thus, those that follow our eye-gaze capture our attention. In developing the paradigm necessary for this illustration a number of boundary conditions were also outlined, which suggest the social context of the interaction is crucial: the gaze leading effect appears to work in direct opposition to other social orienting phenomenon (e.g.

gaze cueing), may be specific to eye-gaze stimuli, and is associated with self-reported autism-like traits. We propose that the gaze leading effect implies a mechanism in the human social cognitive system for detecting when one's gaze has been followed, promoting the more elaborate social attention state of shared attention, possibly facilitating the ongoing interaction. Thus, the current work opens up a number of interesting research avenues concerning how attention orienting during gaze leading may facilitate social learning and how this response may be disrupted in atypically developing populations. This work was supported by a University of East Anglia postgraduate studentship to SGE, an EPS Undergraduate Research Bursary to LJS, and a co-financed MIUR (Italian Ministry of Education, University and Research) and University of Padova postgraduate studentship to MD.

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Symposia Session 2 (24-06-2016) – 14:30 Porto room

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*Symposium title:*

How emotions drive attention and decision making

*Chair(s):* Henk van Steenbergen<sup>1</sup>

<sup>1</sup>Affect, Motivation & Action lab, Leiden Institute for Brain and Cognition, Institute of Psychology, Leiden University, The Netherlands

*Symposium abstract:*

This symposium highlights recent advances in our understanding of the neural mechanisms underlying the effect of emotions on attention and decision making. In the first talk (Pessiglione), new studies are discussed that provide evidence for the idea that the ventromedial prefrontal cortex is involved in value-driven decision making and that it also integrates information about the confidence about our decisions. New insights into the social aspects of decision making are provided in the second talk (Gläscher) by showing how information about the choices of others also affect the computations of expected values in the brain of the participant. The influence of anticipating momentary loss and the associated increase in arousal on attention and the neural encoding in visual areas is discussed in the third talk (Mather). The fourth talk (van Steenbergen) then shows how the visual encoding of outcomes and their associated reward values also play a role in action control and demonstrate that the influence of cue-outcome associations on decision making operate via interactions between the amygdala and basal ganglia. The final talk (de Wit) provides a comprehensive overview of a recent series of studies that investigated the effect of motivation on Pavlovian-instrumental transfer, which provides important insights in understanding the conditions under which motivation does not immediately impact decision making. Taken together, this symposium offers a state of the art overview of a number of different lines of research on how our own and others' emotions shape our decisions.

*Talk 1 title:*

The interplay between value and confidence in decision making

Mathias Pessiglione<sup>1</sup>, Alizée Lopez<sup>1</sup>, Emmanuelle Bioud<sup>1</sup>, Raphaëlle Abitbol<sup>1</sup>, Maël Lebreton<sup>1</sup>

<sup>1</sup>Motivation, Brain & Behavior lab, Institut du Cerveau et de la Moelle épinière, Hôpital de la Pitié-Salpêtrière, Paris, France

*Abstract:*

Basic principles of decision theory assume that in order to make a choice, agents assign values to available options and compare them so as to select the best one. The neuroeconomics research program has identified the ventromedial prefrontal cortex

(VMPFC) as a key node for signaling the subjective values that drive decision making. Recently, it has been demonstrated that the VMPFC signal automatically incorporates the value of many irrelevant components in a perceived or imagined situation, which might bias the valuation of choice options. In this talk, I will provide evidence from fMRI and intracranial recordings in humans that the VMPFC signal also integrates confidence, defined as the probability of the behavior being correct. Then I will present results from psychological experiments showing that such an interaction between value and confidence at the neural level might explain some psychological phenomena manifested in seemingly irrational behaviors. For instance, participants felt more confident in their performance when the potential reward was greater (a case of desirability bias) or when the background music was more pleasant (a case of halo effect). Functional properties of the brain valuation system might therefore have important implications for developing a neuro-compatible theory of choice.

*Talk 2 title:*

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Social influences in human decision-making

Jan Gläscher<sup>1</sup>, Lei Zhang<sup>1</sup>

<sup>1</sup>Institute for Systems Neuroscience, University Medical Center Hamburg-Eppendorf, Germany

*Abstract:*

Most human decision-making takes place in a social context, which can influence individual decisions. In addition to making choices according to the action-outcome associations, humans tend to align themselves with others, even without any direct social interaction. A long tradition of economic and social psychological studies has demonstrated a robust effect of social influence and conformity on perceptual decision-making (Asch, 1951). However, relatively little is known how information about the choices of others affect the computations of expected values underlying each decision and how this social influence is represented in the human brain. I will present data from a recent study intended to address this research gap. We developed a novel social influence task, in which subjects were informed in real-time about the choices of 4 other players, while all were performing a probabilistic reversal learning task. Following the presentation of the others' choices subjects could adjust their decisions. Model-free analyses reveals a strong influence of the coherence of the group decision, if their first decision differed from that of the subject. Computationally, we compared several "social" and "non-social" reinforcement learning models (i.e. those that incorporated or excluded the information about others' choices) using Bayesian hierarchical modeling and found that the social models provided a much better fit to the data. Furthermore, participants seem to parse social information simply in terms of number of players (dis)agreeing with their initial choice rather than maintaining individual models of the others' decision-making process.

*Talk 3 title:*

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Anticipating losses in a monetary incentive task increases the selectivity of encoding

D. Clewett<sup>1</sup>, R. Huang<sup>1</sup>, R. Velasco<sup>1</sup>, T.H. Lee<sup>1</sup>, M. Mather<sup>1</sup>

<sup>1</sup>University of Southern California, Davis School of Gerontology, Los Angeles, USA

*Abstract:*

According to the arousal-biased competition (ABC) model (Mather & Sutherland, 2011), an increase in arousal, such as during threat, enhances processing goal-relevant stimuli at the expense of processing distracters. Thus, arousal optimizes cognitive selectivity when it matters most. Past work demonstrates that arousal differentially modulates perception-related brain activity as a function of stimulus priority; however, whether such arousal-related selectivity relates to differential memory outcomes is unclear. Using functional

magnetic resonance imaging (fMRI), we tested ABC using a monetary incentive encoding task in which participants explicitly prioritized a background scene in attention and memory while ignoring a transparent foreground object. On some trials, arousal was induced by threatening to deduct 50 cents from a preset account if participants forgot loss-cued scenes during a subsequent memory test. A functional localizer was used to identify category-selective visual regions-of-interest (ROIs) specialized to process the high priority scenes (parahippocampal place area; PPA) and lower priority objects (lateral occipital cortex; LOC).

Consistent with ABC, threat of monetary punishment enhanced memory of scenes, while impairing memory of objects. Arousal also intensified competition on trial-by-trial basis, such that participants were even more likely to remember a scene and forget its corresponding object. As predicted, threat yielded brain activity patterns consistent with increased neuronal gain, with arousal strengthening successful scene memory traces in the PPA. In contrast, lower priority object memory traces were associated with weakened activity in the LOC under arousal. Together these results demonstrate that threat-induced arousal optimizes memory selectivity via priority-specific effects in sensory cortex.

*Talk 4 title:*

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The neural encoding of outcomes and its role in action control

Henk van Steenbergen<sup>1</sup>

<sup>1</sup>Affect, Motivation & Action lab, Leiden Institute for Brain and Cognition, Institute of Psychology, Leiden University, The Netherlands

*Abstract:*

According to ideomotor theory, goal-directed action involves the sensory anticipation of actions and their associated outcomes. We present two fMRI studies that aim to reveal how corticostriatal circuits and category-specific areas in visual cortex mediate the sensory and hedonic coding of these outcomes. In the first study, we used a Pavlovian-Instrumental Transfer task in which participants learned response-outcome and stimulus-outcome associations, after which one of the food outcomes (popcorn or Smarties) was devalued using satiation. In the subsequent test phase, participants were asked to respond to the stimuli earlier associated with a specific outcome. We found that participants responded to these cues regardless of the food they were satiated on, and brain activity in the posterior putamen differentiated between responses compatible and incompatible with the outcome. Moreover, a region in ventral amygdala showed stronger functional connectivity with posterior putamen, providing novel evidence for the role of amygdalostriatal interactions in outcome-specific transfer. In the second study, we used a task in which participants prepared for facial and manual actions which was expected to activate the sensory representation of these actions in category-specific regions of the visual cortex that encode faces (FFA) and body parts (EBA). In line with our predictions, preparation of a manual or facial action increased the consistency of neural activation patterns in the EBA and FFA, respectively. Reward increased the stability of the sensory neural representations in both areas. Our results provide new insights into the neural mechanisms that support outcome-driven action control.

*Talk 5 title:*

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The role of outcome anticipation and evaluation in cue-elicited behavior

Sanne de Wit<sup>1</sup>

<sup>1</sup>Department of Clinical Psychology, University of Amsterdam, The Netherlands

*Abstract:*

Pavlovian cues can affect choice by reminding the agent of the outcomes of alternative

instrumental actions. Investigations of this 'Pavlovian-instrumental transfer' in animals and humans have raised the question as to how flexibly this influence of Pavlovian cues is modulated by motivation. I will present relevant findings from our lab and will argue that once the underlying associations have been established, changes in motivation will not immediately impact on performance.

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Symposia Session 2 (24-06-2016) – 14:30 Douro Norte room

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*Symposium title:*

Using ERPs: from research on healthy populations to clinical applications

Chair(s): Salvatore Campanella<sup>1</sup>, Henrique Sequeira<sup>2</sup>

<sup>1</sup>Laboratoire de Psychologie Médicale, Université Libre de Bruxelles

<sup>2</sup>Laboratoire de Neurosciences Fonctionnelles et Pathologies, UMR 8160 CNRS, Service EFV, Hôpital Salengro

*Symposium abstract:*

A huge amount of empirical data has been currently collected on different cognitive processes through the use of event-related potentials (ERPs). Thanks to an optimal temporal resolution, ERPs allow us to monitor brain activity during the entire information processing stream, ranging from sensory to higher cognitive processes. In other words, during a cognitive task, ERPs allow one to identify in healthy participants the different electrophysiological components representing the different cognitive stages implicated in this task. In keeping with this, in pathological subjects, using cognitive ERPs may help to show the ERP component representing the onset of a dysfunction, and then to infer the related impaired cognitive stage. In this symposium, we will illustrate how ERP research can increase our understanding of cognitive processes, when they are efficient, in children as well as in adults, or when they are altered on both populations. Five different speakers will present original data on healthy/pathological children/adults. The first presentations will focus on ERP correlates of normal cognitive and emotional functioning in children (Vincent Reid, University of Lancaster, UK) and in adults (Henrique Sequeira, University of Lille, France). The last three presentations will focus on ERP index of cognitive alterations in children (Georgia Chronaki, University of Lancashire and Manchester, UK; Marie Gomot, INSERM - University François-Rabelais of Tours, France) and adults (Salvatore Campanella, University of Brussels, Belgium). Implications of these data will be discussed at fundamental and clinical levels.

*Talk 1 title:*

A developmental perspective on emotion processing from body expressions and the voice

Peiwen Yeh<sup>1</sup>, Elena Geangu<sup>2</sup>, Vincent Reid<sup>1</sup>

<sup>1</sup>Developmental Sciences Laboratory, Lancaster University, UK

<sup>2</sup>Social and Emotional Development Lab, Lancaster University, UK

*Abstract:*

Perceiving emotion from multiple modalities enhances the perceptual sensitivity of an individual. This allows more accurate judgments of other's emotional states, which is crucial to appropriate social interactions. It is known that body expressions convey emotional messages effectively, although fewer studies have examined how this information combines with auditory cues. This talk will present research using event-related potentials (ERP) to investigate the interaction between emotional body expressions and vocalizations in adults and in infants. We also examined emotional congruency between auditory and visual information to determine how preceding visual context influences later auditory processing. In adults, consistent with prior findings, a reduced N1 amplitude was observed in the

audiovisual condition compared to an auditory-only condition. The same component was absent for the congruency effect; however, the P2 was sensitive to the emotionally incompatible audiovisual pairs. Further, the direction of these congruency effects was different in terms of facilitation or suppression based on the preceding contexts. Overall, the adult results indicate a functionally dissociated mechanism underlying two stages of emotional processing whereby N1 is involved in cross-modal processing, whereas P2 is related to assessing unifying perceptual content. These data also indicate that emotion integration can be affected by the specific emotion that is presented. In infants at 6.5 months, we examined angry stimuli due to the inherent constraints of EEG with this age range. For the P150, we found no differences either for modality or for congruency effects, whereas the P350 was more pronounced for the audio-only condition than for the other two audiovisual conditions at frontal-left regions. The modality effect within the P350 is similar to the adult data, whereby a greater N1 response was found in the auditory-only compared to the audiovisual condition. These studies provided evidence that the anticipation of body expressions is likely to be predictive for auditory processing, and infants at 6.5-months of age have the capacity to anticipate the modification of emotion signals across visual and auditory modalities. In particular, body expressions with movement may play an important role in emotion recognition as motion effects can be found to modulate emotional processing at the electrophysiological level.

*Talk 2 title:*

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Emotional vision: data from ERPs studies

Henrique Sequeira<sup>1</sup>, Jacques Honoré<sup>1</sup>

<sup>1</sup>Univ. Lille, CNRS, UMR9193 – SCALab – Sciences Cognitives et Sciences Affectives

*Abstract:*

In cognitive and affective neuroscience research, the vision constitutes a privileged sensory channel to elicit emotional states. Indeed, closed links between emotion and vision are well illustrated by Adolphs (2004) expression: «Optimists see the world through rose-colored glasses; both rage and love can blind us». This can be related to the fact that, in primates, vision has a specific status being coded by a very large cortical surface and because visual information conveys a significant emotional adaptive role, at biological and social levels (detecting a potential danger, regulating human interactions). The aim of this communication is to present results helping to understand how the vision allows to elicit emotions thanks to brain processing. To this end, we focused on behavioral and ERPs data obtained in paradigms testing interactions between cognitive and emotional processes, using different cultural backgrounds or stimulating specific parts of visual field. In most of cases, we used standardized scenes or faces to induce emotional states in healthy adults. From a first group of experiments, we obtained data showing how affective arousal and valence content of pictures modulates cognitive processes, indexed by ERPs components, at several steps in the information processing stream. Secondly, in a global cross-cultural perspective, we investigated whether cultural background could be related to a differential neural coding of emotional processing. Main findings yielded cultural differences in emotional ERP components, characterized by a specific spatio-temporal signature. In a third step, we explored how emotional scenes and faces can contribute to explore the role of far visual eccentricity to modulate the emotional processing despite impoverished perceptive conditions of peripheral vision. Finally, from these contributions, we will draw an integrative view of ERP findings to explore cognitive and affective processes in healthy individuals and suggest some research combinations with neuromagnetic and electrical autonomic measures.

*Talk 3 title:*

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Event-Related-Potentials to Emotional Stimuli in Children with Externalizing and Internalizing Psychopathology



Georgia Chronaki<sup>1,2,3</sup>, Graeme Fairchild<sup>3</sup>, Nicholas Benikos, Samantha Broyd<sup>4</sup>, Matthew Garner<sup>3</sup>, Margaret Thompson<sup>3</sup>, Julie Hadwin<sup>3</sup>, Edmund J.S. Sonuga-Barke<sup>3</sup>

<sup>1</sup>University of Central Lancashire, Developmental Cognitive Neuroscience Laboratory, UK

<sup>2</sup>University of Manchester, Section of Clinical and Cognitive Neuroscience, School of Psychological Sciences, UK

<sup>3</sup>University of Southampton, Developmental Brain-Behaviour Laboratory, School of Psychology, UK

<sup>4</sup>School of Psychology, University of Wollongong, Wollongong, Australia

*Abstract:*

Recognizing emotions from facial and vocal expressions plays an important role in children's socio-emotional development. Deficits in emotion processing, reported in externalizing (i.e., attention-deficit/hyperactivity disorder - ADHD) and internalizing (i.e. anxiety) behaviour problems during childhood have been linked to both early perceptual and later attentional components of event-related potentials (ERPs). Previous research in ADHD has mainly focused on facial stimuli and little is known on the neural processing of vocal stimuli. In regards to internalizing problems, there is limited ERP research in emotion recognition from facial expressions during childhood. This talk will present an overview of Event-Related-Potential findings in emotion processing in children with psychopathology including externalizing (ADHD) and internalizing (Anxiety) behaviour problems. In the first study, we employed a vocal emotion recognition task in 25 children with a diagnosis of ADHD and 25 typically developing controls aged 6-11 years. Relative to controls, children with ADHD displayed enhanced N100 and attenuated P300 component amplitudes to vocal anger. The N100 effect was significant when children with ADHD and comorbid conduct disorder (n = 10) were excluded. This study provides the first evidence linking ADHD to atypical neural activity during the early perceptual stages of vocal anger processing. In a second study, we employed a facial emotion recognition task in a population sample of 58 children with high and low levels of generalised anxiety aged 6-11 years. Children with high levels of anxiety presented higher Late Positive Potential (LPP) amplitudes to angry compared with neutral faces in posterior regions. Early components (P1, N170) were not associated with childhood anxiety levels. This study provides evidence of enhanced processing of threatening (i.e. angry) stimuli in childhood anxiety. Results from the two studies presented above indicate that neural alterations in the processing of threat (anger) occur at early, pre-attentive processing stages (N100) in externalising psychopathology and later evaluative/effortful stages (LPP) in internalising psychopathology during childhood. Findings contribute to current theory and research and demonstrate the utility of ERPs in identifying pathophysiological risk markers in childhood externalising and internalizing psychopathology. This research has important implications for preventive interventions aiming to increase emotional resilience in children.

*Talk 4 title:*

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Emotional automatic deviance-detection in Autism spectrum Disorder

Marie Gomot<sup>1</sup>

<sup>1</sup>UMR INSERM U930, Université François-Rabelais de Tours, France

*Abstract:*

Although resistance to change is a main feature of Autistic Spectrum Disorder (ASD), the brain processes underlying this aspect of the disorder remain poorly understood. This oversensitivity to changes may lead to an inability to anticipate and adapt to new sensory inputs, and especially to a dynamic social environment. In this respect the processes involved in pre-attentive detection of changes in stimulus features have been extensively investigated in ASD. This has been studied in the auditory modality using the mismatch negativity (MMN), an event-related potential that reflects error detection caused by a deviation from a learned regularity. However although ASD is also characterized by an

inability to detect and adapt to changes in emotional states, none of the MMN studies in ASD have investigated automatic deviancy detection in an emotional context.

We will present research addressing direct comparison of automatic change detection of neutral and emotional deviants across typical development and in patients with TSA. To this end, participants were presented with two deviants, neutral and angry (prosodic variation of the vowel 'aaa') embedded in a repetitive neutral stimuli sequence.

Comparisons of age groups and conditions during typical development indicate a late maturation of the brain processes associated with emotional prosody discrimination. Findings in ASD revealed an atypical processing of emotional deviancy, especially in adults, and almost normal MMN to neutral deviancy.

This study points to specific difficulty in the online processing of emotional changes in ASD, which potentially plays a crucial role in social interaction deficits and that possibly worsen with age due to a long-lasting lack of expertise in processing prosodic cues.

*Talk 5 title:*

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The P300 and the NoGo-P300 event-related potentials: biological markers of abstinence vs. relapse in alcohol dependence?

Salvatore Campanella<sup>1</sup>, Elisa Schroder<sup>1</sup>, Catherine Hanak<sup>1</sup>, Charles Kornreich<sup>1</sup>, Paul Verbanck<sup>1</sup>

<sup>1</sup>Laboratory of Medical Psychology and Addiction, Université Libre de Bruxelles (ULB), Belgium

*Abstract:*

The relapse rate for psychiatric disorders is staggeringly high, indicating that treatment methods combining psychotherapy with neuro-pharmacological interventions are not entirely effective. This is illustrated by alcohol dependence: during clinical trials, placebo control groups showed a relapse rate of up to 85%, even if hospitalized until complete remission of the physical withdrawal symptoms. Impaired inhibitory control has been indexed as one main variable triggering relapse in alcohol dependence, as failures in response inhibition weaken the ability to stop alcohol intake and promote the continuation of drinking. Alcohol-cue reactivity has also been tagged as a principal mechanism, as repeated alcohol consumption leads to dopaminergic neurological changes and mesocorticolimbic sensitization resulting in heightened incentive salience of stimuli associated with drinking. Overall, these two phenomena reciprocally impact each other in such a way that pushes unreasonable consumption. On this basis, a current clinical challenge is to find a way to screen recently detoxified alcoholic patients in order to discriminate those who would be particularly at risk to relapse. We performed two separate ERP studies. At the end of a three-week detoxification cure, thirty patients were confronted with (1) a contextual Go-NoGo task; and (2) a visual oddball task, including deviant stimuli, related or unrelated to alcohol. A three-months follow-up was pursued in order to verify whether patients relapsed or not. Data suggest that (1) the higher difficulty for inhibition indexed by a higher NoGo P300 in relapsers may be a good predictor of relapse in alcohol dependence; and (2) a devaluation of the motivational significance of stimuli related to alcohol, indexed by a decreased P300 in abstainers, could protect from a relapse within three months following detoxification in alcohol dependent patients. Programs aiming at increasing cognitive control and decreasing motivation towards alcohol cues should be developed.

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Symposia Session 2 (24-06-2016) – 14:30 Douro Sul room

*Symposium title:*

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Close human relationships: From infancy to adulthood

*Chair(s):* Lara Maister<sup>1</sup>

*Symposium abstract:*

Humans are fundamentally social animals. We form and maintain close bonded relationships with others, and live in affiliated family groups. Findings from social psychology show that we process social information from our family, intimate partners and friends in distinct ways from that from generic, unfamiliar 'others'. However, very few studies in the social neurosciences have used stimuli featuring these significant others, instead preferring to focus on how we respond to unfamiliar individuals. Therefore, our understanding has been restricted to social processing on a large-scale, impersonal level. Here, we address the neural, psychophysiological, neurobiological and embodied basis of some of the most fundamental human relationships; those between intimate partners, close friends, and between a mother and her infant. First, Murray investigates the distinct neural mechanisms involved in processing close and familiar others. Guerra takes a psychophysiological approach, to explore the unique way we respond to loved familiar faces. Maister similarly focusses on romantic partners, by investigating the extent to which embodied self-other representations are blurred in romantic, as opposed to platonic, relationships. Atzil and Hahn move away from adult relationships, to focus on the relationship between a mother and her infant; Atzil uses simultaneous fMRI-PET imaging to highlight the role of dopamine in maternal bonding, whilst Hahn explores how individual differences in hormonal patterns can explain women's caregiving behaviours. Overall, the symposium casts new light on fundamental interpersonal interactions with significant others, using a range of techniques and bringing together diverse research areas within the social, developmental and cognitive neurosciences.

*Talk 1 title:*

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In Deference to the Other: A Working Model of Differential Neural Processing for Close and Familiar Others

Ryan Murray<sup>1</sup>

<sup>1</sup>Swiss Center for Affective Sciences, University of Geneva, Switzerland

*Abstract:*

Presently, inferences of social cognitive neural processing have relied principally upon interactions with strangers, individuals who are necessarily emotionally distant and unfamiliar to the individual. The bulk of our daily experiences, however, arguably consist of emotionally rich interactions with close and familiar others. Close others include friends, romantic partners and family while familiar others include classmates and work associates. Investigating cerebral activity responding differentially to close/familiar others would thus be essential to conceptualize a more ecologically valid model of social cognitive neural processing. In my proposed talk, I will thus address differential neural processing of close/familiar others, relative to self and unfamiliar others. I will first present our earlier published meta-analytic data which illustrated a dorsal-ventral continuum of self- and other-processing in the medial prefrontal cortex, varying spatially according to the degree of familiarity. Next, I will synthesize published social neuroscience evidence demonstrating differential neural close/familiar other-processing, across both face perception and personality trait inference paradigms. Herein, I will highlight two key regions which emerge as highly probable candidates for differential close/familiar other-processing: the temporoparietal junction (TPJ) and the posterior cingulate/precuneus (PCC/PC). Finally, I will support this proposal with evidence from our recent meta-analytic connectivity modeling study which demonstrated PCC/PC-TPJ coupling to underlie a dedicated other-specific neural network across both task-based and task-free states. Given this, along with a suggested functional profile revealed by forward and reverse inference algorithms in our recent study, I will propose a working neurocognitive model of differential close/familiar other processing, relative to self and unfamiliar others.

*Talk 2 title:*

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The Relational Body: Shared body representations between romantic partners

Lara Maister<sup>1</sup>, Manos Tsakiris<sup>1</sup>

<sup>1</sup>Royal Holloway University of London, UK

*Abstract:*

Our relationships with romantic partners are often some of the closest and most important relationships that we experience in our adult lives. Interpersonal closeness in romantic relationships is characterised by an increased overlap between cognitive representations of oneself and one's partner. Importantly, this type of self-other overlap also occurs in the bodily domain, thought to be mediated by a 'mirror neuron system' in the brain. In this case, we represent another's embodied experiences in the same way as we represent our own. However, as yet this bodily self-other overlap has only been investigated in individuals unfamiliar to each other. Here, we investigate bodily self-other overlap between romantic partners, considering both motor representations of own- and partner-actions, and multisensory representations of one's own and one's partner's body. There is a greater overlap in bodily representations between romantic partners than between platonic friends, both in motor and multisensory domains. Furthermore, adult attachment style plays a distinct role in the way these bodily representations are shared, and the direction of this effect discriminates between romantic and platonic relationships.

*Talk 3 title:*

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Dopamine mediates human maternal bonding. A behavioral PET-fMRI study

Shir Atzil<sup>1</sup>, Ciprian Catana<sup>1</sup>, Ruth Feldman<sup>1</sup>, Jacob Hokker<sup>1</sup>, Lisa Feldman Barrett<sup>1</sup>

<sup>1</sup>Massachusetts General Hospital and Harvard Medical School, Boston, MA

*Abstract:*

We are a social species. Our brains and bodies are set to intimately bond with others throughout life. In social species, bonding is a matter of life and death, as offspring will not survive, or properly develop, without social care. In rodents, variation of oxytocin-dependent dopamine transmission in the striatum cause individual-differences in maternal behavior. Previous studies from our lab show that individual differences in human maternal behavior are linked to differential function of the NAcc amygdala and vmPFC. Specifically, mothers who are synchronous with their infants respond with increased "reward" neural activations to their infants. However, the involvement of dopamine in affiliation was never evaluated in humans. We applied for the first time simultaneous fMRI-PET imaging to mothers observing their infants to test the involvement of reward and dopamine in human bonding. Mothers were also tested for behavioral synchrony and plasma oxytocin. Results show for the first time that dopamine is involved in human bonding. Mothers show a differential dopaminergic response to their infant (vs. an unfamiliar infant) in the pallidum, vmPFC and ACC. In synchronous moms, dopamine is correlated to plasma oxytocin. Moreover, dopamine predicted the cohesion of brain networks of reward and affiliation. This is the first study that functionally evaluates dopamine in human bonding. Studying neurotransmitters in healthy humans is a new frontier in neuroscience. These preliminary results provide initial proof of concept for the use of MR-PET to study human affiliation, and for the critical role of dopamine in human social bonding.

*Talk 4 title:*

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Hormonal and personality correlates of women's responses to infant facial cues

Amanda Hahn<sup>1</sup>, Lisa DeBruine<sup>1</sup>, Dave Perrett<sup>1</sup>, Benedict Jones<sup>1</sup>

*Abstract:*

Infant facial cuteness can play an important role in aspects of adult-child interaction, such as caregiving behaviors. The mechanisms through which these links emerge are currently poorly understood, however. Here I will discuss research that uses a behavioral key-press task to demonstrate that women generally find high-cuteness versions of infant faces to be more rewarding than low-cuteness versions. I will also present evidence that differences in the reward value of infant facial cuteness occur both between and within women as a function of their self-reported maternal tendencies and salivary hormone levels, respectively. Collectively, these results suggest that differences in the reward value of infant facial cuteness may shape generalized motivational dispositions relating to infants and contribute to differences in caregiving behavior.

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Symposia Session 3 (24-06-2016) – 16:30 Porto room

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*Symposium title:*

Affective modulation of perception and attention and the potential embedded contribution of action processes

*Chair(s):* Stéphanie Dubal<sup>1</sup>, Julie Grèzes<sup>2</sup>

<sup>1</sup>Social and Affective Neuroscience (SAN), Institut du Cerveau et de la Moelle Epinière (ICM), UMR7225 / U1127, UPMC/CNRS/INSERM, GHU Pitié-Salpêtrière, 47 Bd de l'Hôpital, F-75651 PARIS Cedex 13

<sup>2</sup>Laboratoire de Neurosciences Cognitives (LNC), Département des études cognitives, Ecole Normale Supérieure, 29, rue d'Ulm - 75005 Paris, France

*Symposium abstract:*

The present symposium aims at putting forward current theories and hypotheses about affective modulations of perceptual and attentional processes, and the potential embedded contribution of action processes. The first two speakers will address how emotion arousal increases the gain of visual perception and attention in sensory processing areas. The first speaker demonstrates that arousal contributes to visual processing at the subjective perception level, in addition to increasing activity in primary and associative visual cortex. The second speaker reveals that arousal does not uniformly increase perceptual processing but enhances the processing of salient stimulus while impairing non-salient stimulus processing. The last two speakers will address the possibility that the detected gain of visual perception and attention may be mediated by the motor system. They investigated the influence of a task irrelevant threatening stimulus on either free decision of hand actions or on saccadic behaviors. Both speakers propose that prioritization results from an enhanced representation of the threatening stimulus in the motor system (either hand or eye-related one), which drives attentional and visual selection.

*Talk 1 title:*

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How emotional arousal contributes to visual perception

Stéphanie Dubal, Kenneth Knoblauch, Mariam Chammat

Social and Affective Neuroscience (SAN), Institut du Cerveau et de la Moelle Epinière (ICM), UMR7225 / U1127, UPMC/CNRS/INSERM, GHU Pitié-Salpêtrière, 47 Bd de l'Hôpital, F-75651 PARIS Cedex 13

*Abstract:*

Emotional properties of a visual stimulus are conveyed by physical stimulus characteristics such as color, spatial frequency and local/global features. In order to understand how physical and emotional properties interact in visual perception, we used a conjoint measurement model that allows the assessment of separate contributions of two (or more)

attributes to perceived differences in stimuli. Emotional and contrast levels of social and sensory scenes were scaled (4 point scale) to assess how judgment along one dimension is influenced by the level of the other. In a given session, observers judged either which image was of higher contrast or of higher emotion. Judgments were analyzed using Maximum Likelihood Conjoint Measurement (MLCM) the aim of which is to estimate scale values, whose additive combination best captures the observer's judgments of the perceptual difference between the stimuli in each pair. The results show that the contrast level and emotion level interact in determining perceived contrast but also that the contribution of emotion to contrast perception is additive. fMRI data further illustrated that emotion contributed to visual appearance in the primary visual cortex. Thus, the physical appearance of a stimulus is modulated by its emotional content.

*Talk 2 title:*

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Emotional arousal increases the gain on neural representations

Mara Mather<sup>1</sup>, Tae-Ho Lee<sup>1</sup>, Steven Greening<sup>1</sup>, Allison Ponzio<sup>1</sup>, David Clewett<sup>1</sup>

<sup>1</sup>The Emotion and Cognition Lab, The University of Southern California, Los Angeles, USA

*Abstract:*

Emotional arousal sometimes enhances processing of neutral stimuli and sometimes impairs it. A potential explanation for how arousal can have such different effects on stimuli is that arousal increases the gain on neural representations, enhancing activity associated with salient or high priority representations while impairing activity associated with low priority representations (Mather & Sutherland, 2011; Mather, Clewett, Sakaki, & Harley, 2015). To test this, in an fMRI study we induced arousal using fear-conditioned tones and examined how it influenced neural processing associated with more versus less salient stimuli. On each trial, participants heard a tone that had been conditioned to predict shock (CS+) or not (CS-), then saw two images (one place and one object) side by side. One image was made more salient than the other by having a higher contrast level (80% vs. 20%) and a yellow frame around it. We examined activity associated with the place stimulus using ROIs of the parahippocampal place area (PPA). Among younger adults (ages 18-34; N=28), we found that arousal induced by the CS+ tone (compared with CS- trials) increased PPA activity when the place was more salient and decreased PPA activity when the place was less salient. Thus, as predicted, arousal increased the gain on attentional processing, favoring strong and impairing weak representations. In contrast, among older adults (ages 55-75, N=24), we found that arousal increased PPA activity regardless of whether the place was salient, suggesting that arousal does not increase attentional selectivity as effectively among older adults.

*Talk 3 title:*

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Effects of threatening facial expressions on attention and action-related decisions within realistic social context

Julie Grèzes<sup>1</sup>, Marwa El Zein<sup>1</sup>, Emma Vilarem<sup>1</sup>

<sup>1</sup>Laboratoire de Neurosciences Cognitives (LNC), Département des études cognitives, Ecole Normale Supérieure, 29, rue d'Ulm - 75005 Paris, France

*Abstract:*

Evolutionary theoretical accounts suggest that emotional displays serve a communicative function, implying that 1) emotional signals have co-evolved with recipient's behavioral responses, and 2) the recipient's response should reflect the social function of the perceived expression. To experimentally address these assumptions, we created stimuli reproducing naturalistic social environments i.e. a waiting room with four seats, where the two middle seats are occupied by two individuals, one with a neutral expression and the

other one expressing either anger or fear of varying intensity. The choice of fearful and angry displays exploited the fact that their social functions differ and therefore were expected to be associated with different recipient's behavioral associations. Participants performed either a binary action-based free-choice task (decide where to sit between two free outer seats) or a perception-based visual search task (detect the orientation of a "T" appearing on either outer seat of the waiting room), in the presence of a task-irrelevant individuals. The perception-based visual search task capitalized on the knowledge that observers' current potential action enhancing attention toward action-relevant spatial location. Our results (reaction times, proportion of choice, movement cinematic, pupil dilation and direction of saccades) indicate similar but selective impact of emotional displays on attention and action selection processes: anger and fear prompt better visual discrimination in opposite sides of the scene and elicit avoidance versus affiliative approach behaviors, respectively. Altogether our data do suggest that emotional displays indeed promote elaboration of adapted decisions and specific motor actions.

*Talk 4 title:*

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The Influence of Threat on the Oculomotor System

Manon Mulckhuyse<sup>1</sup>

<sup>1</sup>Donders Institute for Brain, Cognition and Behavior, Affective Neuroscience, Radboud University, Nijmegen, The Netherlands

*Abstract:*

Saccadic eye movements reflect the dynamic interplay between endogenous and exogenous driven processes that control active vision. Endogenous (top-down or voluntary) saccades are driven by the goals or intentions of the observer, whereas exogenous (bottom-up or involuntary) saccades are controlled by visually salient events in the environment. These latter saccades are considered to be automatic and are typically faster than top-down driven saccades. Previous research showed that threatening stimuli affect saccade latency and endpoint, suggesting that threat is automatically prioritized in visual selection. However, in most studies, the threatening stimulus is always to some extent task relevant and therefore part of the goal or intention of the observer. In other words, these eye movements do not reflect emotional modulation of automatic or bottom-up driven saccadic behavior. In this talk, I will discuss several studies in which we investigated the influence of a task irrelevant threatening stimulus on saccadic behavior. Using a differential fear-conditioning procedure, we presented a threatening colored distractor (CS+) or a nonthreatening colored distractor (CS-) during oculomotor selection tasks. The results demonstrate automatic prioritization of threat; saccade trajectory was strongly modulated by a threatening distractor, oculomotor capture was modulated by a threatening distractor and the time-course of top-down driven saccades was modulated by the presence of a threatening distractor. However, threat did not affect saccade latency of bottom-up driven saccades. The findings are interpreted in terms of a neurobiological model of saccade programming.

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Symposia Session 3 (24-06-2016) – 16:30 Douro Norte room

*Symposium title:*

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Electroencephalographic advancements in the study of pain and of its cognitive and affective modulations

*Chair(s):* Diana Torta<sup>1</sup>, Elia Valentini<sup>2\*</sup>, Enrico Schulz<sup>3,4</sup>, Markus Rutgen<sup>5</sup>

<sup>1</sup>Institute of Neuroscience, System and cognitive neuroscience division (IoNS-COSY), Université Catholique de Louvain

<sup>2</sup>Department of Psychology and Centre for Brain Science, University of Essex, England, UK

<sup>\*</sup>Corresponding chair

<sup>3</sup>Oxford Centre for Functional Magnetic Resonance Imaging of the Brain, Nuffield Department of Clinical Neurosciences, University of Oxford, Oxford

<sup>4</sup>Department of Neurology, Technische Universität München, Munich, Germany

<sup>5</sup>Social, Cognitive and Affective Neuroscience Unit, Department of Basic Psychological Research and Research Methods, Faculty of Psychology, University of Vienna, Vienna, Austria

#### *Symposium abstract:*

The study of the brain processing of pain is seeing a new era of important re-appraisal. Consensus is growing on the idea that brain responses to nociceptive stimuli reflect the activity of a supramodal system devoted to detection of threat to the body, and that brain activity is primarily linked to the salience of the stimuli and behavioural relevance of the ongoing perceptual event. The symposium will cover the speakers' ongoing laboratory electroencephalography (EEG) research on healthy humans. They will illustrate how their research address the study of nociceptive and pain representation in the brain using sound methodological approaches. The content of the talks will span from the induction of high frequency stimulation of nociceptors aimed to evaluate the crossmodal influence of central sensitization on the processing of visual stimuli (D. Torta), to the investigation of intra- and inter-individual variability in the oscillatory EEG activity during phasic and tonic pain (E. Schulz). The second part will focus on the cognitive and affective modulations of nociception and pain. E. Valentini will present data showing the effect of death-related cognition on EEG activity associated with painful nociceptive stimuli, or the influence of images with death-related content on nociceptive and visual EEG responses. M. Rutgen will discuss evidence showing that the blockade of opioidergic activity during placebo analgesia can significantly modulate EEG activity associated with both the first-hand experience of pain and empathy for pain, thus suggesting the existence of a common opioidergic modulation for the two brain processes.

#### *Talk 1 title:*

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Does sustained pain induce crossmodal central sensitization?

Torta DM<sup>1</sup>, Van den Broeke EN<sup>1</sup>, Filbrich L<sup>1</sup>, Lambert J<sup>1</sup>, Legrain V<sup>1</sup>, Mouraux A<sup>1</sup>

<sup>1</sup>Institute of Neuroscience, System and cognitive neuroscience division (IoNS-COSY), Université Catholique de Louvain

#### *Abstract:*

Studies on multisensory integration and crossmodal interactions have shown that information coming from other sensory modalities can shape pain (Senkowski, Hofle et al. 2014). Much less is known about how pain may shape the processing of other sensory stimuli. Here, I will present the results of studies in which we used a novel approach to characterize electroencephalography (EEG) changes in crossmodal interactions. We used an experimental model of central sensitization, high frequency stimulation of the skin (HFS, Klein et al., 2004), and investigated the sustained *after-effects* of intense nociceptor activation on the processing of non-somatosensory (i.e. visual) stimuli. Unlike other methods to induce central sensitization, HFS does not elicit any spontaneous ongoing long-lasting sensation of discomfort or burning pain. This ensures that observed effects are not due merely to a crossmodal effect of *ongoing* pain perception but rather that they are truly related to sustained changes induced by the preceding activation of nociceptors. The results of these studies indicate that intense and sustained nociceptor activation induces an enhancement of brain responses belonging to several sensory modalities, including visual stimuli. The effects of central sensitization on brain oscillations related to the *anticipation* of these stimuli will also be discussed, together with the implication of these results for the study of chronic pain.

#### *Talk 2 title:*

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## Impact of reminders of death on pain and sensory representation as measured by electroencephalographic activity in healthy individuals

Elia Valentini<sup>1</sup>, Katharina Koch<sup>2</sup>, Valentina Nicolardi<sup>3,4</sup>

<sup>1</sup>Department of Psychology and Centre for Brain Science, University of Essex, England, UK

<sup>2</sup>Department of General Psychiatry, University of Tübingen, Tübingen, Germany

<sup>3</sup>Sapienza University of Rome, Psychology Department, Italy

<sup>4</sup>Santa Lucia Foundation, Scientific Institute for Research, Hospitalization and Health Care, Italy

### *Abstract:*

The awareness of death induces negative self-focused states and dreadful anxiety in human beings. As brain responses to nociceptive stimuli may reflect the activity of a cortical system involved in the detection of potential threats to the body, we hypothesized that the cognitive/emotional defenses induced by end-of-life related anxiety may have a profound impact on sensory processing in the brain, particularly on brain responses to nociceptive stimuli and perception thereof. In this talk, I will present and discuss data collected using electroencephalography (EEG) showing that reminders of mortality can induce a modulation of delta and theta oscillatory activity as well as of the slow late potential triggered by somatosensory nociceptive stimuli, but not by auditory threatening stimuli. I will show that these responses are associated with individual differences in state anxiety and negative mood, as well as self-esteem. In addition, I will report more recent findings on crossmodal modulation exerted by visual images with death content on the amplitude of nociceptive laser evoked potentials and oscillatory alpha desynchronization. I will discuss these findings according to an attentional and motivational account of death-related cognition grounded on a general anxiety and threat-compensation system, possibly akin to the system involved in the detection of potential threats to the body.

### *Talk 3 title:*

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Inter- and intraindividual variability of pain perception

Enrico Schulz<sup>1,2</sup>

<sup>1</sup>Oxford Centre for Functional Magnetic Resonance Imaging of the Brain, Nuffield Department of Clinical Neurosciences, University of Oxford, Oxford

<sup>2</sup>Department of Neurology, Technische Universität München, Munich, Germany

### *Abstract:*

The perception of pain is characterised by a tremendous intra- and interindividual variability. Within the brain, the encoding of pain intensity is associated with different neuronal responses.

The first part of the talk will give a brief overview of the neuronal responses to pain derived from frequency decomposed EEG data. The presentation will show how these neuronal responses subserve interindividual and intraindividual variations in the perception of identical painful stimuli.

The second part will cover the feasibility to predict the individual pain sensitivity from brain activity. With means of multivariate pattern analysis on EEG and fMRI data recent findings show how a classifier trained on a group of healthy individuals can predict another individual's pain sensitivity with high accuracy.

Finally, the third part of the talk covers a fundamental shift in the approach to investigate pain: away from ecologically less valid brief laser pain stimulation to a more natural long-lasting pain stimulation. Very recent studies will be presented that aimed to investigate the neuronal processes to resemble the duration and ongoing changes of the natural pain experience in healthy humans. The encoding of subjective pain intensity experienced by the participants differs fundamentally from that of objective stimulus intensity and from that of brief pain stimuli.

The results will be discussed in relation to anatomical findings which emphasise that the experience of pain is not a simple reflection of sensory information.

*Talk 4 title:*

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Common opioidergic modulation of first-hand experience and empathy for pain: neural evidence from event-related potentials

M. Rütgen<sup>1</sup>, E.-M. Seidel<sup>1</sup>, A. Gartus<sup>2</sup>, I. Rieccansky<sup>1,3</sup>, C. Lamm<sup>1</sup>

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<sup>3</sup>Institute of Normal and Pathological Physiology, Slovak Academy of Sciences, Bratislava, Slovakia

*Abstract:*

The investigation of shared representations of pain and empathy for pain has made considerable advance in recent years. The pain-related P2, an event-related potential, represents a reliable way to measure neural affective responses to pain. Recently, we were able to provide evidence for a placebo- modulation of the P2 also in the empathic experience of pain (Rütgen et al., JNeurosci 2015). In a behavioral study we furthermore showed that pharmacological blockade of placebo analgesia by an opioid antagonist results in an equivalent blockade of placebo empathy analgesia (Rütgen et al., PNAS 2015). However, what is missing is the demonstration of opioidergic modulation also on a neural level. This would provide more conclusive evidence of common neurotransmitter activity underlying pain and empathy for pain. We thus conducted an experiment in which we induced a placebo analgesic effect in one group and then applied an opioid antagonist to achieve a blockade of the effect. We measured P2 amplitudes and subjective ratings of this antagonist group. Compared to a placebo-only group, we found significant differences, while these measures did not differ from a non-manipulated control group. Importantly, these effects were similar for the first-hand experience of pain and empathy for pain, which provides strong evidence of a common opioidergic modulation by means of ERP indicators. Our findings contribute to accumulating evidence that empathy for pain is grounded in neural processes and neurotransmitter systems engaged by the first-hand experience of pain.

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Symposia Session 3 (24-06-2016) – 16:30 Douro Sul room

*Symposium title:*

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Eye-to-Eye Social Cognition: A Theme and Variations

*Chair(s):* Jari Hietanen<sup>1</sup>

<sup>1</sup>Human Information Processing Laboratory, School of Social Sciences and Humanities, University of Tampere, Tampere, Finland

*Symposium abstract:*

When looking at the human face, people's visual fixations typically first land in the eyes and the eye region is fixated for longer than the other facial features. The eyes are socially salient because they are a major source of information important for social interaction: eye gaze signals an individual's direction of attention and morphological changes in the eye area contain information important for the recognition of emotional facial expressions. Thus, the eye region provides cues not only about another's emotions but also about the causes of those emotions. Perception of another's direct gaze is a special social stimulus, explored in this symposium. Direct gaze is a potent social cue, observed across species. Even newborns

prefer faces with direct gaze. Seeing another person's direct gaze informs the perceiver that he/she is the target of another's attention. People often reciprocate to another's direct gaze with their own direct gaze, forming joint gaze. Receiving another's direct gaze is desirable – a cue of social inclusion. How one directs his/her own attention and gaze to other people's eyes depends on how other individuals' gaze influences his/her own attention and emotions. We demonstrate that the normative developmental trajectory and patterns of gaze behavior as well as responses to others' face and gaze can be shaped by unusual early perceptual experiences, personality, psychiatric disorders, and by neurobiological developmental disorders.

*Talk 1 title:*

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Effect of early social experience on the development of eye gaze processing in infants of blind parents

Atsushi Senju<sup>1</sup>

<sup>1</sup>Centre for Brain and Cognitive Development, Birkbeck, University of London

*Abstract:*

Eye gaze is a key channel of non-verbal communication in humans. Eye contact with others is present from birth, and eye gaze processing is crucial for social learning and adult-infant communication. However, little is known about the effect of selectively different experience of eye contact and gaze communication on early social and communicative development. In this symposium, I will present our recent study (Senju et al., 2015), which assessed 14 sighted infants of blind parents (SIBPs) longitudinally at 6–10 and 12–16 months. Face scanning and gaze following were assessed using eye tracking. In addition, naturalistic observations were made when the infants were interacting with their blind parent as well as with an unfamiliar sighted adult. Established measures of emergent autistic-like behaviors were used to assess general social cognitive development, and standardized tests of cognitive, motor, and linguistic development were also collected. These data were then compared with those obtained from a group of infants of sighted parents. Despite the results from naturalistic observation and standardized assessments showing typical social skills development overall, infants of blind parents allocated less attention to adult eye movements and gaze direction. We also observed a trend that this effect increased between 6–10 and 12–16 months of age. These results suggest that infants adjust their use of adults' eye gaze depending on gaze communication experience from early in life. The results highlight that human functional brain development shows selective experience-dependent plasticity adaptive to the individual's specific social environment.

*Talk 2 title:*

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Eye contact does not feel the same for everyone: the effects of personality and social anxiety

Jari K. Hietanen<sup>1</sup>

<sup>1</sup> Human Information Processing Laboratory, School of Social Sciences and Humanities, University of Tampere, Tampere, Finland

*Abstract:*

Eye contact between two individuals signals their preparedness for social interaction. For most people, eye contact with another person is a positive thing, but, for some, eye contact may feel negative, even threatening. I will present results from two recent studies investigating the effects of personality and social anxiety on psychophysiological and evaluative responses to eye contact. In these studies, the participants were looking at a live person as a stimulus. In the first study (Uusberg, Allik, & Hietanen, 2015), we investigated the effect of Neuroticism (Five Factor Model of personality traits) on responses to direct gaze,

averted gaze, and closed eyes. Neuroticism was negatively related to the anterior EEG asymmetry scores in response to direct gaze, indicating that higher levels of Neuroticism were associated with avoidance-related, relative right-sided EEG asymmetry. Neuroticism was also related to behavioral direct gaze avoidance and subjective averted gaze preference. In the second study (Myllyneva, Ranta, & Hietanen, 2015), we investigated adolescents with social anxiety disorder (SAD). These results showed indications of enhanced autonomic and self-evaluated arousal, avoidance-related, relative right-sided EEG asymmetry, and more negatively valenced self-evaluated feelings in adolescents with SAD compared to controls when viewing a face making eye contact. These results provide multifaceted evidence that personality and social anxiety greatly modulate physiological and subjective responses to eye contact with another person. The studies also show that facing a live person which makes participants aware of being looked at is an effective way to reveal individual differences in reactions to eye contact.

*Talk 3 title:*

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Using Live Face-to-Face fMRI to Investigate the Social Brain in Autism

Laura A. Harrison<sup>1,2</sup>, J. Michael Tyszka<sup>1</sup>, Jed Elison<sup>3</sup>, Ralph Adolphs<sup>1</sup>

<sup>1</sup>California Institute of Technology

<sup>2</sup>University of Southern California

<sup>3</sup>University of Minnesota

*Abstract:*

A large literature, primarily using picture and video stimuli, documents abnormal processing of faces and gaze in autism. Yet, pictures and real people are likely processed in quite different ways, which may be dissociatively impaired in autism. As autism is partially characterized by a persistent deficit in social interaction, it is reasonable to presume that group differences in gaze processing may be accentuated in actual interaction with another person. Findings from eye tracking studies indicate that gaze behavior is influenced by the direct presence of another person. We investigated how the neural response to gaze in autism changes as a function of the live presence of another person. We employed a novel fMRI paradigm using a live person as a stimulus. In the Live condition, participants monitored the gaze of a live actor sitting behind the bore of the magnet. Equivalent video recordings of the Live condition were used in the contrasting Video condition. Distinct patterns of neural activation to direct gaze in putative Mirror Neuron System, Theory of Mind, face-processing, and control regions were seen in individuals with autism compared to controls in the Live but not in the Video condition. In some of these regions, notably the inferior frontal gyrus, neural activity correlated with autism severity. Our findings are (1) consistent with an account of impaired top-down social processing in autism, whereby live social interaction does not elicit distinct processing, and (2) highlights the utility of ecologically valid methods, including interactive paradigms, for social neuroscience.

*Talk 4 title:*

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From face to hand: attentional bias towards expressive hands in social anxiety

Mariska E. Kret<sup>1</sup>, Jeroen J. Stekelenburg<sup>2</sup>, Beatrice de Gelder<sup>3</sup>, Karin Roelofs<sup>4</sup>

<sup>1</sup>Institute of Psychology, the Cognitive Psychology Unit, Leiden University

<sup>2</sup>Department of Social and Behavioral Sciences, Cognitive Neuropsychology, Tilburg University

<sup>3</sup>Cognitive Neuroscience, Maastricht University

<sup>4</sup>Behavioural Science Institute & Donders Institute for Brain Cognition and Behaviour, Radboud University Nijmegen

*Abstract:*

The eye-region conveys important emotional information that we spontaneously attend to. Socially submissive individuals avoid other's gaze which is regarded as avoidance of others'

emotional face expressions. But this interpretation ignores the fact that there are other sources of emotional information besides the face. Here we investigate whether gaze-aversion is associated with increased attention to emotional signals from the hands. We used eye-tracking to compare eye-fixations of pre-selected high and low socially anxious students when labelling bodily expressions (Experiment 1) with (non)-matching facial expressions (Experiment 2) and passively viewed (Experiment 3). High compared to low socially anxious individuals attended more to hand-regions. Our findings demonstrate that socially anxious individuals do attend to emotions, albeit to different signals than the eyes and the face. Our findings call for a closer investigation of alternative viewing patterns explaining gaze-avoidance and underscore that other signals besides the eyes and face must be considered to reach conclusions about social anxiety and perhaps also other disorders where gaze avoidance is typical (autism).

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Symposia Session 4 (25-06-2016) – 11:00 Porto room

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*Symposium title:*

Non invasive brain stimulation induces transient changes in neural activity and behaviour: evidence across three stimulation methods

*Chair(s):* Maimu Rehbein<sup>1</sup>, Markus Junghöfer<sup>1</sup>

<sup>1</sup>Institute for Biomagnetism and Biosignalanalysis, University Hospital Muenster, Muenster, Germany

*Symposium abstract:*

Non-invasive brain stimulation (NIBS) methods such as repetitive transcranial magnetic stimulation (rTMS) and transcranial direct current stimulation (tDCS) are increasingly used in a variety of psychiatric disorders. Andreas Fallgatter will start the symposium with giving an overview on a series of neuroimaging (EEG, fMRI, NIRS) studies in their laboratory providing first evidence for a therapeutic application of NIBS in depression, anxiety and schizophrenia. Markus Junghöfer will continue by presenting two MEG studies directly comparing effects of excitatory and inhibitory rTMS of the dorsolateral PFC on emotional face processing in healthy adults. Constantin Winker will then report convergent results of two parallel MEG and fMRI studies investigating the impact of inhibitory and excitatory tDCS of the ventromedial PFC on emotional picture processing in healthy control subjects. In the last two talks Antonio Oliviero and Javier González-Rosa will introduce transcranial static magnetic field stimulation (tSMS) as a novel and promising tool to modulate human behaviour and cerebral excitability. Overall, visitors of this symposium will be provided with detailed information concerning new developments in NIBS as well as advantages and disadvantages of different NIBS methods and target regions. They will learn how NIBS opens up promising new research avenues and might provide therapeutic applications in the future.

*Talk 1 title:*

Non-invasive brain stimulation in psychiatry

Andreas J. Fallgatter<sup>1</sup>, Thomas Dresler<sup>1</sup>, Ann-Christine Ehlis<sup>1</sup>, Christian Plewnia<sup>1</sup>

<sup>1</sup>Department of Psychiatry, University of Tuebingen, Germany

*Abstract:*

Psychiatric disorders like depression, anxiety and schizophrenias are currently mainly treated with pharmacotherapeutic and psychotherapeutic methods. The success measured as improvement of symptoms under pharmacotherapeutic and psychotherapeutic treatment strategies is surprisingly good with high effect sizes (>0.8) in randomized controlled trials. However, there is still room and need for improvement. Non-invasive brain stimulation methods like repetitive transcranial magnetic stimulation (rTMS) and transcranial direct

current stimulation (tDCS) are increasingly applied (1) in combination with neuroimaging methods like fMRI, NIRS or EEG in order to better understand the pathophysiological background of the above-mentioned psychiatric disorders or disorder-related symptoms and (2) as an alternative or add-on therapeutic approach. Evidence from multiple studies with rTMS and in the last years also with tDCS points to a major role of a dysfunction of the lateral prefrontal cortex in depression and anxiety and of the temporal cortex in auditory hallucinations in schizophrenic patients. Treatment protocols with rTMS and tDCS focussing on a functional improvement of these brain regions in the respective disorders provide first evidence for a therapeutic application. Both rTMS and tDCS are of increasing importance as methods for an improved understanding of the brain pathophysiology underlying depression, anxiety and schizophrenias as well as methods suitable for a direct therapeutic application in these disorders.

*Talk 2 title:*

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Shifting emotion regulation – opposite effects of inhibitory and excitatory prefrontal cortex stimulation

Markus Junghöfer<sup>1</sup>, Swantje Notzon<sup>2</sup>, Christian Steinberg<sup>1</sup>, Peter Zwanzger<sup>2,3</sup>

<sup>1</sup>Institute for Biomagnetism and Biosignalanalysis, University Hospital Muenster, Germany

<sup>2</sup>Department of Psychiatry, Mood and Anxiety Disorders, University Hospital Muenster, Germany

<sup>3</sup>kbo-Inn-Salzach-Hospital, Wasserburg am Inn, Germany

*Abstract:*

Repetitive transcranial magnetic stimulation (rTMS) can inhibit or facilitate cortical motor activity. Clinically, rTMS is predominately used in depression therapy with promising results. For instance, excitatory rTMS over the left dorsolateral prefrontal cortex (dlPFC) can alleviate depression symptoms. This effect is typically explained by compensating for hypoactive dlPFC regions in the left hemisphere which has often been associated with approach-related behavior. Inhibitory stimulation of the right (withdrawal-related) PFC has been suggested as alternative strategy. The right dlPFC of two groups of healthy participants were stimulated with either excitatory intermittent theta burst stimulation or inhibitory low frequency rTMS. Before and after brain stimulation participants passively viewed fearful and neutral faces while neural activity was measured by whole-head magnetoencephalography (MEG). Stimulus-related cortical generators were estimated based on inverse distributed source modelling. Two spatially extended source clusters at right occipital and right temporal regions revealed significant Expression by Group interactions. The processing of fearful compared to neutral faces was relatively increased after inhibitory stimulation whereas an opposite pattern emerged after excitatory stimulation. Convergent significant Expression by Group interactions were found for the arousal rating of faces and also for reaction times in a facial expressions discrimination task. Our results provide neural and behavioral evidence for opposite effects of inhibitory and excitatory rTMS over the right dlPFC on affective processing and thus, confirm the dlPFC as relevant target region for transcranial brain stimulation to influence disturbed emotional processing.

This work was supported by the German Research Association (DFG; SFB-TRR58-C1).

*Talk 3 title:*

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Noninvasive stimulation of the medial prefrontal cortex enhances pleasant scene processing

Constantin Winker<sup>1</sup>, Dean Sabatinelli<sup>2</sup>, Maimu Rehbein<sup>1</sup>, Markus Junghöfer<sup>1</sup>

<sup>1</sup>University of Münster, Germany

<sup>2</sup>University of Georgia, USA

*Abstract:*

Connectivity analyses of functional imaging data have shown that the medial prefrontal cortex (mPFC) - as part of a default mode network - is dysfunctional in patients suffering from major depressive disorder (MDD). Interestingly, cognitive behavioral therapy increases mPFC activation and the success of the intervention in depression is more likely, the greater mPFC activation. Additionally, the mPFC is specifically reactive to pleasant scene perception, an effect that is absent in dysphoria. These findings suggest that an excitation of the mPFC by transcranial direct current stimulation (tDCS) could reduce attentional and processing biases towards unpleasant and away from pleasant material in depression. Two different groups of 22 or 29 healthy adults provided functional magnetic resonance (fMRI) or magnetoencephalographic (MEG) data respectively. All participants received excitatory as well as inhibitory mPFC-tDCS stimulation with a 90-minute break between both sessions and directly after each stimulation viewed a series of pictures displaying natural scenes of different pleasant and unpleasant contents. FMRI data analysis revealed multiple cortical regions with interactions of the factors Stimulation (Excitatory, Inhibitory) and Valence (Pleasant, Unpleasant). Importantly almost all areas showed significant increases of pleasant picture processing after excitatory compared to inhibitory stimulation. Correspondingly, all spatio-temporal MEG clusters with significant Stimulation by Valence interactions showed relative increases of event related neural activity during pleasant picture processing after excitatory compared to inhibitory stimulation. This convergence of strong statistical effects in predicted directions across groups and methods should trigger further investigations of this novel mPFC-tDCS brain stimulation in MDD.

This work was supported by the German Research Association (DFG; SFB-TRR58-C1) and the Interdisciplinary Center for Clinical Research of the University of Münster (Ju2/024/15).

*Talk 4 title:*

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Effects of focal transcranial static magnetic fields over the brain in humans

Antonio Oliviero<sup>1</sup>, Laura Mordillo-Mateos<sup>1</sup>, Vanesa Soto-León<sup>1</sup>

<sup>1</sup>FENNSI Group; Hospital Nacional de Paraplégicos, Toledo, Spain

*Abstract:*

Despite evidence that static magnetic fields interfere with neuronal function in animals, a demonstration that static magnetic fields can influence human brain activity and behaviour is currently lacking. Recently, we demonstrated effects of tSMS over the motor, parietal and visual cortices in humans. Focal transcranial application of a moderate static magnetic field (tSMS) over the human cortices produces behavioural and neurophysiological effects in the underlying cortex. These results indicate that a powerful magnet placed on the scalp both modulates normal brain activity and induces behavioural changes in humans. This is a new technique for non-invasive brain stimulation (NIBS) virtually inexpensive, portable, and with a good possibility for sham-control design.

*Talk 5 title:*

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The use of transcranial static magnetic field stimulation (tSMS) for inducing transient changes in neural activity and behaviour

Javier J. González-Rosa<sup>1</sup>, Pablo Ortega San Miguel<sup>1</sup>, Carlos Nieto-Doval<sup>1</sup>, Clara Suárez<sup>1</sup>, Bryan A. Strange<sup>1</sup>

<sup>1</sup>Laboratory for Clinical Neuroscience, Centre of Biomedical Technology (CTB), Technical University of Madrid, Spain

*Abstract:*

The influence of static magnetic fields on biological systems has been an area of considerable interest for many years. In this respect, transcranial static magnetic field stimulation (tSMS) has been recently introduced as a promising tool to modulate human

cerebral excitability in a non-invasive and portable way. We previously reported that the continuous application of tSMS over the motor cortex induces a reduction of cortical excitability lasting several minutes after the end of tSMS. Furthermore, we have also investigated the effects of tSMS placed over the visual and parietal cortex in different experiments, demonstrating that tSMS has a profound influence, first, on oscillatory EEG activity, which may reflect a modulation of visual and parietal cortical excitability, and secondly, on visual search and visual short-term memory performances, which may be secondary to a decrease or an increase in underlying EEG oscillations. Our results suggest that focal static magnetic fields can interfere with normal brain function even at an intensity of 120 –200 mT (at 2–3 cm from the magnet surface), although further studies using tSMS are required to extend the knowledge of the functional significance of brain oscillations changes induced by the application of small magnets over the scalp.

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Symposia Session 4 (25-06-2016) – 11:00 Douro Norte room

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*Symposium title:*

How are Emotions and the Self related? Evidence from Affective, Cognitive, Behavioral and Clinical Neuroscience

*Chair(s):* Cornelia Herbert<sup>1</sup>, Georg Northoff<sup>2</sup>

<sup>1</sup>Applied Emotion and Motivation Research, Institute of Psychology and Education, University of Ulm, Germany

<sup>2</sup>Mind, Brain Imaging and Neuroethics, Institute of Mental Health Research, University of Ottawa, Ottawa, ON, Canada

*Symposium abstract:*

We describe ourselves in terms of emotional attributes indicating that the self is primarily emotional. However, the relation between self and emotions seems to be mutual: self-referential processing is often triggered by emotions and emotional processing can be modulated by self-related processing. This symposium discusses data from various contexts to determine how emotion- and self-related processes interact with each other. Neurophysiological data are presented investigating emotional and self-related processing in the brain when emotional stimuli (words, voices, faces) varying in self-reference or self-relevance are presented. Ventromedial PFC, ACC and insula appear target regions linking emotional processes to the self; the DLPFC is important for perspective taking and cognitive regulation of self-experienced emotion (e.g., during laughter perception). Although bodily self-awareness mediates self-emotion interactions in the brain and personal relevance of a stimulus facilitates affective behavior (e.g., startle reflex), some bodily changes seem more relevant for the evaluation of other- than self-related emotional stimuli. Moreover, social emotions (e.g., romantic love) extend self-related emotions to the perception of others' emotions. Crucially, being evaluated by a real person or a virtual other influences the appraisal of self-related emotional information by modulating its processing in visual and sensorimotor brain regions. This may alter the interaction between emotional and self-related processes temporarily. However, clinical disorders associated with difficulties in emotional and self-processing lead to substantial changes in emotional self-processing on a subjective and neural level. We conclude that self-emotion interactions are deeply rooted in our brain, modulated by social context, and altered in mental disorders.

*Talk 1 title:*

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The look inside: Processing and evaluation of self-related emotional stimuli in healthy participants, persons in love and patients with affective and psychotic disorders

Cornelia Herbert<sup>1</sup>, Patrick Weis<sup>2</sup>, Anissa Stekl<sup>1</sup>, Friedrich Meixner<sup>1</sup>



*Abstract:*

We rapidly discriminate emotional from neutral stimuli, quickly identify emotions displayed by others and empathize with them effortlessly. Nevertheless, one question remains: how are stimuli related to one's own emotions processed in the brain and the body? Recent studies revealed activity in the insula, amygdala, the ACC and the ventromedial prefrontal cortex, suggesting a close interaction between self- and emotion-related brain structures during processing of self-related emotional stimuli. In addition, deeper encoding of positive stimuli related to the perceiver's self was observed in the EEG. The current studies additionally investigate the role of bodily and behavioral changes in the evaluation of self-related emotional stimuli (e.g. words) and extend previous results to social emotions (romantic love), genetic differences (oxytocin) and clinical populations impaired in emotion and self-processing (e.g., depression, schizophrenia). This shows that in healthy subjects bodily changes, especially changes in facial muscle activity are more pronounced during emotional evaluation of other- than self-related emotional information. Despite this, as shown previously, across all studies a processing advantage for self-related positive stimuli was found in healthy subjects. This bias, which shows a genetic dependency, extends to the emotional other in romantic love, turns into a self-negativity bias in depression (cortical, physiological and behavioral level) and is absent in schizophrenic patients. This supports a differentiated view on the mechanisms involved in self-related processing of emotional stimuli and their role in social emotions and clinical disorders where changes in self- and emotion processing are associated with distinct cortical, physiological and behavioral response patterns.

*Talk 2 title:*

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fMRI investigations of bodily self-awareness in non-psychiatric, alexithymic and depressed individuals – support for a relationship between emotions and the self

Christine Wiebking<sup>1</sup>

<sup>1</sup>Cluster of Excellence in Cognitive Sciences, Department of Sociology of Physical Activity and Health, University of Potsdam, Germany

*Abstract:*

The awareness of stimuli originating inside the body plays an important role in human emotions and psychopathology. Personality traits such as alexithymia, characterized by difficulties recognizing and describing own emotions have been linked to increased bodily awareness, deficient emotional awareness and to emotional disorders like major depressive disorder (MDD). MDD in turn is characterized by aberrant emotion processing, increased self-focus and altered bodily awareness. The insula has been identified as a key brain region involved in bodily awareness, whereas neural activity of the anterior cingulate cortex (ACC) has been related to emotion processing and emotional self-awareness. Thus, the insula and the ACC could be target regions linking emotional processes to the self and vice versa by detecting changes in the body and supporting their self-awareness in response to emotional stimuli or affective states. The current talk shows results of an fMRI study that used a well-established paradigm for studying bodily/environmental awareness (heartbeat/tone counting) to investigate the relationship between neural activity in the insula and the ACC in populations characterized by difficulties in emotional and self-processing (alexithymic and depressed participants). Neural differences between healthy and depressed patients occurred in the supragenual ACC as a function of alexithymic traits. Compared to low alexithymia in healthy participants, high alexithymia was associated with increased insula activity during body-awareness. Finally, akin to

depressive participants, alexithymic participants showed decreased neural activity in the ACC, but increased insula activity. This might mirror a neural compensatory mechanism of bodily self-awareness in alexithymia.

*Talk 3 title:*

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Perspective of the Self in Laughter Perception

Dirk Wildgruber<sup>1</sup>, Jan Ritter<sup>1</sup>, Lena Weigel<sup>1</sup>, Heike Jacob<sup>1</sup>, Benjamin Kreifelts<sup>1</sup>

<sup>1</sup>Department of Psychiatry and Psychotherapy, University of Tübingen, Germany

*Abstract:*

Laughter is a powerful signal to express social acceptance or rejection. Recordings of distinct laughter types (taunting, tickling, joyful) can be identified well above chance level even without any contextual information and specific patterns of brain activation were identified during processing of distinct laughter types. Here, we evaluate the effect of perspective taking and the impact of social anxiety on laughter processing. Stimuli comprised 60 videos of laughing faces including three different laughter types (joyful, tickling, taunting). After stimulus presentation participants judged the intention of the laugher on a four-point scale ranging from strongly socially inclusive to strongly socially exclusive. In one session, the participants were asked to imagine they were directly addressed by the laughter (SELF), during the other session they imagined a different person was addressed (OTHER). Sixty participants (30 women) took part in a behavioral study and 26 individuals (13 women) participated in an fMRI-study. Additionally degrees of social anxiety were assessed. Joyful laughter was rated as the most inclusive and taunting as the most exclusive type. Under the SELF-condition the difference between both decreased as compared to the OTHER-condition. Moreover, we observed a negative bias irrespective of laughter type confined to the SELF-condition in participants with social anxiety. At the neurobiological level the effects of perspective taking were linked to modulation of responses within the left dorsolateral prefrontal cortex. The observed effects highlight the usefulness of laughter as a highly prevalent social signal for research on the interrelations of emotion perception and the self.

*Talk 4 title:*

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Face-to-face: Implicit variation of personal relevance in face perception

Florian Bublitzky<sup>1</sup>, Georg W. Alpers<sup>1</sup>

<sup>1</sup>University of Mannheim, School of Social Sciences, Chair of Clinical and Biological Psychology and Psychotherapy, Mannheim, Germany

*Abstract:*

The human face conveys emotional and social information. The overarching aim of the present research was to examine the mutual impact of emotional and personal relevance in face processing. To this end, two faces displaying happy, neutral, or angry faces were presented side by side. To manipulate participants' involvement, faces were presented either both facing the observer, or in profile views directed towards, or looking away from each other. In Study 1, participants (N = 46) rated the perceived personal relevance of each face pair (presented for 2 s). There were main effects of facial emotion (emotional > neutral) and face orientation (frontal > towards > away). Furthermore, interactions indicated a joint impact of emotional expression and face orientation on relevance ratings. In Study 2 (N = 44), defensive responding to auditory startle probes was tested while viewing face pairs (6 s, varying ITI). Results confirmed a personal relevance gradient which mediates defensive startle reflex, especially pronounced for angry faces. Finally, Study 3 (N = 33) measured event-related potentials (ERP) while viewing face pairs. Happy, neutral, and angry pictures were presented (1 s, no ITI) in blocks of each face orientation. Results replicated previous findings showing an early

posterior negativity (~200 ms) and late positive potential (~400 ms) for emotional compared to neutral facial expressions. In addition, a parieto-occipital positivity (~300 ms) varied according to the relevance gradient (frontal > towards > away). Taken together, the current data support the notion of facilitated face processing depending on implicit personal relevance.

*Talk 5 title:*

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It's all in your head: How putative sender identity modulates the processing of self-related emotional statements

Johanna Kissler<sup>1</sup>, Sebastian Schindler<sup>1,2</sup>

<sup>1</sup>Department of Psychology, University of Bielefeld, Bielefeld, Germany

<sup>2</sup>Center of Excellence Cognitive Interaction Technology (CITEC), University of Bielefeld, Germany

*Abstract:*

A statement's personal significance depends on the communicative context. Across three studies, we investigated how the implied source of evaluative feedback alters cortical processing. Brain event-related potentials (ERPs) were recorded as participants read word-streams consisting of positive, negative, and neutral trait adjectives, supposedly representing feedback from another human or generated by a computer. In experiment 1 the computer was portrayed as acting randomly, in experiment 2 it was portrayed as a socially intelligent system and in experiment 3 two human partners, a fellow student or a psychotherapist were said to give feedback. Actually, no interaction partner was present and feedback was always random. All experiments revealed strong effects of perceived sender and content. In experiment 1, the notion of receiving feedback from a human amplified the P2, the early posterior negativity (EPN) and the Late Positive Potential (LPP). Differences were localized in visual areas, particularly bilateral fusiform gyri. In experiment 2, sender effects were delayed, starting only with the P3. Again, sender effects were localized in the fusiform gyri, but sender identity further modulated superior frontal, anterior temporal, and sensorimotor regions. In experiment 3 the notion of an expert interaction partner accelerated feedback processing, sender effects starting with the N1. Both visual and social brain activity further increased when participants thought they were interacting with a psychotherapist. Results specify how the mere notion of different interaction partners alters the processing of identical messages in visual and social brain regions testifying to the importance of social attributions in information processing.

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Symposia Session 4 (25-06-2016) – 11:00 Douro Sul room

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*Symposium title:*

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Brain and heart responses to cognitive and social feedback processing

*Chair(s):* Gilles Pourtois<sup>1</sup>, Maurits van der Molen<sup>2</sup>

<sup>1</sup>Department of Experimental Clinical and Health Psychology, Ghent University, Belgium

<sup>2</sup>Department of Psychology, University of Amsterdam, The Netherlands

*Symposium abstract:*

Feedback processing is crucial for adaptive behavior. Typically, feedback processing had been studied using cognitive paradigms and electrocortical measures. Studies showed that performance feedback is associated with a negative component of the electrocortical response to the feedback; the feedback-related negativity (FRN). It has

been argued that the FRN is a manifestation of a neural system implicated in reinforcement learning. Obviously, feedback processing is essential in many other domains beyond cognition and performance. Cumulating evidence suggests the importance of social and affective factors in feedback processing. Moreover, recent findings indicate that feedback processing has widespread effects on bodily state as indicated by measures derived from the autonomic system. The goal of this symposium is to review recent findings on feedback processing adopting a 'cognitive x social/affective by electrocortical x autonomic' matrix. Collectively, these findings underscore the importance of feedback processing in action monitoring across vital domains of human behavior.

*Talk 1 title:*

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Beyond effects of valence and expectancy during performance monitoring: amplitude modulations of the FRN by goal relevance

Gilles Pourtois<sup>1</sup>

<sup>1</sup>Department of Experimental Clinical and Health Psychology, Ghent University, Belgium

*Abstract:*

In a series of ERP experiments, we examined whether the feedback-related negativity (FRN) recorded during a simple perceptual-motor decision task in healthy adult participants was influenced by contextual factors related to goal relevance. In the present case, we operationalized goal relevance as the information timely provided to the participant in the form of task feedback regarding the goal conduciveness of his actions. Using a within-subject design, we manipulated across blocks the feedback's information (being either high or low) provided to the participant, while keeping other task factors unchanged. Our results showed that goal relevance strongly influenced the amplitude of the FRN besides the effects brought about by valence and expectancy. Moreover, we found that in the absence of relevant feedback information, an automatic shift towards enhanced internal action monitoring was evidenced. We interpret these neurophysiological results using a new theoretical framework assuming hierarchical and dissociable effects of valence, expectancy and relevance during performance monitoring. More generally, these findings also emphasize the flexibility or context-dependence of performance monitoring brain processes.

*Talk 2 title:*

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Funny Kittens: Influence of affective stimuli on performance monitoring

Roland Nigbur<sup>1,2</sup>, Markus Ullsperger<sup>1,2,3</sup>

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*Abstract:*

The interplay of performance monitoring functions and affective variables labeled as moods or emotions has been investigated within different theoretical frameworks including conflict adaptation and reinforcement learning. However, results regarding the electrophysiological underpinnings of performance monitoring such as the error-related negativity (ERN) remain inconsistent. While some studies report ERN enhancements after positive mood induction, others find reductions due to positive affect. An additional source of complexity regards the manifold induction methods across studies. To optimize stimulus material, we conducted a two-step study using short video clips combined with a flanker paradigm. In a first experiment we used a variety of pre-rated short film clips consisting of either positive (i.e. funny animal videos or so-called fail videos) or neutral

clips (animal or sport videos). Participants were asked to perform a flanker task. In between the flanker blocks we inserted either positive or neutral film blocks participants had to rate. Besides behavioral data we measured skin conductance responses (SCR) as well as electromyographic activity (EMG) over musculus zygomaticus and musculus corrugator. In a second step we used the videos that were rated concordantly as funny or neutral to record ERN responses after positive and neutral affect in a longer EEG-experiment. While emotion only affected post error slowing on the behavioral level, ERN amplitudes were enhanced after positive mood induction blocks. These results will be discussed regarding previous evidence as well as general problems of emotion elicitation.

*Talk 3 title:*

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Social evaluative feedback processing in the brain: Electro cortical sensitivity to unexpected peer rejection

Melle J. W. van der Molen<sup>1,2</sup>, Laura M. S. Dekkers<sup>3</sup>, Michiel P. Westenberg<sup>1,2</sup>, Ferdinand M. van der Veen<sup>4</sup>, Maurits W. van der Molen<sup>3,5</sup>

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<sup>5</sup>Amsterdam Brain and Cognition, Amsterdam, the Netherlands

*Abstract:*

Social connectedness theory posits that the brain processes social rejection as a threat to survival. We here present a series of studies that aimed to gain insight in the electrocortical mechanisms of this alleged neural sensitivity to social rejection. In these studies, we have used the Social Judgment paradigm in which participants were provided with expected or unexpected social acceptance or rejection feedback. Results from these studies show that the feedback-related negativity (FRN) is sensitive to unexpected social feedback, irrespective of feedback valence. However, time-frequency decomposition of the FRN revealed an increase in theta (4-8 Hz) power, which was most prominent when participants received unexpected rejection feedback. This increase in theta power to unexpected rejection feedback could be source-localized to a neural network comprising the medial PFC, insula, and superior temporal gyrus. Collectively, these studies point to oscillatory theta power as an index of processing unexpected social rejection feedback. Possibly, theta power may serve as an important marker in investigating typical and atypical neural processing of social evaluative information.

*Talk 4 title:*

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Social anxiety is characterized by negatively biased learning about performance and the self

Leonie Koban<sup>1,2</sup>, Rebecca Schneider<sup>1</sup>, Yoni K. Ashar<sup>1,2</sup>, Jessica R. Andrews-Hanna<sup>1,2</sup>, Lauren Landy<sup>1</sup>, David A. Moscovitch<sup>3</sup>, Tor D. Wager<sup>1,2</sup>, Joanna J. Arch<sup>2</sup>

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<sup>3</sup>Department of Psychology and Centre for Mental Health Research, University of Waterloo, Canada

*Abstract:*

Social anxiety disorder (SAD) is characterized by a negative view of the self. Yet, what causes and maintains this negative self-view is not well understood. Here we employ a novel experimental social feedback task and computational model to test the hypothesis that *biased social learning* regarding self-perception and self-feelings represents a core feature

of SAD. Twenty-one adults with SAD and 35 healthy controls (HC) performed a speech in front of three judges. They subsequently evaluated themselves and received performance feedback from the judges, and rated how they felt about themselves and the judges. Changes in self-directed feelings (affective updating) were computationally modeled using a simple Rescorla- Wagner learning model. Healthy controls showed a positivity bias in affective updating, which was absent in SAD. Further, follow-up performance ratings revealed group differences in learning from positive feedback—a difference that endured for up to 1 year. These findings demonstrate the presence and long-term impact of biased learning from social feedback in SAD, suggesting an alteration in the neural systems that process social feedback and mediate learning.

*Talk 5 title:*

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The heart responds to cognitive and social feedback

Maurits van der Molen<sup>1</sup>, Riek Somsen<sup>1</sup>, Eveline Crone<sup>2</sup>, Bregtje Gunther Moor<sup>2</sup>

<sup>1</sup>Department of Psychology, University of Amsterdam, The Netherlands

<sup>2</sup>Department of Psychology, University of Leiden, The Netherlands

*Abstract:*

The predominant perspective on feedback processing is derived from electrocortical and neuroimaging measures. In this presentation, it will be shown that heart rate provides a valuable additional window on feedback processing, both in cognitive and social domains. Results of studies using cognitive paradigms (e.g., probability and rule learning) revealed that the heart responds to negative feedback with a transient heart rate slowing that is absent when feedback is positive. Results of studies using a social paradigm (social judgments) showed that, as in cognitive paradigms, heart rate slows to negative evaluations, but only when these evaluations are unexpected. For both cognitive and social domains, illustrations will be presented of how these findings can be applied in developmental studies. Finally, the case will be made that the heart rate response associated with feedback processing is a manifestation of a central-autonomic system comprising regions of the anterior cingulate cortex and insula.

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Symposia Session 5 (25-06-2016) – 14:30 Porto room

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*Symposium title:*

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Interoceptive mechanisms in cognitive neuroscience: Embodied emotion and social cognition

*Chair(s):* Ruben Azevedo<sup>1</sup>, Sarah Garfinkel<sup>2,3</sup>

<sup>1</sup>Lab of Action & Body, Royal Holloway University of London, UK

<sup>2</sup>Department of Psychiatry, Brighton and Sussex Medical School, UK

<sup>3</sup>Sackler Centre for Consciousness Science, University of Sussex, UK

*Symposium abstract:*

Cognition and emotion are dynamically influenced by internal bodily state. This symposium will address how internal visceral signals are represented in the brain, and the mechanisms through which they can alter cognition and behaviour. It will cover three major elements: Firstly, the neural mechanisms underlying interoception (i.e. the representation of internal bodily state). Secondly, how interoceptive signals shape cognitive and emotional processes. Finally, taking a translational perspective, how clinical populations with disrupted emotion and self-processing show perturbations in interoception, with corresponding changes in neural systems supporting body-brain integration.

We will start with a comprehensive examination of the neural correlates underlying representation of bodily state, as revealed by a new fMRI meta-analysis (*Stefan Schulz*). The impact of bodily state on social cognition and emotion will be exemplified through demonstrations of how signals from individual heartbeats impact the processing of (racial) threat-signalling stimuli (*Ruben Azevedo*). The generation of spontaneous self-related thoughts during mind-wandering will be shown to be guided by neural responses to heartbeats (*Mariana Babo-Rebelo*). Specific alterations in interoceptive processing will be described in patients with Autism and Schizophrenia (*Sarah Garfinkel*). Associations between altered interoception, aberrant pain perception and reduced capacity for emotion regulation will be discussed with reference to the therapeutic potential of training to enhance interoceptive awareness (*Stefan Sütterlin*).

Together, this symposium will highlight how the body is integral to cognitive and affective neuroscience, how disrupted interoceptive processes is present in clinical conditions with impaired cognitive and emotion processing and how interoceptive mechanism may be a useful treatment target.

*Talk 1 title:*

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Meta-Analysis of BOLD fMRI Correlates of Interoception

Stefan M. Schulz<sup>1,2\*</sup>

<sup>1</sup>Department of Psychology I, University of Würzburg, Germany

<sup>2</sup>Comprehensive Heart Failure Center, University of Würzburg, Germany

*Abstract:*

Interoception, defined as perceiving one's internal body and visceral sensations is related to emotional and cognitive performance. Increased or damaged interoception has been suggested as important predictor of affective disorders. To date only few studies have examined the functional-anatomical basis of interoception via BOLD fMRI in humans. Meta-analysis of these studies may reveal commonalities of neural activity related to specific aspects of interoception across subtle differences between studies.

We have identified eight studies reporting BOLD-fMRI correlates of heart-focused interoception. These were submitted to multi-level kernel density analysis in order to reveal neural activity associated with interoceptive *attentiveness* (i.e., focused attention to a particular interoceptive signal for a given time interval). Three of these studies using a task commonly employed for assessing interoceptive *accuracy* (i.e., an operationalization of interoceptive *sensitivity*) were submitted to supplementary meta-analysis.

Both analyses have corroborated a central role of the right posterior insula for cardioception. Further activation was found in claustrum, medial frontal gyrus, superior temporal gyrus, and precentral gyrus.

Our findings suggest an extended network underlying heart-focused interoceptive *attentiveness* and/or *sensitivity*, highlighting right hemispheric dominance and the role of posterior parts of the insula but also including prefrontal structures. Further research is required to differentiate whether different sources (e.g., respiration, stomach activity) or dimensions of interoception (e.g., metacognitive *awareness* of interoceptive sensitivity) share these resources.

*Talk 2 title:*

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Racial bias in a heartbeat: cardiac afferent activity modulates the expression of racial stereotypes

Ruben T. Azevedo<sup>1\*</sup>, Sarah Garfinkel<sup>2,3</sup>, Hugo D. Critchley<sup>2,3</sup>, Manos Tsakiris<sup>1</sup>

<sup>1</sup>Lab of Action & Body, Royal Holloway University of London, UK

<sup>2</sup>Department of Psychiatry, Brighton and Sussex Medical School, UK

<sup>3</sup>Sackler Centre for Consciousness Science, University of Sussex, UK

*Abstract:*

In a common form of negative racial stereotyping a person may associate Black people with threat, even when such a belief is not consciously endorsed. This bias may lead to the tragic misidentification of a harmless object as a weapon held by a Black individual. Physiological arousal can influence threat-related perception, yet little is known about how bodily states impact the expression of racial stereotyping. We demonstrate activation of race-threat stereotypes and subsequent behaviour by cardiovascular afferent information, at the level of individual heartbeats. This was achieved by tapping into the phasic activation of arterial baroreceptors, i.e. pressure sensors within major arteries from the heart, which signal the timing and strength of heartbeats (at systole), yet are quiescent between heartbeats (at diastole). Across two established tasks (Weapons Identification Task and First Person Shooter Task), stimuli depicting Black or White individuals were presented to coincide with these different phases of the cardiac cycle. Results showed that race-driven misidentification of weapons was increased during systole, when baroreceptor afferent firing was maximal, relative to diastole. Importantly a third study examining the positive stereotypical perception of Black individuals as athletic, failed to demonstrate similar modulation by cardiac cycle. Taken together, our results demonstrate that incoming cardiovascular signals exaggerate the processing of racial cues in a context-dependent way, during salient negative associations. By capitalizing upon spontaneous fluctuations in the representation of bodily arousal, we identify a body-brain interaction wherein a fundamental interoceptive mechanism mediates effects on the appraisal of social stimuli and racially-biased behaviour.

*Talk 3 title:*

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Neural responses to heartbeats in the default network encode the self in spontaneous thoughts

Mariana Babo-Rebello<sup>1\*</sup>, Craig G. Richter<sup>1,2</sup>, Catherine Tallon-Baudry<sup>1</sup>

<sup>1</sup>Laboratoire de Neurosciences Cognitives (ENS – INSERM), Département d'Etudes Cognitives, Ecole Normale Supérieure – PSL Research University, France

<sup>2</sup>Ernst Strüngmann Institute (ESI) for Neuroscience in Cooperation with Max Planck Society, Germany

*Abstract:*

It has been proposed that selfhood is grounded in the neural monitoring of internal organs such as the heart – which sends signals to the neocortex with each heartbeat – yet direct experimental evidence remains scarce. Here, we relate the neural representation of heart signals to selfhood, by measuring with magnetoencephalography neural responses to heartbeats (obtained by averaging brain activity locked to each heartbeat) during spontaneous thoughts. Participants mind-wandered while fixating, and when cued at random intervals by the appearance of a visual stimulus scored the self-relatedness of the interrupted thought according to two scales, targeting two distinct self-dimensions: whether they were engaged as the first-person perspective *subject* of the thought (the “I”), and whether they were the *object* of an introspective thought (the “Me”). Neural responses to heartbeats in two distinct regions of the default-mode network, the ventral precuneus and the ventro-medial prefrontal cortex, co-varied respectively with the “I” and the “Me” dimensions of the self expressed in thoughts. No co-variation between self-relatedness and autonomic measures (heart rate, heart rate variability, pupil diameter, electrodermal activity, respiration rate) was observed. Our results support the conceptual distinction between the “I” and the “Me”, and indicate the existence of a functional coupling between self-related processing and the neural monitoring of the heart, in the default-mode network. This could constitute a mechanism through which neural responses to heartbeats specify the self by generating a constantly updated body-centered referential, that would serve as a basis for the development of self-relatedness expressed in spontaneous thoughts.

*Talk 4 title:*

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Altered dimensions of interoception in Autism and Schizophrenia



Sarah N Garfinkel<sup>1,2</sup>, Geoff Davies<sup>3</sup>, Charlotte L Rae<sup>1,2</sup>, Anil K Seth<sup>2</sup>, Kathryn Greenwood<sup>3</sup>, Hugo D Critchley<sup>1,2</sup>

<sup>1</sup>Psychiatry, Brighton and Sussex Medical School, UK

<sup>2</sup>Sackler Centre for Consciousness Science, University of Sussex, UK

<sup>3</sup>Department of Psychology, University of Sussex, UK

*Abstract:*

Emotions and affective feelings are influenced by one's internal state of bodily arousal via *interoception*. Different clinical conditions are associated with emotion impairments, including reduced capacity for emotion recognition, emotion dysregulation and altered levels affect. We tested the hypothesis that such affective differences may arise from abnormalities in interoceptive processing in clinical disorders, with a focus on Autism (N=20) and Schizophrenia (N=40) relative to matched control participants. We demonstrate that individuals with Autism have reduced interoceptive accuracy (quantified using heartbeat detection tests) and exaggerated interoceptive sensibility (subjective sensitivity to internal sensations on self-report questionnaires), reflecting an impaired ability to objectively detect bodily signals alongside an over-inflated subjective perception of bodily sensations. The divergence of these two interoceptive axes can be computed as a trait prediction error which correlated with deficits in emotion sensitivity and occurrence of anxiety symptoms. Interoceptive awareness (defined as interoceptive metacognitive accuracy, i.e. correctly knowing you are good, or correctly knowing you are poor), was inversely related to actual interoceptive accuracy in Autism, while it significantly predicted interoceptive accuracy in our Schizophrenia sample. In addition, Schizophrenia was related to an altered network of neuronal activation underlying the body-to-brain axis. Our results indicate opposing origins of emotion deficits in Autism and Schizophrenia at the interface between body and mind, specifically in regard to metacognitive awareness into interoceptive information. These findings provide insight how different dimensions of interoception (objective, subjective and metacognitive) may predict different emotion impairments characteristic of distinct clinical disorders, with implications for potential treatment targets.

*Talk 5 title:*

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Cognitive evaluation of interoceptive information and negative health outcomes

Stefan Sütterlin<sup>1,2</sup>, Ricardo G. Lugo<sup>1</sup>, Sven C. Mueller<sup>3</sup>, Stefan M. Schulz<sup>4,5</sup>, Raymonde Scheuren<sup>6</sup>

<sup>1</sup>Department of Psychology, Lillehammer University College, Norway

<sup>2</sup>Department of Psychosomatic Medicine, Oslo University Hospital – Rikshospitalet, Norway

<sup>3</sup>Department of Experimental Clinical and Health Psychology, University of Ghent, Belgium

<sup>4</sup>Department of Psychology I, University of Würzburg, Würzburg, Germany

<sup>5</sup>Comprehensive Heart Failure Center, University of Würzburg, Germany

<sup>6</sup>Institute for Health and Behavior, University of Luxembourg, Luxembourg

*Abstract:*

Cognitive processing of interoceptive information plays a relevant role in the mediation of health complaints. In a short overview of recent studies on interoception we will focus on the cognitive evaluation of interoceptive signals. Our results strengthen the assumption of interaction effects between interoceptive sensitivity (IS) and (dys)functional cognitive-emotional processing on behavioral outcomes.

Enhanced IS has been related to an increased emotional bias in complex decision-making (Sütterlin et al., 2013). These potentially beneficial effects of interoceptive information on intuitive decision-making are in contrast to detrimental effects of available interoceptive information in Panic Disorder patients (Wölk et al., 2014). In healthy samples, our recent research suggests that both the dysfunctional cognitive processing of interoceptive cues and the tendency to engage in perseverative cognition increases the subjective experience of physical pain in the absence of a noxious stimulus (Scheuren et al., 2015). More recently,

the habitual use of rumination as a dysfunctional emotion regulation strategy has been related to high IS in adolescents (De Witte et al., 2015).

The implications of these findings are discussed in light of the potential role of training metacognitive awareness across domains (Meessen et al., 2016) and the role of altered interoceptive processes for the development and understanding of impaired decision-making in behavioral and substance addiction (Olsen et al., 2015).

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Symposia Session 5 (25-06-2016) – 14:30 Douro Norte room

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*Symposium title:*

How expectations and learning shape the experience of aversive stimuli: From behavior to brain mechanisms.

Chair(s): Marieke Jepma<sup>1</sup>, Leonie Koban<sup>2</sup>, Stephan Geuter<sup>2</sup>

<sup>1</sup>Leiden University

<sup>2</sup>University of Colorado

*Symposium abstract:*

Prior experiences strongly drive our expectations. Our expectations, in turn, can strongly influence our experiences. Such experience-expectation interaction are particularly apparent – and have important clinical implications – in the processing of threatening and painful events, as is prominently illustrated in phenomena like placebo analgesia and fear generalization. What are the cognitive and brain mechanisms underlying such interactions between expectations and experience? And how do these interactions affect learning, fear responses, and perception? In this symposium, an international group of scientists will present recent studies addressing these issues, using different behavioral, physiological, and neuroimaging methods. The first two presentations will examine the effects of threat on somatosensory processing (Van Damme), and compare the effects of pain, pain relief, and reward anticipation (Andreatta). The following three presentations will discuss how pain expectancies influence experience-based learning (Jepma), how pain learning interacts with and differs from social influences on pain (Koban), and how mismatch between expected and experienced pain can be integrated in a broader predictive-coding framework (Geuter). Together, these presentations will provide converging insights in how aversive expectations, perception, and learning mutually shape each other.

*Talk 1 title:*

Learned pain cues bias somatosensory processing at the threatened body location

Stefaan Van Damme<sup>1</sup>, Amanda Clauwaert<sup>1</sup>, Charlotte Vanden Bulcke<sup>1</sup>, Geert Crombez<sup>1</sup>

<sup>1</sup>Department of Experimental-Clinical and Health Psychology Henri, Ghent University, Belgium

*Abstract:*

Pain is a biologically relevant signal of bodily harm, activating protective responses including avoidance. Successful adaptation, however, also requires predictive learning, so that situations that are repeatedly associated with pain activate preparatory responses. It has been proposed that one such response is prioritized somatosensory processing at body locations where pain is anticipated. In this presentation it is explored how visual and proprioceptive cues for pain influence somatosensory processing. Recent behavior and EEG data in healthy individuals will be presented. In one study ( $N=110$ ), two tactile stimuli were presented (one on both hands with different SOAs), and the task was indicating which hand was stimulated first. Trials were preceded by a visual cue, signaling either experimental pain on one hand (threat) or no pain (neutral). Only in threat trials, tactile stimuli on the threatened hand were perceived earlier than on the other hand ( $F(1,109)=26.49$ ,  $p<.001$ ;  $d=0.52$  [0.31-0.72]). In another study participants ( $N=40$ ) detected

tactile stimuli either on the left or right arm, while performing a movement to the left or right. One movement was sometimes followed by pain (threat), whereas the other was not (neutral). Analyses showed that only in threat trials tactile stimuli were better detected on the threatened than on the neutral arm ( $F(1,39)=4.95$ ,  $p<.05$ ;  $d=0.37$  [0.05-0.69]). Somatosensory evoked potentials were also recorded, and will be discussed. It is concluded that pain anticipation may prioritize somatosensory processing at a threatened body location. Potential clinical implications of such processing bias will be discussed.

*Talk 2 title:*

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The appetitive side of pain and its learning effect

Marta Andreatta<sup>1</sup>

<sup>1</sup>Department of Psychology (Biological Psychology, Clinical Psychology, and Psychotherapy), University of Würzburg, Germany

*Abstract:*

Pain is an unpleasant experience and consequently pain-predicting stimuli elicit fear responses. Strikingly, pain termination elicits a pleasant reaction called relief. It remains unclear, whether the relief might work as learning signal (Study1 and Study2) and whether it might be as appetitive as a reward (Study3). In three studies, participants underwent either a pain, a relief or a reward learning protocol. During pain protocol, a geometrical shape (conditioned stimulus, painCS) preceded a painful electric shock (unconditioned stimulus, painUS). During relief protocol, a shape (reliefCS) followed the painUS that is it was displayed upon the relief. During reward protocol, a shape (rewardCS) preceded a reward (rewardUS, e.g., chocolate). In all three protocols, an additional geometrical shape (controlCS) was presented, but never associated with the USs. Participants of all three studies rated the reliefCS as negative and arousing as the painCS and more than the controlCS and the rewardCS. This indicates that a relief-associated stimulus has been subjectively experienced as aversive. On the contrary, such relief-associated stimulus elicited physiological and neural reward-like responses. Thus, startle response was attenuated and striatum was activated to the reliefCS as compared to the painCS or the controlCS. Importantly, startle attenuation to the reliefCS was comparable to startle attenuation to the rewardCS. In summary, relief entailed similar appetitive properties as reward and consequently elicited similar reward-like conditioned responses. On the contrary, relief-associated stimuli remained subjectively aversive, possibly because of their temporal proximity to pain.

*Talk 3 title:*

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Self-reinforcing expectancy effects on pain: contributions of descending pain modulation and biased learning

Marieke Jepma<sup>1</sup>

<sup>1</sup>Institute of Psychology, Cognitive Psychology Unit, Leiden University, The Netherlands

*Abstract:*

Expectancies about noxious events can strongly affect subsequent pain perception. This has been explained by descending modulation of spinal nociceptive processing via projections from cortical regions. In contrast to predictions from extinction-learning principles, expectancy effects on pain are often 'self-reinforcing' in that they persist in the absence of confirming evidence. Here, we examined the respective contributions of descending pain modulation and biased learning processes on self-reinforcing expectancy effects on pain. In two experiments, we induced cue-pain associations by conditioning different cues to either low or high noxious heat levels. In a subsequent extinction phase, all cues were followed by identical noxious heat stimuli, and we measured trial- to-trial dynamics in pain expectations, pain experience, and (in Experiment 2) fMRI activity.

Throughout the extinction phase, subjective and neural responses to identical heat stimuli were stronger following high- than low-pain cues, and these effects were mediated by participants' self-reported pain expectancies. Analyses of learning dynamics revealed that participants updated their pain expectancies more following expectancy-confirming than expectancy-disconfirming outcomes, indicating a 'confirmation bias' that maintained disproportionately strong cue-pain associations. fMRI analyses suggested that the dorsomedial prefrontal cortex has a key role in the regulation of learning rate as a function of prior beliefs. Finally, a computational model including pain-modulation and confirmation-bias processes yielded evidence for both processes and could explain most of the trial-to-trial variance in expected and experienced pain. These results can help explain why beliefs in many domains can have persistent effects even in the absence of confirming evidence.

*Talk 4 title:*

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Separate brain mediators of social influence and conditioned cue effects on pain

Leonie Koban<sup>1</sup>, Tor D Wager<sup>1</sup>

<sup>1</sup>Institute of Cognitive Science, Department of Psychology and Neuroscience, University of Colorado Boulder

*Abstract:*

Previous research suggests that pain can be strongly modulated by experience-based learning. It is less clear whether pain is also influenced by unreinforced social information. The present study investigated how conditioning and social influence change pain. In each trial of a learning task, participants were presented with one of two visual cues, serving as conditioned stimuli (CS). One cue (CS<sub>LOW</sub>) was followed by low-to-medium, the other (CS<sub>HIGH</sub>) by medium-to-high painful thermal stimulation of the forearm. In addition, participants were presented with several lines and were told that those reflected the pain ratings of other individuals. We measured expectation and pain ratings, as well as brain responses (fMRI) to painful heat. Our results showed significant effects of both unreinforced social information and CS on pain. When presented with high vicarious pain ratings, participants rated the heat as significantly more intense compared to low vicarious ratings. In parallel, pain ratings were higher when preceded by the CS<sub>HIGH</sub> compared to the CS<sub>LOW</sub>, but only for participants who were aware of the cue contingency. Both social influence and learning effects on pain were mediated by self-reported expectations. However, these effects were mediated by separable brain activation patterns that map on different large-scale networks. Whereas social influence effects were mediated by activity in fronto-parietal regions, learned cue effects were mediated by more posterior regions, including visual and cerebellar areas. In conclusion, our results demonstrate strong social influences on pain, and partially distinct brain pathways underlying learnt versus socially instructed modulation of pain.

*Talk 5 title:*

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From Intensity Coding to Predictive Coding in Pain Processing

Stephan Geuter<sup>1,2</sup>, Sabrina Boll<sup>1</sup>, Falk Eippert<sup>3</sup>, Christian Büchel<sup>1</sup>

<sup>1</sup>Department of Systems Neuroscience, University Medical Center Hamburg- Eppendorf, Germany

<sup>2</sup>Institute of Cognitive Science, University of Colorado Boulder, USA

<sup>3</sup>Centre for Functional Magnetic Resonance Imaging of the Brain (FMRIB), University of Oxford, UK

*Abstract:*

The mechanisms by which pain perception emerges from nociception are still unknown. Predictive coding theories provide a unified framework that explains how perception emerges from the integration of sensory input with internal predictions about the world. The internal model generating predictions is then updated according to the prediction

error, i.e. the mismatch between prediction and sensory input. We investigated whether pain is based on predictive coding principles using a cued heat pain paradigm and functional magnetic resonance imaging. Bayesian model comparison revealed that skin conductance, pupil dilation, and anterior insula responses strictly followed the response patterns hypothesized by our predictive coding model. In contrast, posterior insula simply encoded stimulus intensity. Interestingly, prediction errors contributed twice as much as predictions to the anterior insula signal. This highlights the critical role of updating the internal model with external information. Structural and functional changes of the anterior insula in chronic pain could thus lead to dysfunctional updating of beliefs and offer a novel interpretation of aberrant pain processing.

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Symposia Session 5 (25-06-2016) – 14:30 Douro Sul room

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*Symposium title:*

Social cognition and affective neuroscience from a female perspective: the impact of sex hormones

Chair(s): Belinda Pletzer<sup>1</sup>, Birgit Derntl<sup>2</sup>

<sup>1</sup>Department of Psychology & Centre for Cognitive Neuroscience, University of Salzburg, Austria

<sup>2</sup>Department of Psychiatry and Psychotherapy, University of Tübingen, Germany

*Symposium abstract:*

Sex differences in social cognition and emotion processing have gained increasing interest during the past years and are thought to have served adaptive purposes during evolution. More recently, these mainly behavioural findings were related to sex differences in the neural correlates of social cognition and emotion processing. However, it is less commonly recognized, how these functions and their neuroimaging correlates are influenced by sex hormones. Therefore, this symposium is dedicated towards a female perspective on this topic and focuses specifically on how hormonal fluctuations throughout the menstrual cycle and the intake of synthetic steroids in form of hormonal contraceptives affect the neural processes underlying social and emotional processing. In particular, the individual contributions to this symposium will cover social evaluative threat, face processing, mood and emotional conflict processing. Potential evolutionary functions of the menstrual cycle dependent changes (sexual selection, protection of offspring) and the resulting societal implications of hormonal contraceptive dependent changes in social and emotional functions will be discussed.

*Talk 1 title:*

The influence of menstrual cycle and androstadienone on female stress reactions

Dixon Chung<sup>1</sup>, Felix Peisen<sup>1</sup>, Lydia Kogler<sup>1,2</sup>, Sina Radke<sup>1,3</sup>, Bruce I Turetsky<sup>4</sup>, Jessica Freiherr<sup>5</sup>, Birgit Derntl<sup>1,2,3</sup>

<sup>1</sup>Department of Psychiatry, Psychotherapy and Psychosomatics, RWTH Aachen University, Germany

<sup>2</sup>Department of Psychiatry and Psychotherapy, University of Tübingen, Germany

<sup>3</sup>Jülich Aachen Research Alliance (JARA-BRAIN), Translational Brain Medicine, Germany

<sup>4</sup>Department of Psychiatry, University of Pennsylvania, Philadelphia, USA

<sup>5</sup>Department of Diagnostic and Interventional Neuroradiology, RWTH Aachen University, Germany

*Abstract:*

Androstadienone (ANDR), a synthetic male steroid, is a socially relevant chemosignal exhibited to increase positive mood and cortisol levels specifically in (perioovulatory) females in positively arousing contexts. In a negative context, we expected that ANDR could amplify social evaluative threat depending on the stress sensitivity, which differs between menstrual cycle phases. Therefore, we multi-modally challenged psychosocial stress reactions in 31

naturally cycling females (15 early follicular (EF), 16 mid-luteal (ML)) tested with ANDR and placebo treatment in a repeated-measures design.

Regardless of odor stimulation, psychosocial stress (i.e. mental arithmetic task with social evaluative threat) led to elevated negative mood and anxiety in all females. A negative association of amygdala activation and competence ratings appeared in ML-females, indicating enhanced threat processing by ANDR, particularly in ML-females who felt less competent early in the stress experience. Further, ML-females showed reduced performance and stronger stress-related hippocampus activation compared to EF-females under ANDR. Hippocampal activation in ML-females also correlated positively with post-stress subjective stress. Contrarily, such patterns were not observed in EF-females or under placebo in either group. Strikingly, unlike passive emotional processing, ANDR in a stressful context decreased cortisol concentration in all females. This points to a more complex interaction of ovarian/gonadal hormones in social threat processing and stress reactivity.

Our findings suggest that ANDR enhanced initial evaluation of self-related social threat in ML-females. Female stress reactions are related to stress sensitivity through enhanced awareness and processing of social cues in a stressful context, with menstrual cycle phase being a critical factor.

*Talk 2 title:*

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Hormonal contraceptives alter the brain structural correlates of face processing

Belinda Pletzer<sup>1</sup>

<sup>1</sup>Department of Psychology & Centre for Cognitive Neuroscience, University of Salzburg, Austria

*Abstract:*

It has previously been demonstrated, that hormonal contraceptives affect the neuroimaging correlates of face processing. Hormonal contraceptive users showed enhanced brain activation in the fusiform face area during the viewing of neutral and ambiguous faces and this increase was associated with the duration of hormonal contraceptive use. Here, we demonstrate, that hormonal contraceptive use alters the neural substrates of face processing not only functionally, but also structurally. In two studies we demonstrate increased gray matter volumes in the fusiform gyrus, particularly the fusiform face area in hormonal contraceptive users. Importantly however, the second study shows, that this increase in gray matter is restricted to users of hormonal contraceptives containing newer anti-androgenic progestins and does not occur with second and third generation contraceptives containing anti-androgenic progestins. Furthermore, we were able to establish a direct link between this increase and performance. Gray matter volumes in the FFA were related to face recognition performance, resulting in enhanced performance in users of hormonal contraceptives containing anti-androgenic progestins. As in the previous functional study, the brain structural changes were also related to the duration of pill use. Potential relations to hormonal contraceptive dependent changes in mate preferences and implications for sexual selection are discussed.

*Talk 3 title:*

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Hormonal contraceptive influence on emotion processing

Inger Sundström Poromaa<sup>1</sup>

<sup>1</sup>Department of Women's and Children's Health, Uppsala University, Sweden

*Abstract:*

The combined hormonal contraceptive (CHC) pill has been on the market for more than fifty years, yet relatively little is known on its' effects in the brain. From a clinical point of view, the most frequent complaints are the emotional side effects. Although it has been difficult to establish how common these problems are, they have a significant bearing on women's mental health. In a series of studies we have established that in women who are susceptible

to the adverse mood effects of CHCs, mood symptoms may be reinstated if these women are re-exposed to CHC. Moreover, CHC-induced mood symptoms are more common in women with neuroticism-related personality traits, and are accompanied by lowered sensory motor gating, and lower emotion-induced reactivity in the insula, and the ventromedial and orbitofrontal cortices. In a recent investigator-initiated, randomized, double-blinded, placebo-controlled study including 202 healthy women, we found that CHC use was associated with small, but significant, increases in mean anxiety, irritability, mood swings and fatigue scores, particularly during the intermenstrual phase. No difference from placebo was noted in the premenstrual and menstrual phases of the treatment cycle. Overall, these findings suggest that emotional side effects from combined hormonal contraceptive use are a real concern to young women. Furthermore, due to the difficulty in finding acceptable contraception, these susceptible women are at increased risk of unplanned pregnancies.

*Talk 4 title:*

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Changes in emotional conflict processing & stress across the menstrual cycle

Julia Sacher<sup>1</sup>

<sup>1</sup>Department of Neurology, Max Planck Institute for Human Cognitive and Brain Sciences, Germany

*Abstract:*

Several studies report distinct behavioral patterns across the menstrual cycle including changes in spatial orientation, selective attention, cognitive flexibility and processing speed, as well as emotion recognition, reward processing, and decision making among others. While these findings for emotional and cognitive processing represent important contributions to our understanding of different aspects of behavior that might be influenced by the menstrual cycle, it is the parallel execution of both emotional and cognitive processing that is required for optimal performance in a situation of emotional conflict. However, little is known about whether emotional conflict processing is affected by the menstrual cycle phase and how performance in women with premenstrual syndrome (PMS) differs from that in women without PMS. In a pilot study, we measured performance in an emotional conflict task and, given that cortisol has been shown to affect emotional processing in general and it has also been shown that women with severe PMS show distinct cortisol pattern changes, we also included stress levels in women with PMS (n=15) and women without PMS (n=15) throughout their menstrual cycle. We found a significant increase ( $p=0.001$ ) in the mean reaction time for resolving emotional conflict from the follicular to the luteal cycle phase in all subjects. Only women with PMS demonstrated an increase in physiological and subjective stress measures during the luteal menstrual cycle phase. Our findings suggest that the menstrual cycle modulates the integration of emotional and cognitive processing in all women. Preliminary data are supportive of the secondary hypothesis that stress levels are mediated by the menstrual cycle phase only in women with PMS. The presented evidence for menstrual cycle-specific differences in integrating emotional and cognitive information highlights the importance of controlling for menstrual cycle phase in studies that aim to elucidate the interplay of emotion and cognition.

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Symposia Session 6 (25-06-2016) – 16:30 Porto room

*Symposium title:*

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Avoidance and reversal of conditioned fear: Processes and paradoxes

*Chair(s):* Paul Pauli<sup>1</sup>, Johanna Baas<sup>2</sup>

<sup>1</sup>University of Würzburg, Germany

<sup>2</sup>Utrecht University, The Netherlands

*Symposium abstract:*

Most anxiety disorders are characterized by strong fear in response to specific stimuli or contexts and avoidance of such fear triggers. According to fear conditioning models classical as well as operant conditioning are crucially involved in the development of anxiety disorders. Avoidance is assumed to be reinforced by the absence of the feared negative consequence and simultaneously obstructs extinction learning. Animal as well as human studies unraveled important factors modulating and mediating classical conditioning processes involved in the acquisition of fear triggers. This symposium will move one step further and discuss studies examining the interplay between acquisition, extinction, and reversal of conditioned fear and avoidance behavior. Why do anxiety patients maintain avoidance behavior even after extinction? Does avoidance behavior contribute to return of conditioned fear? Do anxious and non-anxious individuals differ in the experienced relief following avoidance behavior and in the processing of stimuli predicting relief or punishment? Which brain areas contribute to fear reversal learning, i.e. learning that a previously fear stimulus becomes safe and vice versa? Is such reversal learning disturbed in OCD patients characterized by strong avoidance behavior? How does exposure and avoidance of exposure contribute to treatment efficacy? Which treatment components change exposure behavior most? Studies addressing these research question will be presented and finally critically summarized.

*Talk 1 title:*

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Avoidance behavior in humans is resistant to extinction and triggers return of fear

Johanna Baas<sup>1</sup>

<sup>1</sup>Department of Experimental Psychology, Utrecht University, Utrecht, The Netherlands

*Abstract:*

Previous research has shown that avoidance preserves threat beliefs by blocking extinction learning. However, the effect of intermittent avoidance behavior during extinction learning remains untested. Acquisition consisted of two CS+'s paired with a shock (50% reinforcement). In the subsequent avoidance phase, participants could press a button to avoid the US during CS+A while this was not possible during CS+U. During extinction, incidental avoidance trials were interjected between blocks of extinction trials to test (1) whether avoidance responses would be executed despite ongoing extinction learning, and (2) effect of incidental avoidance on extinction. Fear-potentiated startle (FPS) was assessed to determine conditioned Pavlovian responding. After the first block (8 out of 24) extinction trials, FPS was no longer significantly different between both CS+'s and CS-, indicating extinction of fear. Yet, the majority of subjects (66%) kept executing the avoidance response throughout extinction. In addition, trial-by-trial analysis following the incidental avoidance trials during extinction indicated a return of FPS in CS+A trials directly after an avoidance trial. Hence, extinction of fear is not enough to eliminate avoidance behavior, and continued avoidant behavior during extinction triggers a return of fear specifically for the avoided stimulus. The mechanism behind the latter effect has yet to be determined; is being reminded of the avoidance response enough to reinstate FPS in subsequent trials, or is actual execution of the response critical for fear to return? Results of an experiment in which the avoidance cue is presented but the avoidance response is made unavailable will be also presented.

*Talk 2 title:*

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Learning processes underlying avoidance of negative outcomes

Marta Andreatta<sup>1</sup>, Sebastian Michelmann<sup>1,2</sup>, Paul Pauli<sup>1,3</sup>, Johannes Hewig<sup>4</sup>

<sup>1</sup>Department of Psychology (Biological Psychology, Clinical Psychology, and Psychotherapy), University of Würzburg, Germany



<sup>2</sup>School of Psychology, University of Birmingham, UK

<sup>3</sup>Center of Mental Health, Medical Faculty, University of Würzburg, Germany

<sup>4</sup>Department of Psychology (Differential Psychology, Personality Psychology, and Psychological Diagnostics), University of Würzburg, Germany

**Abstract:**

Successful avoidance of threatening events works as negative reinforcer and elicits reward-like responses, i.e. relief. Avoidance has been implicated in the etiology of anxiety disorders. Here, we investigated the learning-related properties of threat avoidance with the feedback related negativity (FRN) in individuals with high- or low-anxiety traits. The FRN is modulated by violations of an expected outcome, i.e. the bigger the difference between expected and actual outcome, the larger is the FRN amplitude. Fourteen high and 14 low anxious participants underwent operant conditioning, in which a behavior (button press) allowed them to avoid a mild painful electric shock. Specifically, if they pressed the pain-associated button, 1s later a negative feedback (nFB) was presented and the shock was delivered. If they pressed the relief-associated button, 1s later a positive feedback (pFB) was presented and no shock was delivered. Response was reinforced 80% of the times. Participants pressed significantly more often the relief-associated button than the pain-associated button and FRN amplitude to nFB was significantly larger than to pFB. High-anxious individuals showed larger N100 and P200 amplitudes to nFB vs. pFB indicating early discrimination of the feedback. However, these participants presented equal FRN amplitude to nFB and pFB. In sum, high-anxious individuals discriminated feedbacks on an automatic level, but they do not discriminate them on a cognitive level. The probability to get the punishment after a relief-associated response is smaller than after a pain-associated response. Possibly, high anxious individuals after having learned the association, they do not further consider feedback-related differences.

**Talk 3 title:**

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Impaired use of vmPFC safety signaling in Obsessive Compulsive Disorder disrupts flexible responding to threat

Annemieke M. Apergis-Schoute<sup>1,2,3</sup>, Claire M. Gillan<sup>4</sup>, Naomi A. Fineberg<sup>5,6</sup>, Emilio Fernandez-Egea<sup>3</sup>, Barbara J. Sahakian<sup>2,3</sup>, Trevor W. Robbins<sup>1,3</sup>

<sup>1,2,3</sup>Departments of Psychology and Psychiatry, and the Behavioural and Clinical Neuroscience Institute, University of Cambridge, UK

<sup>4</sup>the Department of Psychology at New York University, New York

<sup>5</sup>South Essex Partnership University NHS Foundation Trust, Springhouse, Biggleswade Hospital, UK

<sup>6</sup>Department of Psychiatry, Queen Elizabeth II Hospital, UK; Postgraduate Medical School, University of Hertfordshire, UK

**Abstract:**

The aim of our study was to investigate the putative interaction between anxiety and cognitive inflexibility in Obsessive Compulsive Disorder, examining its neural and behavioral components. We employed neuroimaging of Pavlovian fear reversal, a well-validated paradigm for studying flexible updating when the contingencies for a threatening (CS+, reinforced with a mild shock to the wrist at 30%) and safe stimulus (CS-) reverse. We compared fear reversal learning in 43 OCD patients and 35 matched healthy controls by assessing threat expectancy with skin conductance responses (SCRs) and its neural correlates with functional magnetic resonance imaging. Learning was quantified as the difference between SCRs to the CS+ and CS- during acquisition and reversal, which were divided in to early (first half) and late (second half) phases. OCD patients and healthy controls both showed intact early and late fear learning. However during early and late reversal only healthy controls differentiated the CS+ and CS-, while OCD patients failed to differentiate between stimuli during both early and late stages of reversal. Increased activation of the ventromedial prefrontal cortex (vmPFC) during early conditioning predicted the degree of generalization in OCD patients during reversal whilst vmPFC safety

signals for updating the CS- were non-existent. Regions of the salience network (dorsal anterior cingulate, insula and thalamus) showed early learning task related hyperconnectivity with the vmPFC in OCD, consistent with increased processing of the CS+. Our findings reveal an absence of vmPFC safety signaling in OCD, undermining flexible threat updating and explicit contingency knowledge in this disorder.

*Talk 4 title:*

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Limited generalization effects of exposure-based therapy on avoidance behavior in patients with panic disorder and agoraphobia

Jan Richter<sup>1</sup>, Alfons O. Hamm<sup>1</sup> & the German panic-network consortium

<sup>1</sup>Department of Physiological and Clinical Psychology, Ernst-Moritz-Arndt-University Greifswald, Germany

*Abstract:*

So far mechanisms of fear reduction during exposure-based therapy remained unclear. Most theoretical considerations, e.g. extinction learning, focus on processes during confronting phobic stimuli but are neglecting the effect of avoidance behavior. Also, little is known about processes of generalization of therapeutic experiences to all-day life. We investigated the effect of repetitive exposure to a behavioral avoidance test (BAT) in 345 patients with PD/AG with observable behavior, subjective ratings and physiological responses as fear indicators. Comparing those patients receiving high-doses exposure therapy between the three BAT assessments (T-group; psycho-education between t1 and t2; exposure exercises between t2 and t3) with those patients without intervention (WLC-group; time parallelized assessments) we found that avoidance to the test chamber reduced over time in both groups. However, behavior changed more strongly in the T-group but only between t1 and t2. Importantly, over the half of avoiding patients also failed to expose to the BAT after therapy indicating very limited generalization of therapeutic effects. In those patients showing no avoidance during all BAT assessments subjective fear ratings and autonomic arousal significantly decreased over time, again in both groups. Again fear reduction was more pronounced in the T- group, but now between t2 and t3. In sum, we found evidence that exposure to a phobic situation reduces fear even without therapeutic support, which, however, facilitated fear reduction. Most important, the supportive effects depended on level of fear: psycho-education intensified elimination of avoidance behavior, while exposure exercises during therapy were associated to less in-situ BAT fear reactivity.

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Symposia Session 6 (25-06-2016) – 16:30 Douro Norte room

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*Symposium title:*

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Bad Brains: Prejudice, Immorality, and Other Nefarious Behaviours

*Chair(s):* Lasana T. Harris<sup>1,2</sup>

<sup>1</sup>Experimental Psychology, University College London, UK

<sup>2</sup>Social and Organisational Psychology, Leiden University, The Netherlands

*Symposium abstract:*

This symposium explores social neuroscience that addresses the neural and psychological underpinnings of nefarious behaviours, including prejudice and immorality. Such behaviour can be due to individual differences, or driven by contextual effects. Here, we focus on the latter, exploring how the social context can influence neural processes that lead to prejudicial and immoral behaviours. The first half of the symposium discusses recent evidence

exploring the impact of social group processes on such bad behaviour; first demonstrating that processing of emotional signals from others is moderated by group membership, perhaps leading to a lack of empathic responding to outgroup members, then identifying common brain processes involved in fear learning and aversion and racial bias, which suggests why prejudiced responses are difficult to ameliorate. The second half of the symposium explores immoral behaviours; first exploring the influence of neurotransmitters on perceptions of immoral people and behaviours, bringing computational approaches to bear on attributions of moral character, then describing the impact of the social context on brain mechanisms necessary for social cognition and empathic processing, suggesting that people may utilize dehumanisation as a pro-active emotion regulation strategy. Therefore, this symposium presents cutting edge research that explores bad brains and their role in nefarious behaviours.

*Talk 1 title:*

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The impact of minimal group membership on the processing of others' emotional signals

Julie Grèzes<sup>1</sup>

<sup>1</sup>Département d'Études Cognitives, École Normale Supérieure, France

*Abstract:*

Mere affiliation to a social group alters people's perception of other individuals. It has been recently suggested that group membership triggers divergent visual facial representations for in-group and out-group members, which could act as top-down expectations, constraining face processing. Here, using EEG along with fMRI during a group categorization task, we investigated the impact of mere affiliation to an arbitrary group on the processing of emotional faces. We show that activity in the earliest stages of emotional processing (30-100ms after expression onset) in temporo-parietal junction was enhanced for unexpected group-related emotions. This pattern of activity most likely resulted from top-down influences from medial prefrontal cortex, where group membership was encoded. A follow-up emotion categorization task further revealed that group-membership information biased the interpretation of facial expressions in favor of expected group-related emotions, without impacting perceptual sensitivity to expected emotional facial features. Taken together, the present results demonstrate that mere membership in an arbitrary group induces polarized expectations for in-group and out-group members, which bias the appraisal of their emotional expressions in a very fast and probably reflexive manner.

*Talk 2 title:*

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Brain substrates of biased fear learning and social interaction in an intergroup context

Tanaz Molapour<sup>1</sup>, Armita Golkar<sup>1</sup>, Carlos David Navarrete<sup>2</sup>, Jan Haaker<sup>1</sup>, Andreas Olsson<sup>1</sup>

<sup>1</sup>Department of Clinical Neuroscience, Karolinska Institutet, Sweden

<sup>2</sup>Department of Psychology, Michigan State University, USA

*Abstract:*

The role of learned aversions in phobic avoidance behavior is well recognized, however, the role of learned aversions in social interactions remains largely unknown. We investigated how aversive experiences guide and influence behavior in a social context. We used a fear-conditioning paradigm to investigate the neural substrates of aversive learning biases towards racial in-group and out-group members, and their predictive value for discriminatory interactive behavior towards other virtual members of the racial out-group. Our results demonstrate that activity in brain regions previously linked to conditioned fear, and perception of individuals belonging to racial or stigmatized outgroups, jointly contribute to differential brain activity and biased behavior based on race. In particular, we found that the amygdala and anterior insula (AI) played key roles in differentiating between in-group and out-group faces both when the faces were paired with a mild shock (acquisition) and

when no more shocks were administered (extinction). Moreover, we showed that activity in this brain network was related to participants' discriminatory interactions with novel out-group members on a later day. Our findings reveal the importance of learned aversions in anti-social behaviors in social contexts.

*Talk 3 title:*

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Dehumanised Perception: How the Social Context Promotes Inhumane Behaviour

Lasana T. Harris<sup>1</sup>

<sup>1</sup>Experimental Psychology, University College London, Great Britain; Social & Organisational Psychology, Leiden University, The Netherlands

*Abstract:*

Secular theories of evil hold the social context responsible for heinous acts (Arendt, 1963; Kant, 1785). Indeed, social psychology has demonstrated that social contexts can cause people to ignore the suffering of others (Darley & Batson, 1973; Latane & Darley, 1968), administer dangerous electric shocks (Milgrim, 1963), and abuse 'prisoners' in artificial holding cells in the basement of a psychology department (Haney, Banks, & Zimbardo, 1973). Such evidence, however, does not elucidate more proximal mechanisms. Social neuroscience research over the last decade has identified such a proximal mechanism: dehumanized perception (see Harris & Fiske, 2009, for review). Recognising another as a full human being deserving of moral protection with whom one should obey social norms and moral rules when interacting requires social cognition: thinking about the other's mind. I present evidence not only that people fail to engage parts of the brain necessary for social cognition when placed in a variety of social contexts that promote dehumanisation (Harris & Fiske, 2006; 2007; 2011; Harris, Lee, Capestany, & Cohen, 2014), but that such dehumanisation responses allow empathy avoidance, serving as a pro-active emotion regulations strategy (Cameron, Harris, & Payne, 2015). Therefore, dehumanised perception is not reserved for evil people; most people can engage dehumanised perception if promoted by the social context.

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Symposia Session 6 (25-06-2016) – 16:30 Douro Sul room

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*Symposium title:*

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New evidence on the role of the Cerebellum in Social Cognition

*Chair(s):* Frank Van Overwalle<sup>1</sup>

<sup>1</sup>Vrije Universiteit Brussel

*Symposium abstract:*

This symposium investigates the undervalued role of the cerebellum in social cognition. Novel evidence indeed demonstrates that the cerebellum is much more involved in social cognition than assumed so far. To provide some general introduction and overview, Frank Van Overwalle presents evidence from a large scale meta-analysis and novel meta-connectivity analyses, demonstrating that the cerebellum plays a critical role in social cognition, both in mirror and mentalizing functions. Each of these functions are subserved by distinct areas in the cerebellum. But what is the function of the cerebellum in social cognition? To learn more about this, Chiara Ferrari presents data suggesting that the cerebellum is involved in sequences processing, acting as a sort of "forward controller". This role of sequence processing has been extended from motor and sensory processes into the cognitive level. Using transcranial magnetic stimulation, she shows that virtual lesions of cerebellar hemispheres impair participants' ability to detect violations in just-learned sequences. The next two speakers explore the role of the cerebellum in social disorders of clinical populations. Gary Donohoe presents data suggesting the involvement of the

cerebellum in emotion processing and theory of mind among schizophrenic patients. In addition, he describes evidence suggesting a genetic contribution to cerebellar activity during social processing. Finally, Giusy Olivito investigates cerebellar functional connectivity and social behavior in patients with autism spectrum disorders. Using resting-state fMRI, decreased functional connectivity was detected between cerebellar output channels (dentate nucleus) and cerebral regions involved in social brain networks.

*Talk 1 title:*

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Is the cerebellum involved in social cognition? Novel meta-analytic and multi-study connectivity findings

Frank Van Overwalle<sup>1</sup>, Peter Mariën<sup>1</sup>

<sup>1</sup>Vrije Universiteit Brussel

*Abstract:*

In a recent meta-analysis, Van Overwalle and colleagues (2014) documented that the cerebellum is implicated in social processes of “body” reading (mirroring; e.g., understanding other persons' intentions from observing their movements) and “mind” reading (mentalizing, e.g., inferring other persons' beliefs, intentions or personality traits, reconstructing persons' past, future or hypothetical events). In a recent functional connectivity study, Buckner and colleagues (2011) offered a novel parcellation of cerebellar topography that substantially overlaps with the cerebellar meta-analytic findings of Van Overwalle et al. (2014). This suggests that the involvement of the cerebellum in social reasoning depends on its functional connectivity with the cerebrum. To test this hypothesis, we explored the meta-analytic co-activations as indices of functional connectivity between the cerebellum and the cerebrum during social cognition. The results confirm substantial and distinct connectivity with respect to the functions of (a) action understanding (“body” reading) and (b) mentalizing (“mind” reading). In a follow-up multi-study connectivity analysis, the functional connectivity of the cerebellum with the cerebrum in social mentalizing was explored. The analysis covered 5 studies (n = 92) involving abstract and complex forms of social mentalizing. The results confirmed that cerebellar activity during these social processes reflects a domain-specific mentalizing functionality that is strongly connected with a corresponding mentalizing network in the cerebrum. The consistent and strong connectivity findings suggest that cerebellar activity during social judgments reflects distinct mirroring and mentalizing functionality, and that these cerebellar functions are connected with corresponding functional networks in the cerebrum.

*Talk 2 title:*

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The cerebellum is involved in sequences processing and prediction: a TMS study

Ferrari C.<sup>1</sup>, Casiraghi L.<sup>2,3</sup>, Oldrati, V.<sup>2,3</sup>, Bergonzoli, S.<sup>2,3</sup>, Cattaneo, Z.<sup>1,3</sup>, Vecchi, T.<sup>2,3</sup>

<sup>1</sup>Department of Psychology, University of Milano-Bicocca, Italy

<sup>2</sup>Department of Brain and Behavioral Sciences, University of Pavia, Italy

<sup>3</sup>Brain Connectivity Center, National Neurological Institute, C. Mondino, Italy

*Abstract:*

Evidence from patients with cerebellar lesions and neuroimaging findings in healthy participants suggest that the cerebellum is involved in motor and sensory sequences processing, acting as a sort of “forward controller”. Furthermore, the cerebellum seems to play a role also in processing repetitions of events (i.e., sequences) that are not sensory- or motor-based but pertain to the cognitive level. In this study, we aimed to investigate the cerebellar contribution in processing sequences based on different relational rules by means of transcranial magnetic stimulation (TMS). In Experiment 1, we showed that online TMS over cerebellar hemispheres significantly impaired participants' ability to detect violations in just-

learnt sequences. Experiment 2 replicated the effects of cerebellar TMS on just-learnt sequences, but showed that interfering with cerebellar activity does not affect processing of overlearned sequences, such as alphabetic or numerical strings. Our results point to a casual role of the cerebellum in (non-motor) sequences processing and prediction and suggest that cerebellar involvement in sequence processing is modulated by the extent to which series are familiar (novel vs. overlearned) to the participants.

*Talk 3 title:*

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Emotion and Theory of Mind in Schizophrenia - Investigating the Role of the Cerebellum

Gary Donohoe<sup>1</sup>, Omar Mothersill<sup>1</sup>

<sup>1</sup>CogGene Research Group, School of Psychology, National University of Ireland Galway, University Road, Ireland

*Abstract:*

Deficits in social cognition, including deficits in facial emotion recognition and theory of mind, are a core feature of schizophrenia and more strongly predicts functional outcome than neurocognition alone. Although traditionally considered to play an important role in motor coordination, the cerebellum has recently been suggested to play an important role in emotion processing and theory of mind, and also shows structural and functional abnormalities in schizophrenia. In this presentation we will outline the evidence for the involvement of the cerebellum in social cognition, specifically in emotion processing and theory of mind. We will then describe the evidence from our group of difference between patients (n=25) and controls (n=21) during a face processing task. We will also describe genetic studies we have undertaken of face processing based on the genome wide associated variants ZNF804A, MRI137 and CANCEA1C in n=81 healthy controls to discuss whether there is evidence of a genetic contribution to cerebellar activity during social processing to date. We will conclude by suggesting that there is now significant evidence of the cerebellum's contribution to deficits in social information processing in schizophrenia, although the precise neural substrates by which this occurs remains to be elucidated.

*Talk 3 title:*

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Cerebellar functional connectivity and social behavior in patients with Autism Spectrum Disorders

Giusy Olivito<sup>1,2</sup>, Maria Leggio<sup>1,2</sup>

<sup>1</sup>Department of Psychology, Faculty of Medicine and Psychology, "Sapienza" University of Rome, Italy  
<sup>2</sup>Ataxia Laboratory, IRCCS Santa Lucia Foundation, Italy

*Abstract:*

Autism spectrum disorders (ASDs) are known to be characterized by core deficits in theory of mind processes and to involve a complex neural network including cortical and subcortical brain areas. Converging evidence from voxel based morphometry studies have shown not only cerebellar structural alterations in ASDs but also a vulnerability of specific cerebellar regions. Furthermore, functional connectivity (FC) between the mentalizing network of the cerebrum and mentalizing areas in the cerebellum demonstrated that the cerebellum plays a crucial role in social cognition by recruitment of domain-specific mentalizing processes. In order to clarify the cerebellar role in ASDs social deficits, resting-state functional Magnetic Resonance Imaging (rs-fMRI) was performed in subjects with ASDs to investigate FC between the cerebellar dentate nucleus (DN) - that is the output channel of cerebellar processed information - and cortical regions that are the target of cerebellar projections. A decreased FC was detected between the cerebellar DN and cerebral regions involved in social brain networks strongly implicated in ASDs, such as the Default Mode network. Additionally, areas of altered FC showed a positive correlation with social cognition

scores providing further support into understanding the link between cerebellar connectivity and theory of mind processes in ASDs. Overall, social behavior of ASDs may be interpreted as result of altered FC between cerebellum and key cortical social brain regions, confirming the crucial role of the cerebellum in social cognition by modulating mentalizing cortical areas.

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Symposia Session 7 (26-06-2016) – 10:30 Porto room

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*Symposium title:*

Novel perspectives in Social Cognitive Neuroscience

*Chair(s):* Claus Lamm<sup>1</sup>

<sup>1</sup>Social, Cognitive and Affective Neuroscience Unit, University of Vienna, Austria

*Symposium abstract:*

The last decade has considerably advanced our understanding of the neural bases of social affect and cognition. Progress, however, has also been limited by methodological and conceptual shortcomings, such as e.g. that most of the evidence is based on correlative rather than causal research designs. The present symposium brings together scholars whose work adopts novel perspectives to overcome the limitations of prevailing research approaches. The contribution by L. Schilbach introduces the concept of "second person neuroscience", highlighting that a deeper understanding of social interaction requires more ecologically valid paradigms as previously used. M. Rütgen will then present how experimental psychological and pharmacological manipulations in combination with a multi-modal neuroimaging approach help to attain more mechanistic insights into empathy and affect sharing. Extending this approach, I. Santiesteban will demonstrate how our understanding of self-other distinction can be improved by a combination of causal-experimental measures including behavioural training, cross-cultural manipulations and non-invasive brain stimulation. Finally, G. Silani illustrates how adopting a clinical and a developmental social cognitive neuroscience perspective can be exploited to understand the origins and development of emotional egocentricity, and its regulation. Apart from focusing on the specific content of their research, each presenter will also introduce the strengths and the potential of the novel methodological and conceptual approaches they are advocating. The symposium will therefore be of broad interest and relevance for researchers in all sub-domains of Social, Cognitive and Affective Neuroscience.

*Talk 1 title:*

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Toward a second-person neuroscience: New developments in social neuroscience and implications for the transdiagnostic study of the neurobiology of psychiatric disorders

Leonhard Schilbach<sup>1</sup>

<sup>1</sup>Independent Max Planck Research Group for Social Neuroscience at the Max Planck Institute of Psychiatry, Germany

*Abstract:*

In spite of the remarkable progress made in the burgeoning field of social neuroscience, the neural mechanisms that underlie social encounters are only beginning to be studied and could – paradoxically – be seen as representing the "dark matter" of social neuroscience. Recent conceptual and empirical developments consistently indicate the need for investigations that allow the study of real-time social encounters in a truly interactive manner. In this talk, I will outline the theoretical conception of a second-person approach to other minds and will present evidence from functional neuroimaging studies to argue for the development of a second-person neuroscience, which may help neuroscience to really "go social". Furthermore, I will present data from patient studies to indicate how a focus on social

interaction may also be relevant for our understanding of the neurobiology of psychiatric disorders construed as disorders of social interaction rather than social observation.

*Talk 2 title:*

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The phenomenon of placebo empathy analgesia: multimethod evidence for shared representations between first-hand experience and empathy for pain

Markus Rütgen<sup>1</sup>

<sup>1</sup>Social, Cognitive and Affective Neuroscience Unit, University of Vienna, Austria

*Abstract:*

Partially overlapping neural responses to painful experiences and empathy for pain could be taken as evidence for theories of shared representations of emotions. Due to methodological limitations of previous studies and technical limitations of neuroscientific measures, it is unclear whether such shared activations imply that pain empathy engages similar neural functions as first-hand pain experiences. To overcome these limitations, we pursued a conceptually novel approach: we used the phenomenon of placebo analgesia to experimentally reduce the first-hand experience of pain, and assessed whether this results in a concomitant reduction of empathy for pain. We measured subjective ratings and neural correlates of pain processing in a series of multimethod studies. By combining this highly specific manipulation with the use of electroencephalography (first study), functional magnetic resonance imaging (second study) and psychopharmacology (third study) we were able to repeatedly demonstrate a common modulation of both phenomena and, furthermore, show a link to the endogenous opioid system. In the first study, we found significant placebo-induced reductions of the pain-related P2 component in first-hand and vicarious experience of pain. In the second study, we demonstrated modulation of regions related to pain affect by placebo analgesia in both conditions. And finally, in the third study we successfully blocked placebo analgesia in both conditions with an opioid receptor antagonist. Taken together, these findings suggest that pain empathy may be associated with neural responses and neurotransmitter activity engaged during first-hand pain, and thus might indeed be grounded in our own pain experiences.

*Talk 3 title:*

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Understanding Self-Other Processes in Social Cognition from behavioural and non-invasive brain stimulation studies

Idalmis Santiesteban<sup>1</sup>

<sup>1</sup>Department of Psychology, University of Cambridge, UK

*Abstract:*

To develop and maintain the long-lasting social relationships crucial for our well-being, we must be able not only to connect or identify with others, but also to differentiate our own thoughts and feelings from those of our interaction partners. This process of 'self-other distinction' is important for a number of socio-cognitive abilities such as the control of imitation, visual perspective taking and theory of mind. My research investigates the extent to which mechanisms underlying self-other processes are shared or differ across various social abilities. In this talk, I will present some of our recent findings from studies aiming to address this research question using a range of methodologies such as behavioural training, cross-cultural manipulations and non-invasive brain stimulation. I will argue that adopting a wider approach to the investigation of self-other processes contributes towards a better understanding of the mechanisms underlying socio-cognitive abilities.

*Talk 4 title:*

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When affect sharing and self-other distinction fail: understanding emotional egocentricity bias from a clinical and developmental perspective

Giorgia Silani<sup>1</sup>

<sup>1</sup>Social and Collective Emotions Laboratory, SISSA Trieste, Italy

*Abstract:*

Successful social interactions require the capacity of understanding and sharing others' emotional states. Humans tend to understand the states of others in relation to their own, but such a self-projection mechanism can result in biased social judgments if confusion between self and others subsists. Recently, we showed that empathic judgments of another person's emotions are indeed systematically and egocentrically biased towards the participant's own current emotions; and that the size of the bias is causally associated with variations in neural activity of dedicated brain regions (Silani et al., 2013). In this talk, I will present how a multi-level clinical and developmental neuroimaging approach can contribute to understand the emergence of emotional egocentricity bias by describing: 1) how egocentrically biased judgments change across *the life span*, by specifically showing that the presence of the bias follows a quadratic curve with increasing age. 2) how a clinically relevant condition, such as *Autism Spectrum Disorders*, impacts the ability to distinguish between self- and other-related emotions, and therefore the inability to regulate emotional egocentricity bias.

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Symposia Session 7 (26-06-2016) – 10:30 Douro Norte room

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*Symposium title:*

Neurobiological underpinings of freeze-fight-flight behaviour in humans

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*Chair(s):* Karin Roelofs<sup>1</sup>, Mahur M. Hashemi<sup>1</sup>

<sup>1</sup>Radboud University Nijmegen

*Symposium abstract:*

In the face of threat, human and animal behaviour is regulated by hardwired automatic action tendencies such as freezing, and fight-or-flight (FFF). Freezing and fight-or-flight reactions are two qualitatively distinct response repertoires that have been found back in both rodent and human behaviour. Importantly however, while freezing and active fight/flight reactions are routinely assessed in rodent experiments, there is a glaring paucity of studies that have done so in the human realm. This is especially important because recent studies demonstrate that having the option to actively act upon threat may qualitatively change neural and physiological defensive responses. Thereby, it may even be suggested that our current models of human defensive responding are severely biased and incomplete, due to the fact that they have been built mainly on data acquired in passive threat paradigms. The current symposium brings together affective neuroscientists specialized in neurophysiology that are at the forefront of a new impetus to study neurobiological determinants of defensive responses in terms of psychophysiological action tendencies. The resulting enhanced understanding of the neurocognitive mechanism and the dynamics involved in controlling FFF-actions tendencies may critically advance models of stress disorders as anxiety, panic and aggression disorders.

*Talk 1 title:*

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Dynamics of defensive behaviour during freezing and active avoidance

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Alfons Hamm<sup>1</sup>

<sup>1</sup>Department of Biological and Clinical Psychology, University of Greifswald, Germany

*Abstract:*

When detecting a threat, humans and other animals engage in defensive behaviors and supporting physiological adjustments that vary with threat imminence and potential response options. We shed light on the dynamics of defensive behaviors and associated physiological adjustments in humans using multiple psychophysiological and brain measures. When participants were exposed to a dynamically approaching, uncontrollable threat, attentive freezing was augmented, as indicated by an increase in skin conductance, fear bradycardia, and potentiation of the startle reflex. In contrast, when participants had the opportunity to actively avoid the approaching threat, attention switched to response preparation, as indicated by an inhibition of the startle magnitude and by a sharp drop of the probe-elicited P3 component of the evoked brain potentials. These new findings on the dynamics of defensive behaviors form an important intersection between animal and human research and have important implications for understanding fear and anxiety-related disorders.

*Talk 2 title:*

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Contextual control over conditioned defensive responses: convergence of body immobility and fear-potentiated startle

Vanessa van Ast<sup>1</sup>

<sup>1</sup>Department of Clinical Psychology, University of Amsterdam, The Netherlands

*Abstract:*

In the study to fear and anxiety mainly two physiological defensive responses evoked by threatening situations have been employed. These are the freeze response and the startle response. The freeze response is characterized by reduced heart rate, also named bradycardia, reduced mobility, and a tense body posture. Research has established that the freeze reaction may be a first part of the human defense cascade consisting of freeze, fight, flight, and tonic immobility. The startle response is a fast sequential muscle contraction thought to facilitate the flight/fight reaction and protect the body from a sudden attack. Although both freezing and fear-potentiated startle are commonly used as an outcome measure for fear and anxiety in animal as well as human fear-conditioning studies, research focusing on the nature of the two reactions is scarce and the relationship between the two is not yet entirely clear. This is especially problematic considering it is often implicitly assumed that these measures can be employed and interpreted interchangeably. Therefore, the aim of the present study was to clarify the interrelationships between freezing responses and startle responses in a fear-conditioning paradigm with human subjects. We adopted a fear-conditioning procedure that can assess both cued and contextual conditioned fear responses, presumably enabling a distinction between anxiety and fear, respectively. Broadly, results indicate that the pattern of conditioned freezing responses converges on the fear-potentiated startle. The results are discussed in the context of current models of human defensive responding.

*Talk 3 title:*

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Hyperpotentiation of Defensive Neurophysiological Reflexes to Imminent Threat after Basolateral Amygdala Damage in Humans

David Terburg<sup>1,2</sup>

<sup>1</sup>Department of Experimental Psychology, Utrecht University, The Netherlands

<sup>2</sup>Department of Psychiatry, University of Cape Town, South Africa

*Abstract:*

Humans, and other mammals, have evolved a diverse palette of survival mechanisms ranging from passive defensive reflexes to active fight/flight behaviors. Distal and escapable

threat can be dealt with by strategic cortically driven actions, whereas imminent and inescapable threat evokes subcortical defensive reflexes. Survival is driven by appropriate coordination of these actions, and here we show that the basolateral amygdala-complex (BLA) performs a crucial role. We compared a sample of humans with rare, focal, and bilateral damage to the BLA with a healthy control group, and tested their neural and physiological responsiveness to dynamic situations of escapable and inescapable threat. Particularly in situations of imminent, yet actively escapable, threat, BLA damage resulted in hyper-potentialization of defensive eye-blink startle reactions and associated subcortical blood-oxygenation level-dependent (BOLD) responses in the brainstem. These results suggest that the human BLA is crucial for the dynamic adjustment of defensive reflexes to the situation at hand.

*Talk 4 title:*

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Neural mechanisms controlling defensive actions during acute threat

M. M. Hashemi<sup>1</sup>

<sup>1</sup>Department of Donders Institute for Cognitive Neuroimaging, Radboud University of Nijmegen, The Netherlands

*Abstract:*

Acute threat facilitates a cascade of defensive mechanisms. Parasympathetically driven freezing responses, characterized by heart rate decelerations, and rigid body posture are often seen as passive defensive response strategy. In contrast to this, sympathetically driven fight responses, characterized by heart rate accelerations, are often classified as active responses strategies. The ability to flexibly switch between these two distinct defensive modes is critical to survival. Although we have gained a great understanding of the function of these defensive actions and how they are controlled in the brain in animals, little is known about the neural control of freeze-fight decisions in humans. By combining fMRI and psychophysiological measures with a newly developed active threat paradigm, we will show basic neural mechanisms controlling defensive actions such as freeze and fight reactions. Additionally, we will evaluate on how we neurally shift from freezing responses to more overt fight reactions. Lastly, we will give neuroanatomical evidence why freezing is not only related to a passive state, but also associates with the preparation for action during threat.

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Symposia Session 7 (26-06-2016) – 10:30 Douro Sul room

*Symposium title:*

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The Neuroaesthetics of people: expertise, individual differences and social embodiment

*Chair(s):* Beatriz Calvo-Merino<sup>1</sup>, Guido Orgs<sup>2</sup>

<sup>1</sup>City University London

<sup>2</sup>Goldsmith, University of London

*Symposium abstract:*

Neuroaesthetics is an exciting new discipline recently embraced by Cognitive Neuroscience, aiming to reveal the cognitive and neural mechanism engaged in aesthetic experience. This symposium expands this rapidly growing field by focussing on the cognitive and brain mechanisms that mediate aesthetic experiences related to watching other people's bodies and movements. With a specific focus on how experience shapes these plastic neural mechanisms, we present a wide range of recent studies using fMRI, EEG and TMS comparing the neural response in aesthetic judgements in experts and novices (between-subject approaches) and by assessing how the acquisition of experience alters these neurocognitive mechanisms (within-subject/training approaches). Finally, we will examine how aesthetic experience is modulated by personality factors and social contexts:

By exploring the role of individual differences in performing and perceiving movements, we specify the behavioural and neurocognitive mechanisms of aesthetic perception, beyond the more established areas of visual and music aesthetics. Overall, the neuroaesthetics of action do not only provide insights into how humans appreciate the performing arts, but provides new insights into other areas of cognitive neuroscience, ranging from understanding how performing joint actions can produce group affiliation and developing clinical applications for eating and body dysmorphic disorders.

*Talk 1 title:*

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The Emotional Homunculus: Evidence for Somatotopic Empathy

Alejandra Sel<sup>1</sup>, Manos Tsakiris<sup>2</sup>, Bettina Forster<sup>3</sup>, Beatriz Calvo-Merino<sup>3</sup>

<sup>1</sup>University of Oxford

<sup>2</sup>Royal Holloway University of London

<sup>3</sup>City University London

*Abstract:*

Recent research has shown independent contribution of somatosensory cortex (SCx) to facial emotion processing (Pitcher et al., 2008; Sel et al., 2014). In addition, research showed that emotions are felt in different body parts and represented by different patterns of brain responses (Nummenmaa et al., 2014; Saarimaki et al., 2015). We tested whether the empathetic response triggered by observing others emotional face expressions leads to distinct activations of SCx. Participants performed a visual facial emotion discrimination task. On half of the trials SCx activity was probed by task irrelevant touch to different body parts. By subtracting neural activity elicited on visual-only facial emotion expression trials from tactually probed trials we isolated pure SCx emotion responses. Furthermore, by comparing responses to different tactile probe locations (finger versus toe) and different facial emotion expression trials (sad versus anger) we show dissociation in the somatotopic response to different facial emotion expressions. Moreover, participants were asked to indicate where in the body the person expressing the facial emotion felt the emotion. This empathetic inference predicted our participants' cortical activation within SCx when judging facial emotion expressions, at least for anger. Taken together, our result is the first evidence for distinct somatotopic activation patterns of perceiving others' felt emotions.

Nummenmaa et al. 2014. PNAS 111: 646-51.

Pitcher et al. 2008. J Neurosci 28: 8929-33.

Saarimaki et al. 2015. Cereb Cortex: 1-11.

Sel et al. 2014. J Neurosci 34: 3263-7.

*Talk 2 title:*

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The shaping of aesthetic preferences by experience

Louise P. Kirsch<sup>1,2</sup>, Emily S. Cross<sup>1,3</sup>

<sup>1</sup>Bangor University, UK

<sup>2</sup>University College London

<sup>3</sup>Radboud University Nijmegen, The Netherlands

*Abstract:*

Perceiving others in action, whether in daily contexts like seeing a commuter run to catch a train, or in highly refined artistic settings, such as watching a skilled dancer perform on stage, evokes affective responses in an observer. The extent to which an observer's prior experience with an observed action shapes his or her affective evaluation remains poorly understood, and is essential for advancing knowledge about how we perceive and interact with others in a social world. The studies discussed in this presentation attempt to construct a more complete understanding of the impact of experience on action perception and affective judgment when watching complex whole-body dance movements, using

complementary behavioural and brain-based approaches, such as skill training interventions, functional neuroimaging and physiological measures of implicit affective responses (facial electromyography; fEMG). In a first series of experiments, a dance-training paradigm was used to investigate experience instilled in participants de novo, and how experience of an action through different modalities, including auditory, visual and motor domains, shapes perception and explicit affective responses at behavioural and brain levels. In a complementary experiment, we recorded facial muscle activity with fEMG while dancers and non-dancers watched dance movements, to investigate how prior experience impacts an implicit, objective measure of affect and determine how this corresponds with subjective, self-report measures of liking. Overall, the results of these experiments suggest that experience with a particular movement affects explicit and implicit affective judgments of that movement, as well as significantly modifies brain circuits engaged during action perception.

*Talk 3 title:*

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Reshaping the body aesthetics brain: behavioral and transcranial magnetic stimulation studies of body exposure effects in healthy individuals and patients with Anorexia Nervosa

Cosimo Urgesi<sup>1</sup>

<sup>1</sup>Bangor University, UK & University of Udine, Italy

*Abstract:*

Among the different stimuli we perceive, the aesthetic appreciation of the body beauty has a particular biological and social importance for our survival. Rather than being encapsulated in biologically-wired mechanisms, the sense of body beauty is driven by the complex interplay between the objects, subjects and contexts of the aesthetic experience and can undergo rapid, plastic changes when these factors are manipulated. While previous studies have documented the influence of perceptual familiarity and exposure to ideal models on the subjective experience of body beauty, the cognitive processes and brain mechanisms underlying such influence and their possible alterations in patients with body-image disorders are unclear. I will present a series of behavioural studies in healthy adults and adolescents suggesting that two different processes, namely perceptual after-effects and reshaping of body beauty ideals, are involved in explaining the changes of body aesthetic appreciation after exposure to models of extreme body weight. Crucially, only perceptual after-effects seem to be in action in adult and adolescent patients with Anorexia Nervosa, suggesting that a rigidity of the systems coding for body template representations may contribute to their susceptibility to extreme ideals of body beauty conveyed by media. Using Transcranial Magnetic Stimulation methods in healthy individuals revealed that neural activity of extrastriate visual areas selectively involved in body processing plays a crucial role in the reshaping of body aesthetic appreciation after perceptual exposure. These findings may shed new light on how body aesthetics is appreciated in the healthy and is altered in body-image disorders.

*Talk 4 title:*

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Joint action aesthetics

Guido Orgs<sup>1</sup>, Staci Vicary<sup>1</sup>

<sup>1</sup>Goldsmiths, University of London

*Abstract:*

Synchronising behaviour is a universal aspect of life and performing dance. Moving together with others enhances interpersonal cooperation, trust and liking among members of a group. For the first time, we investigated the role of behavioural coordination in aesthetic appreciation of a live dance performance. We conducted two experiments in which participants performed a set of movement tasks that were either performed as a group or

individually. During execution (dancers) and observation (spectators) of these tasks, we assessed cross-recurrence of individual acceleration profiles and psychophysiological responses using wrist sensors. We also recorded continuous ratings of aesthetic appreciation and perceived group characteristics. In a first experiment, we show that dancing together increase affiliation, cooperation, but also conformity among novice performers. In a second experiment, we show that continuous changes in synchronisation among performers predicts enjoyment heart rate among spectators, by applying granger causality. In a follow-up-fMRI study, we identify the neural mechanisms of joint action aesthetics. We assessed inter-subject correlations between spectators as a function of behavioural coordination among performers. Thus dancing together produces both increases in group affiliation amongst performers and enjoyment in observers. Our findings point to an evolutionary function of dance - and perhaps all performing arts - in promoting social cohesion in societies. These prosocial effects are not limited to participating in dance activities, but extend to the aesthetic pleasure induced by watching other performers coordinate their movements in a performance situation.

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Symposia Session 8 (26-06-2016) – 11:45 Porto room

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*Symposium title:*

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Neural and cognitive mechanisms of human social interactions

*Chair(s):* Antonia Hamilton<sup>1</sup>

<sup>1</sup>Institute of Cognitive Neuroscience, University College London, UK

*Symposium abstract:*

How do people understand other people and respond in real time? New research and new technologies are now allowing us to explore the mechanisms of human social behavior in increasing detail. This symposium will present results from 4 labs across Europe that use a variety of methods to test how people perform and understand actions in a social context. The first talk will show the neural mechanisms of social information processing from gaze and posture, drawing on a range of fMRI studies. The second explores the imitation of hand actions using virtual reality and fNIRS to track real-world behaviours. The third examines the relationship between attention and action resonance using TMS and eyetracking. The fourth measures interpersonal coordination of hand actions using virtual reality, neuropsychological methods and TMS. Together, these talks provide a sample of cutting-edge research into human social interaction using a variety of neuroscientific methods to tap into dynamic, interactive behavior. The overall discussion will focus on where the field can go next and how we can best study and understand the fundamental mechanisms of two-person social interactions.

*Talk 1 title:*

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Neural Mechanisms of Intersubjectivity

Kai Vogeley<sup>1,2</sup>

<sup>1</sup>Department of Psychiatry, University Hospital Cologne, Germany

<sup>2</sup>Institute for Neuroscience and Medicine, Cognitive Neuroscience INM3, Research Center Juelich, Germany

*Abstract:*

Over the last decade, cognitive neuroscience has started to systematically study the neural mechanisms of social cognition and has identified essentially two different neural systems that appear to constitute two different routes of processing underlying our social cognitive capacities in everyday social encounters, namely the so-called "mirror neuron system"

(MNS) and the “social neural network” (SNN, also theory of mind network or mentalizing network). The functional roles of both systems appear to be complementary: The MNS serves comparatively “early” stages of social information processing that are more related to spatial or bodily signals expressed in the behaviour of others and supports the “detection” of potential social salience, including observation of other persons’ actions. Complementary to the functional role of the MNS, the SNN serves comparatively “late” stages of social information processing that are more related to the “evaluation” of emotional and psychological states of others that have to be inferred as inner mental experience from the behaviour of this person. Empirical studies on the neural mechanisms of social information processing suggest that the primary deficit is the adequate evaluation, but not necessarily the detection of socially relevant information as reflected in a series of studies that show deficits in the adequate recruitment of the SNN but not the MNS.

*Talk 2 title:*

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Neural and social processes in the imitation of hand action trajectories

Paul Forbes<sup>1</sup>, Dom Oliver<sup>1</sup>, Antonia Hamilton<sup>1</sup>

<sup>1</sup>Institute of Cognitive Neuroscience, University College London, UK

*Abstract:*

Imitation of kinematic features of an action may be an important component of unconscious mimicry. Here we present two tasks to explore the detailed mechanisms of imitation, using virtual reality and near-infrared spectroscopy (fNIRS). Both tasks take advantage of the fact that, when pointing to a series of points, people tend to move their finger with a nearly-straight trajectory. However, seeing another person move with an exaggerated, curved trajectory may induce kinematic imitation, where participants now moved with a curved trajectory. In the first study, we establish the robustness and magnitude of this effect, finding evidence for kinematic imitation in a virtual reality paradigm and a video paradigm with varying levels of social engagement. In the second study, we use a related task in which participants move shapes on the screen to form pictures, taking turns with another person. The demonstrator made straight movements on some trials and curved movements on others. fNIRS was used to record concentrations of oxygenated and deoxygenated haemoglobin in left and right parietal cortex while participants performed this imitation task. Right TPJ showed an interaction between action curvature and performance/observation, with the greatest activation for the observation of curved actions. This provides a proof-of-principle for the use of fNIRS in the study of natural imitation behaviours, and points to a critical role for right parietal cortex in discriminating action rationality. Together, these studies advance our understanding of the fundamental mechanisms of imitation in realistic, controlled contexts.

*Talk 3 title:*

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Differential role of spatial attention on motor resonance and complementary actions

Sonia Betti<sup>1</sup>, Umberto Castiello<sup>1</sup>, Luisa Sartori<sup>1</sup>

<sup>1</sup>Neuroscience of Movement Laboratory (NeMo), Dipartimento di Psicologia Generale, Università degli Studi di Padova

*Abstract:*

Observing actions performed by others can activate the corresponding motor representations in the primary motor cortex (M1), the so-called *direct matching*. However, it has been proved that in interactive social contexts this imitative tendency could turn into readiness to perform a dissimilar complementary action. To date, whether or not the observation-execution transformation is automatic (i.e. occurs without attention) is debated. In the present study we aim to bring an increase in the literature by assessing the role of spatial attention during observation of social and non-social actions. The stimuli used were

action sequences eliciting (or not) complementary responses (i.e. incongruent to the observed action) and spatial attention was manipulated by means of a red dot cue. First, eye-tracking procedures were used to measure the spontaneous allocation of overt spatial attention during action observation. Second, we combined transcranial magnetic stimulation (TMS) over M1 and electromyography recordings to assess the excitability of corticospinal projections to hand muscles while participants were observing the action stimuli. Results show that the allocation of spatial attention towards an observed body part is crucial for direct matching to occur. Conversely, the allocation of spatial attention plays no role when the observed action evokes an interactive complementary motor response. Overall, the present research provides one of the first evidence that social motor preparation is impervious to spatial attentional allocation.

*Talk 4 title:*

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Causal contribution of the parietal lobe in human-avatar and human-human (interpersonal) motor interactions

Matteo Candidi<sup>1,2</sup>, Lucia Maria Sacheli<sup>1,2</sup>, Vanessa Era<sup>1,2</sup>, Loredana Canzano<sup>1,2</sup>, Gaetano Tieri<sup>1,2</sup>, Marco Gandolfo<sup>1,2</sup>, Salvatore Maria Aglioti<sup>1,2</sup>

<sup>1</sup>Department of Psychology, Sapienza University of Rome, Italy

<sup>2</sup>RCCS Fondazione Santa Lucia, Rome, Italy

*Abstract:*

Many of our actions are performed jointly and involve coordination between two or more agents. Research on joint action has studied how individuals form action plans that include others' actions, and how co-actors achieve precise spatio-temporal coordination. Basically this implies switching from passive-like 'action observation' scenarios to 'dual-person' ones. Within this framework, virtual reality set-ups allow studying realistic interactions in well-controlled experimental conditions.

Here we set a human-human set-up to test the behavioural and kinematic effects of imitative and complementary interpersonal interactions, and test whether these effects are also found when interacting with a virtual partner. We engaged pairs of individuals in a joint-grasping task where participants are required to coordinate with a partner in performing imitative and complementary reach-to-grasp actions based on the behaviour of the partner.

Based on this set-up, by using inhibitory brain stimulation methods and studying brain damaged patients, we describe the causal contribution of parietal (aIPS) and premotor (PM) regions in underpinning humans' ability to coordinate with others in space and time.

We found that the parietal cortex plays a crucial role in managing the integration of the agent's own and his partner's actions, i.e. in integrating visuo-motor information, especially when individuals are engaged in interactions requiring the execution of complementary movements.

These results suggest that achieving a shared goal by performing complementary movements depends on the contribution of the parietal cortex, and suggest that this region might play a crucial role in achieving interpersonal motor coordination.

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Symposia Session 8 (26-06-2016) – 11:45 Douro Norte room

*Symposium title:*

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On the emotional melody of the voice: a multi-method approach

*Chair(s):* Ana P. Pinheiro<sup>1,2</sup>, Sonja A. Kotz<sup>3,4</sup>

<sup>1</sup>Faculty of Psychology, University of Lisbon, Portugal

<sup>2</sup>Neuropsychophysiology Lab, School of Psychology, University of Minho, Portugal



*Symposium abstract:*

The human voice is plausibly the most important sound category in our social landscape. In particular, the ability to produce and comprehend emotional cues conveyed by the voice is one of the cornerstones of effective social interaction. In spite of the increased number of studies probing vocal emotional processing its neurofunctional correlates still remain elusive. Existing studies suggest that the brain engages different operations to process complex vocal information very early in information processing and in development, and is tuned to detect the salience of vocal information. Evidence in the last decade supports a multi-stage model of vocal emotional perception and recognition, which involves dynamic interactions between bottom-up sensory mechanisms and top-down cognitive processes and these models propose: 1) the sensory processing of emotionally relevant acoustic cues; 2) the categorization of salient acoustic features as emotional vs. non-emotional; and 3) the cognitive evaluation of the emotional significance of the voice signal.

However, given the complex and dynamic nature of vocal emotional perception, these operations may be better understood in a multi-methods approach including neuroimaging, electrophysiological, and behavioral data. By putting together evidence from electroencephalography (EEG), functional magnetic resonance imaging (fMRI) and magnetoencephalography (MEG) evidence, this symposium will unravel the dynamic neurocognitive operations that take place when we listen to the emotional *melody of the voice*.

The data presented will offer a more dynamic and complete characterization of the dynamics of brain activity during vocal emotional perception. Specifically, they highlight neural differences in the processing of emotional vs. neutral vocal information, and emphasize the rapid operation of these mechanisms. The observation of neural differences in the processing of emotional vs. neutral information makes sense in light of the biological relevance that a quick and reliable detection of affective signals has in understanding the environment and the behavioral intentions of others.

*Talk 1 title:*

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Brain signatures of encoding vocal emotions

Sonja A. Kotz<sup>1,2</sup>

*Abstract:*

Speech is an important carrier of emotional information. However, (1) little is known about how distinct vocal emotions are recognized in a receiver's brain, (2) whether such possible distinctions are encoded as specific modulations of the human voice, and (3) whether the neural correlates of such vocal expressions are phylogenetically similar and thus shared across species. EEG and fMRI studies will be presented that explored to which extent vocal emotions are represented in local and extended brain activity patterns.

*Talk 2 title:*

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Continuous vs. discrete cerebral representations of vocal emotions

Pascal Belin<sup>1</sup>

*Abstract:*

Whether emotions are represented in the brain as discrete categories or continuous emotions remains controversial. Here we used magnetoencephalography (MEG) and representational similarity analysis (RSA) to ask whether neural responses to nonverbal emotional vocalizations are better explained by a continuous or a discrete model. We find that both models explain equal amounts of variance in the MEG data, but, crucially, at different latencies: representations of vocal emotion evolve from primarily continuous representations to increasingly categorical representations at later latencies.

*Talk 3 title:*

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Emotional Prosody Perception in Healthy Ageing – Evidence from ERPs and recognition rates

Silke Paulmann<sup>1</sup>

<sup>1</sup>Department of Psychology & Centre for Brain Science, University of Essex, UK

*Abstract:*

Existing research on emotional speech perception across the life-span suggests that the ability to understand emotions from speech can be altered in healthy ageing (e.g. Ruffman et al., 2008). However, the extent and underlying cause remains to be determined. We believe that the questions why and how emotional speech perception is altered in healthy ageing can only be adequately addressed by acknowledging that emotional speech perception is a multi-step process mediated by a diverse brain network (e.g. Schirmer & Kotz, 2006; Wildgruber et al., 2006; Kotz & Paulmann, 2011). Any disruption in the 'processing line' may lead to an altered ability to perceive the emotional intention of a speaker. Thus, here we investigated different stages of emotional speech perception by means of time-sensitive event-related brain potentials (ERPs) and behavioural responses in a group of healthy ageing (65+ years) and a University student population. Specifically, we investigated early emotional salience detection (as reflected in the P200 ERP component) as well as performance on an emotional prosody recognition task. A significant P200 effect showing that neutral prosody can be distinguished from emotional (i.e. anger, disgust, sad, pleasant surprise) prosody was found for both groups suggesting that emotional salience detection is not altered in healthy ageing. In contrast, emotional prosody recognition accuracy rates in elderly are significantly reduced. This suggests that elderly might experience problems in using the correctly identified acoustic input to accurately categorize specific emotions at later processing stages.

*Talk 4 title:*

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Prediction of emotion in the vocal brain

Ana P. Pinheiro<sup>1,2</sup>

<sup>1</sup>Faculty of Psychology, University of Lisbon, Portugal

<sup>2</sup>Neuropsychophysiology Lab, School of Psychology, University of Minho, Portugal

*Abstract:*

The capacity to predict what should happen next and to minimize the mismatch between expected and actual sensory input is a central aspect of perception. In the context of social communication, the effective prediction of auditory inputs that may include emotional information conveyed through the speaker's voice is critical. However, it is still unclear how the perceived salience of vocal stimuli affects sensory prediction and the detection of sensory deviance representing a prediction error signal. We combined event-related potential (ERP) and time-frequency EEG to shed light on these processes. Our findings confirmed that the brain is tuned to detect vocal changes and that deviance detection is modulated by stimulus salience and relevance when change occurs, even when attention is focused elsewhere.

*Symposium title:*

Response inhibition: Neural mechanisms of motor suppression and adjustment

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Leon Kenemans<sup>1</sup>

<sup>1</sup>Helmholtz Institute, Utrecht University, The Netherlands

*Symposium abstract:*

The neural mechanisms underlying adequate suppression of motor responses that have already been substantially prepared have been increasingly clarified in recent years. One standing question is the extent to which these mechanisms are instrumental also in quite different contexts and can be viewed as generic inhibition mechanisms. With respect to a mainly reactive (e.g., to stop signals) mechanism, such genericity will be highlighted in talks by Wessel (post-error slowing), and Kenemans (novelty processing). Maizey et al. will highlight the genericity of an inhibitory mechanism based in inferior frontal cortex and striatum components in the context of more general action updating. A second important question concerns the exact nature and the neural mechanism of proactive inhibitory control. This may pertain specifically to the anticipation of a possible demand for inhibition, in which case it is specifically manifest in measure of inhibitory control such as stop-signal reaction time, but not in measures of on-going executive processes such as go reaction time. It may also to strategic modulation of the executive processes, even at the level of sensory processing, as highlighted by Langford and Boehler.

*Talk 1 title:*

Inhibition after errors: the role of a neural mechanism for global motor suppression

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Jan R. Wessel<sup>1</sup>

<sup>1</sup>Department of Neurology and Department of Psychological and Brain Sciences, University of Iowa

*Abstract:*

Post-error slowing (PES) is a ubiquitous behavioral pattern found throughout the psychological and neuroscientific literature: after committing action errors in fast-paced motor tasks, humans (and non-human animals) exert a marked slowing of motor responding. Theoretical accounts have proposed that PES is the expression of an inhibitory mechanism, recruited to slow down behavior after errors. However, the exact neural mechanism underlying this inhibition is hitherto unclear. Here, I propose that a well-characterized neural mechanism for global motor response inhibition is recruited after errors to affect PES. This mechanism has been primarily studied in the stop-signal task, in which it enables the fast and outright cancellation of impending motor responses following stopping cues. A key feature of this mechanism is its 'global' effect: when it is active during successful motor inhibition, cortico-motor motor excitability (CSE, measured by transcranial magnetic stimulation of the motor cortex) is suppressed even in motor effectors that do not need to be stopped. Here, I will first present source-level single-trial EEG data showing that the same neural mechanism is active following action errors. Then, I will present CSE data showing that, just like during complete stopping, CSE is suppressed following action errors, even in task-unrelated motor effectors. This data speaks towards the generality of a neural mechanism for motor inhibition and provides a mechanistic account of cognitive control after action errors.

*Talk 2 title:*

Distinct neural pathways underlying response inhibition revealed by fMRI

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Leah Maizey<sup>1,2</sup>, Chris Allen<sup>1,2</sup>, C. John Evans<sup>1,2</sup>, Nils Muhlert<sup>1,2</sup>, Frederick Verbruggen<sup>1,2</sup>, Christopher D. Chambers<sup>1,2</sup>

<sup>1</sup>Cardiff University, UK

<sup>2</sup>University of Exeter, UK

**Abstract:**

Previous work has highlighted the importance of cortico-subcortical pathways in implementing response inhibition. Specifically, the right inferior frontal gyrus (rIFG), basal ganglia and thalamus have been implicated as crucial to inhibitory control (e.g. Nambu *et al.* 2002; Aron and Poldrack, 2006). Yet whether these regions act to support response inhibition only, or a more general system of action updating remains unclear (Motovsky and Simmonds, 2008). Here, we explore the role of these structures in inhibitory and non-inhibitory action-updating, with an emphasis on hypothesised pathways proposed to implement response execution and inhibition; the direct, indirect and hyperdirect pathways (e.g. Nambu *et al.* 2002). A task that assays multiple forms of action-updating was employed in combination with functional magnetic resonance imaging (fMRI). Patterns of activity revealed response inhibition to be associated with lateralised activity at both the cortical and subcortical levels. Specifically, the anterior region of the rIFG, the *pars triangularis*, was found to be significantly associated with the requirement to inhibit responses. This specificity continued downstream to subcortical loci, where the pattern of activity in sub-structures of the basal ganglia largely confirmed the hypothesised pathways. Importantly, left-hemisphere basal ganglia activity was found to be greater when participants were required to execute a response, and right-hemisphere structures were recruited when participants were required to inhibit a response. Although such lateralisation has been suggested, this is the first fMRI study to demonstrate how subcortical activity between hemispheres may adapt to situations where response execution and response inhibition is required.

**Talk 3 title:**

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The role of attention in proactive response inhibition

Zachary Langford<sup>1</sup>, C. Nico Boehler<sup>1</sup>

<sup>1</sup>Department of Experimental Psychology, Ghent University, Belgium

**Abstract:**

The ability to rapidly inhibit an already-initiated motor response before execution is a hallmark feature of cognitive control. Response inhibition is often triggered by an environmental change, and is consequently labeled reactive inhibition. Typically it is believed that this function relies on a core “response inhibition network” spanning parts of prefrontal cortex and the basal ganglia. This network has been suggested to also play a role in proactive inhibition, referring to the deliberate slowing down of responses when full response cancellation might be required. Proactive inhibition is believed to play an important and ecologically valid role in the overall context of inhibitory control. Recent data suggest that attentional processes, which most likely precede activity in the core “response inhibition network”, can already influence behavioral outcomes in reactive inhibition. The present electroencephalographic (EEG) studies extend this research line towards the role of attentional processes in proactive inhibition. A central approach here used single-trial analyses to directly model the relationship between response time and the EEG data of Go-trials from a Stop-signal task in a multilevel linear-models framework. A relationship between attention-related activity and proactive inhibition was indeed found (and to be inverse), but only in a task context in which response inhibition was sometimes required, suggesting that attention to Go-stimuli is actively down-modulated when response inhibition might be required. The presented work supports the notion of a dynamic and context-specific proactive control mechanism that modulates attentional resources strategically to govern response inhibition behavior.

*Talk 4 title:*

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Frontal P3 as a generic inhibition mechanism

J. Leon Kenemans<sup>1</sup>, Ivo Heitland<sup>1</sup>

<sup>1</sup>Helmholtz Institute, Utrecht University, The Netherlands

*Abstract:*

Inhibition concerns the capacity to suppress on-going response tendencies. Patient data and results from neuro-imaging and magnetic-stimulation studies point to both proactive and reactive inhibitory-control mechanisms. The reactive mechanism is visible in a longer-latency human event-related potential termed frontal P3 (fP3) which is elicited by (successful) stop stimuli and most likely originates from dorsal-medial prefrontal cortex, and has been dissociated from the proactive mechanisms pharmacologically and by individual differences. The reactive mechanism is hypothesized to be quite independent of the specific inhibition context, and generalize to situations in which behavioral interrupt is not dictated by task demands but invoked by the salience of task-irrelevant but potentially distracting events. Here we test this hypothesis using a comparative analysis of fP3 as elicited in a stop-signal task and the frontal P3 that is commonly observed in response to unique novel stimuli in the context of a novelty oddball paradigm. Coarse distributed dipole-source analysis suggests considerable overlap between the generators of the two varieties of fP3, most notably in (pre-) supplementary motor and anterior cingulate cortex.

### Poster Session 1 (24-06-2016) – Poster listing (P1 to P136 + P262)

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P1 - 'Attending to Your Therapist': How Perceived Sender Expertise Amplifies Cerebral Processing of Emotional Language Feedback

Sebastian Schindler<sup>1</sup>, Johanna Maria Kissler<sup>1</sup>

<sup>1</sup>Bielefeld University

*Abstract:*

The personal significance of a language statement depends on its communicative context. Recently, studies showed that emotional and neutral adjectives are processed more intensely when putatively sent by another human compared to a computer. Here, we investigated how ascribed expertise alters the cortical processing of language-based personal feedback.

To this end, thirty participants were told that they were going to receive written positive, negative, or neutral feedback about themselves from an 'expert' (psychotherapist) or a 'layperson' while high-density EEG was recorded. Putatively, this feedback was based on a video interview and a short personality questionnaire to which participants responded. In a control condition they received random computer-feedback. Actually, in all conditions random but counterbalanced feedback was presented.

We found substantially larger ERP components for both 'human senders', namely larger EPN, P3 and LPP amplitudes. In source space this was reflected in broad visual, parietal, frontal and somatosensory regions, as well as in the posterior cingulum. Crucially, only the 'expert' led to larger N1 and P2 components. An interaction on the P3 showed that all decisions from the 'expert' were amplified, while for the 'layperson' this was only the case for emotional feedback. Finally, emotional decisions led to larger P3 and LPP amplitudes. This emotion enhancement was based on stronger visual processing, but also on larger activity in the posterior cingulum and in frontal regions.

These findings show the contextual plasticity of (emotional) language processing and highlight the importance of developing ecologically situated communicative designs to investigate its neuronal bases.

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### P3 - A Conflict Monitoring Account of the Control Mechanisms Involved in Dual-Tasking

Michal Olszanowski<sup>1</sup>, Arnaud Szmalec<sup>2</sup>, Maria Teresa Bajo<sup>3</sup>

<sup>1</sup>University of Social Sciences & Humanities

<sup>2</sup>Université Catholique de Louvain

<sup>3</sup>University of Granada

*Abstract:*

The present study investigates the cognitive mechanism underlying the control of interference during dual-task coordination. Partially inspired by the Conflict Monitoring Hypothesis (Botvinick et al., 2001), we test the assumption that dual-task interference is resolved by a top-down adaptation mechanism that is responsible for behavioral adjustments in the prioritization of the coordinated tasks. In a series of two experiments, we measured conflict adaptation to the so-called Gratton effect—the decrease in dual-task interference following incompatible trials. At the neurological level, conflict monitoring (CM) is believed to be a function of the anterior cingulate cortex (ACC) (Botvinick, Nystrom, Fissell, Carter & Cohen, 1999; Botvinick, Cohen & Carter, 2004). Top-down adaptations following the detection of conflict by the ACC is understood as a selective activation of relevant task

demands stored in the dorsolateral prefrontal cortex (DLPFC) in order to resolve the interference or conflict and optimize goal-directed behavior.

Presented experiments tested behavioral biases for above mentioned mechanism. In Experiment 1 the primary task was a low demand choice discrimination task, while in Experiment 2 the primary task was an updating task that imposes a continuous load on working memory. The secondary task was a tone discrimination task. Both experiments consistently showed that the response conflict of previous trial triggers top-down behavioral adjustments that reduce interference. We conclude that dual-task interference shows strong similarities to Stroop-like types of cognitive interference, namely in the way that suboptimal performance is dealt with by the cognitive system.

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## P5 - A Neural Link between Affective Understanding and Interpersonal Attraction

Silke Anders<sup>1</sup>, John-Dylan Haynes<sup>2</sup>, Thomas Ethofer<sup>3</sup>

<sup>1</sup>Universität zu Lübeck

<sup>2</sup>Charité Universitätsmedizin Berlin

<sup>3</sup>University of Tuebingen

### *Abstract:*

Humans interacting with other humans must be able to understand their interaction partner's affect and motivations, often without words. We examined whether people are attracted to others whose affective behavior they can easily understand. Two independent samples of volunteers were asked to watch short video clips of six different women (targets) experiencing fear or sadness. After each video clip, participants indicated how confident they were that they had correctly understood the target's affective state. The participants' interpersonal attraction towards each sender was assessed before and after emotion observation. In sample II, the participants' brain activity while they watched the targets was recorded using fMRI. Additionally, these participants' brain activity was recorded while they experienced fear and sadness themselves. This allowed us to compare individual patterns of neural activity elicited during emotion observation to those elicited when the participant experienced the same emotion themselves. We found the better a participant thought they could understand the target's affective state, the more they felt attracted towards that target. Importantly, these effects were specific to individual observer-target pairs and could not be explained by a target's general attractiveness or expressivity. At the neural level, changes in interpersonal attraction were predicted by activity in the observer's reward circuit, which in turn signaled how well a pattern of neural activity elicited during emotion observation matched the pattern of neural activity associated with the participant's own affective states. These findings elucidate neurobiological processes that might play an important role in the formation and success of human social relations.

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## P6 - A Neurogenetic Approach to Attachment Disordered Behaviors: Processing of Face Familiarity in Institutionalized Children and Children with WS

Alberto Crego<sup>1</sup>, Ana Mesquita<sup>1</sup>, Adriana Sampaio<sup>1</sup>, Jay Belsky<sup>2,3</sup>, Ana Osório<sup>4</sup>, Elena Garayábal<sup>5</sup>, Isabel Soares<sup>1</sup>

<sup>1</sup>Neuropsychophysiology Lab, CIPsi, School of Psychology, University of Minho, Portugal

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<sup>4</sup>Mackenzie Presbyterian University, Brazil

<sup>5</sup>Linguistics, University Autonoma Madrid, Spain

### *Abstract:*

Attachment disordered behaviors (ADB), typical of high disruptive rearing contexts can emerge in the form of a socially inhibited subtype and an indiscriminate subtype. These ADB are more prevalent in institutionalized children (IC). However, not all children exposed to these adverse experiences develop ADB, suggesting that quality of care does not fully

account for their emergence. Furthermore, and particularly in the case of indiscriminant behavior, improvements in quality of care (such as adoption) do not attenuate this phenotype. Taken together, this evidence suggests a possible role of genetic factors in the etiology of ADB. Children with Williams syndrome (WS), a rare genetic disorder, also display indiscriminant friendliness in the absence of adverse care conditions, providing a possible neurodevelopmental genetic model for indiscriminate behavior.

Thus, the current study compared the neural correlates of face familiarity in IC displaying ADB (n=18), children with WS (n=6) and paired typically developing children (n=24) using ERPs and e-LORETA techniques. Results showed larger P1 amplitude to face processing in WS, when compared with the ADB and control group; while the typically developing group displayed significant larger P1 amplitude than IC with ADB. This increase in P1 amplitude was associated with a hyperactivation of a larger brain network including different areas of occipital, temporal, parietal lobe and limbic system. Moreover, children with indiscriminate behaviors and WS children showed similar N170 amplitudes for both familiar and unfamiliar faces, while in contrast, inhibited children displayed larger N170 amplitude for the caregiver's face (vs. stranger's face), which was associated with a hyperactivation of the medial and superior frontal gyrus, as well as the cingulate gyrus.

Our results shed new light on the understanding of the neurobiological basis of ADB, calling attention to a possible interface between WS critical genetic region and environmental factors.

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## P7 - A Novel Tool of the Trade for Scan? Mapping the Interplay of Facial Emotion Processing and Executive Functioning with the Emotional Card Sorting Test

Elisa Kreienkamp<sup>1</sup>, Ute Habel<sup>1</sup>, Frank Schneider<sup>1</sup>, Katharina Pauly<sup>1</sup>, Nils Kohn<sup>2</sup>

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<sup>2</sup>Radboudumc, Donders Institute for Brain, Cognition and Behaviour, Department for Cognitive Neuroscience, Nijmegen, The Netherlands

### *Abstract:*

**INTRODUCTION:** Human behavior crucially depends on the intimate interplay of emotion and higher cognition (e.g., facial emotion recognition and executive functioning). Despite apparent progress in this field, the neural underpinnings of these complex interactions still remain elusive.

**AIM & METHODS:** Drawing on the prominent Wisconsin Card Sorting Test (WCST) framework, we devised a novel fMRI protocol aimed at elucidating the neurobehavioral interplay between facial emotion processing and executive functioning: the Emotional Card Sorting Test (ECST) based on emotionally salient stimuli (faces). The classic WCST and a face-neutral control task served as reference tasks to closer demarcate the impact of emotion.

**RESULTS:** Using 3 T fMRI in healthy subjects ( $N = 29$ ), the value of the ECST was demonstrated in a twofold fashion: (1) Our results indicated commonalities between the ECST and its reference tasks at both the behavioral (comparable performance pattern) and the neuronal level (fronto-parietal functional neuroarchitecture), underscoring the validity of the ECST as an executive function paradigm. (2) Pivotaly, we determined the utility of the ECST as a specific emotion-cognition paradigm. Behaviorally, emotion decreased cognitive performance. Neuronally, the ECST evoked robust bilateral activation in the posterior superior temporal gyrus and inferior frontal gyrus, representing key regions of social cognition and pivotal hubs of a ventral emotion regulation circuit, which closely interacts with cognition via amygdala-frontal connectivity.

**CONCLUSION:** These data highlight the validity of our novel emotionally connotated executive function paradigm and emphasize its potential as a promising research tool to further investigate emotion-cognition-interactions. Moreover, it might represent a valuable diagnostic instrument in the context of clinical assessments.

**QUICK READ**



- › deciphering emotion-cognition-interactions represents a key avenue in understanding fundamentals of complex human behavior and its neural manifestation.
- › novel fMRI protocol to elucidate the specific interplay of facial emotion processing and executive functioning.
- › engagement of key structures of social cognition and pivotal hubs of a ventral emotion regulation circuit.
- › promising tool for SCAN research and clinical diagnostics.

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## P8 - A Systematic Review of Social Cognition in Dysexecutive Mild Cognitive Impairment

Joana Melo e Castro<sup>1</sup>, Carina Fernandes<sup>1,2</sup>, Fernando Ferreira-Santos<sup>1</sup>, João Marques-Teixeira<sup>1</sup>

<sup>1</sup>Laboratory of Neuropsychophysiology, Faculty of Psychology and Social Sciences, University of Porto  
<sup>2</sup>Faculty of Medicine, University of Porto

### *Abstract:*

Dysexecutive mild cognitive impairment (dMCI) is a subtype of mild cognitive impairment (MCI) characterized by deficits in executive function. This condition has been considered as a putative intermediate state between normal aging and several dementias that share the impairment of temporal and frontal lobes, both related with Social Cognition (SC). It is currently known that cognitive impairments, even in the stages of MCI, impact on our ability to solve social problems. A systematic search on PubMed, SCOPUS, EBSCO and WebScience databases was carried out to identify studies on dMCI on emotion, social cognition, theory of mind, empathy, and mentalizing. From a total of 201 studies identified from the literature search, 21 met the inclusion criteria for the systematic review. Studies were distributed by three domains of SC: Emotion Recognition, Theory of Mind (ToM)/Mentalization and Empathy.

Evidence from primary studies suggests a relation between dMCI and impaired social cognition, specifically to tasks involving cognitive processes, while affective impairments seem to be more prevalent in amnesic MCI. A possible double dissociation between the dysexecutive and the amnesic subtypes of MCI and impairments in, respectively, frontotemporal and medial temporal brain structures is discussed.

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## P9 - Acknowledging the Elephant in the Room: Empirical Insights into the Relation between Arithmetic and Reading Fluency

Marta Martins<sup>1</sup>, São Luís Castro<sup>1</sup>

<sup>1</sup>Centre for Psychology at University of Porto

### *Abstract:*

Are arithmetic and reading fluency related during childhood? Despite the obvious verbal demands of arithmetics, and over a decade after the earliest neurocognitive evidence of a link between language and arithmetics, the relation between both has not yet been fully understood. Recent evidence suggests that mathematics and reading may have similar underlying processes and that some mathematical impairments are more related to a linguistic deficit than to a quantitative one. The current study examined the relation between arithmetic and reading fluency, number sense and working memory in children (N = 66; 8.3 ± 0.32 years; IQ ≥ 80; 38 female). Arithmetic and reading fluency were measured as the number of arithmetic problems/words correctly solved/read per minute.

An approximate number comparison task was used to assess number sense, in which half of the trials were area-controlled to assess whether responses were affected by total dot area instead of by number proper (Panamath test). Working memory was assessed with one visual and two auditory tasks. We found correlations between arithmetic and reading fluency in differential patterns. Arithmetic fluency positively correlated with non-area-related number sense and visual working memory, whereas reading fluency correlated with area-related

number sense and auditory working memory. These findings contribute to elucidate the relation between arithmetics and language by disentangling aspects of number sense and working memory that may specifically contribute to arithmetic and reading fluency.

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#### P10 - Action-Sound Coincidence and -Contingency Related ERP Attenuations Reflect Different Processes

János Horváth<sup>1</sup>, Iria SanMiguel<sup>2</sup>

<sup>1</sup>Research Centre for Natural Sciences, Hungarian Academy of Sciences

<sup>2</sup>Institute for Brain, Cognition and Behaviour, University of Barcelona

##### *Abstract:*

The processing of sounds presented in temporal proximity to actions is attenuated, which is reflected in reduced auditory event-related potentials (ERP). Because most studies used stimulation protocols with action-contingent sound presentation (i.e. the sounds were induced by the actions), it was suggested that the ERP attenuation was caused by action-sound contingency-representations (e.g. internal forward models) allowing the prevention of redundant auditory processing. A number of studies found, however, that sounds coinciding with an action also elicited lower-amplitude ERPs, despite being presented independently from actions.

The present study investigated whether a contingent action-sound relationship provided additional attenuation to the coincidence-related attenuation effect. Comparing action-related ERP attenuation in contingent and independent presentation protocols is not trivial, because inter-sound intervals will differ between conditions. To make sure that such differences did not inflate the measured effects in the contingent arrangement, inter-sound intervals in the independent condition were chosen to be systematically longer than those in the contingent arrangement. Because of this, the contingency-related attenuation was underestimated.

Although both contingent and independent arrangements resulted in the attenuation of the N1 ERP, attenuation was stronger in the contingent arrangement despite the built-in bias. Importantly, the two types of N1-attenuations showed different topographies: The positive aspect of the N1-attenuation was shifted towards temporal sites in the coincidence condition in comparison to that measured in the contingent condition.

This result demonstrates that action-sound contingency-related auditory ERP attenuation is not solely due to the temporal proximity of action and sound.

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#### P11 - Activation of Psychophysiological Responses with a Virtual Reality Program for the Treatment of Social Anxiety

Francisco Esteves<sup>1</sup>, Nadja Isberg<sup>1</sup>, Marie-France Larsson<sup>1</sup>, Ana Paula Cláudio<sup>2</sup>, Beatriz Carmo<sup>2</sup>, Augusta Gaspar<sup>3</sup>

<sup>1</sup>Mid Sweden University

<sup>2</sup>BioISI, Faculty of Sciences, University of Lisboa

<sup>3</sup>Catholic University of Portugal

##### *Abstract:*

Virtual Reality systems can be considered a valuable tool to enable exposure in the treatment of different anxiety disorders. *Virtual Spectators* is an application created to be used by therapists in the treatment of social anxiety, conceived to be easily manipulated by the therapist during the therapy session. The aim of the present study was to test the emotional impact of the application in non-clinical participants, by measuring psychophysiological changes. Heart-Rate, Skin Conductance Responses and the Startle Reflex were monitored while participants were submitted to the test situation – to read two different texts (one easier and another more difficult) in front of a panel with three animated virtual judges. Thirty-two participants (10 males) were divided in two groups – high and low

social anxiety. The results showed that the participants reacted with higher arousal while reading the first text, with increased heart-rate and skin conductance levels.

A general differentiation between the groups was also observed in the heart-rate data, with participants in the high-anxiety group showing larger levels than the low-anxiety participants. Interestingly, it was the more difficult text that was rated as more realistic. In general, it can be concluded that the application *Virtual Spectators* seems to be a useful instrument to induce anxiety responses in exposure situations in the treatment of social anxiety.

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#### P12 - Activity Patterns in Motor Regions of Chronic Stroke Patients for Action Observation, Execution, and Imitation

Panthea Heydari<sup>1</sup>, Sook-Lei Liew<sup>1</sup>, Hanna Damasio<sup>1</sup>, Carolee Winstein<sup>1</sup>, Lisa Aziz-Zadeh<sup>1</sup>

<sup>1</sup>University of Southern California

##### *Abstract:*

The Mirror Neuron System (MNS) is comprised of motor regions (the inferior frontal gyrus, ventral premotor cortices, and posterior parietal cortices) that are active both when we make an action and when we see someone else make a similar action. Previous studies in non-disabled adults show that during imitation, regions of the brain show reliably larger BOLD signal intensity when compared to action observation or execution alone. Here, we ask: in patients with chronic left middle cerebral artery (MCA) infarcts suffering from mild to moderate upper extremity (UE) motor impairments, does BOLD activity patterns in the MNS follow that of non-disabled adults (imitation>execution>observation)? In this ongoing study, thirteen patients and 9 nondisabled subjects participated in this study. Both groups were asked to observe, execute, and imitate left and right hand actions while in the fMRI scanner. Our preliminary analyses confirm that in nondisabled subjects, the dominant (right) hand follows a pattern of highest percent signal change for conditions of imitation>execution>observation for all ROIs (IFGpo, PSL, PO, and PCG). In patients with stroke, the unaffected(left) hand follows the expected activity pattern (imitation>execution>observation) in all ROIs. For the affected(right) hand, execution engages the MNS to the highest degree, followed by imitation and observation.

Engagement of these regions may suggest that recruitment of MNS is highest for the most used hand, such as the dominant/right hand in the nondisabled and the non-paretic/left hand in the stroke group. This information may be useful in understanding imitation post-stroke rehabilitation methods using imitative learning.

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#### P13 - Adaptation and Change-Detection: The Two Sides of the Same Coin

István Czigler<sup>1</sup>

<sup>1</sup>Institute of Cognitive Neuroscience and Psychology, Centre for Natural Sciences, Budapest

##### *Abstract:*

In sequences of frequent events (standards) an infrequent event (deviant) elicits larger negativity over posterior locations than the standard, even if the events are unrelated to the ongoing task. The deviant minus standard difference is usually termed as visual mismatch negativity (vMMN), i.e., the visual counterpart of the auditory mismatch negativity event-related (ERP) component. VMMN is elicited by deviant features (color, orientation, movement direction, etc.) and more complex events (like perceptual categories, facial emotions). However, deviant minus standard difference can be attributed to the decreased activity to stimulus repetition (stimulus specific adaptation; SSA) and to the mismatch between the representation between the standard and the incoming deviant (genuine mismatch). Contrary to frequent claim of the field, both processes are indices of functionally significant processes. Activity-decrease on the standard is an index of memory acquisition, whereas genuine mismatch is an index of the automatic registration of violated sequential regulations. In our studies we compared ERP effects in adaptation paradigms to the

traditional oddball paradigms of vMMN research. The results show that the weight of the adaptation and mismatch-related components of the deviant minus standard difference potentials is stimulus dependent. In case of deviant orientation of line textures SSA accounts for all the differences, while in case of a centrally presented objects (windmill pattern) mismatch processes contribute to the earlier (120-200 ms), and fully account for the later (200-300 ms) parts of the difference potentials.

Therefore in vMMN research one has to be careful in generalizing the results across the effects of various visual events.

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P14 - Adolescents with ASD Integrate Contextual Cues to Decode Threat-Related Emotions but Do They Use These Emotions to Adapt Their Behaviour?

Christina Ioannou<sup>1</sup>, Coralie Chevallier<sup>1</sup>, Marwa El Zein<sup>1</sup>, Valentin Wyart<sup>1</sup>, Emma Vilarem<sup>1</sup>, Frédérique Amsellem<sup>2</sup>, Richard Delorme<sup>2</sup>, Julie Grèzes<sup>1</sup>

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<sup>2</sup>Robert Debré University Hospital, Paris, France

*Abstract:*

The ability to correctly decode others' threat-related expressions and to adapt behaviour accordingly bears survival advantages. Emotional signals are often ambiguous and can imply different levels of threat for the observer given surrounding contextual cues. For example, anger represents a stronger threat when paired with direct gaze. In contrast, fear signals greater danger when coupled with averted gaze (because it indicates the presence of an imminent threat in the environment). In a first study, we investigated whether gaze direction acts as a contextual cue by facilitating the decoding of these threat-related combinations in 20 adolescents with Autism Spectrum Disorders (ASD) and 20 Typically Developing (TD). Participants performed an emotion categorisation task (fear/anger) that manipulated the ambiguity of the emotions (7 intensities) and gaze direction (direct/averted). A significant emotion by gaze interaction was revealed within each group with a strong effect of task-irrelevant direct gaze on anger recognition.

However, no effect of task unrelated averted gaze on fear was found. Crucially, there was no interaction with group suggesting that the performance of both ASD and TD adolescents was influenced by gaze direction in a similar way. Moreover, overall emotion recognition accuracy was comparable in both groups. We are currently in the process of testing the hypothesis that individuals with ASD, despite demonstrating basic emotion decoding skills, might not perceive emotions as communicative signals, and hence will not adapt their actions accurately.

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P15 - Advantage of Anxiety for Selective Attention under High Load and Threat

Shasha Morel<sup>1</sup>, Stephanie Dubal<sup>1</sup>

<sup>1</sup>ICM

*Abstract:*

Cognitive models of anxiety predict that processing threatening stimuli is automatic, independent of attention load, in association with impoverished attentional control.

Based on such models, anxiety should influence threat evaluation at a preattentive stage under conditions of both low and high perceptual load. In the present study, we compared performance and brain event related potentials of high trait-anxiety (HTA) and low trait-anxiety (LTA) individuals in a letter search task. We manipulated the perceptual load across two conditions: in the low perceptual load condition a succession of two letters was superimposed to a visual background whereas in the high perceptual load condition, a succession of seven different letters was used. In addition, target letters were presented on either a neutral or threatening background, thus acting as irrelevant stimuli.

According to Lavie's model of selective attention, the processing of task-irrelevant stimuli may be prevented under high perceptual load condition. This assumption was confirmed in LTA participants, whose performance in the high perceptual load condition was not impacted by emotion. Conversely, HTA accuracy was lower when irrelevant stimuli were emotional than neutral in the high perceptual load condition. Notably, accuracy was better in anxious than non-anxious subjects in the high load condition with neutral irrelevant stimuli. In the latter condition, very early cortical activity in the occipital cortex, around 30 and 50 msec post-stimulus was increased in the anxious group compared to any other condition and group, suggesting that the better behavioral performance would occur in the context of an early attentional orienting.

Anxiety proved to improve selective attention in high perceptual load conditions, with very early orienting of processing resources independent of emotion.

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#### P16 - Affective Face Processing under Predictable and Unpredictable Threat

Isabelle A. G. Klinkenberg<sup>1</sup>, Maimu A. Rehbein<sup>1</sup>, Christian Steinberg<sup>1</sup>, Markus Junghöfer<sup>1</sup>

<sup>1</sup>Institute for Biomagnetism and Biosignalanalysis, University Hospital Muenster, Germany

##### *Abstract:*

The threat-of-shock- and the “phasic and sustained fear”-paradigms have provided ample data on the emotional processing of predictable and unpredictable threat, but little is known about the processing of aversive, threat-irrelevant stimuli in these paradigms. We investigated how the predictability of threat influences the neural visual processing of threat-irrelevant fearful and neutral faces. Thirty-two healthy individuals participated in an NPU-threat test, consisting of a safe or neutral condition (N) and a predictable (P) as well as an unpredictable (U) threat condition, using audio-visual threat stimuli. In all NPU-conditions, we registered participants' brain responses to threat-irrelevant faces via magnetoencephalography. The data showed that increasing unpredictability of threat evoked increasing emotion regulation during face processing predominantly in dorsolateral prefrontal cortex regions during an early to mid-latency time interval.

Importantly, we obtained only main effects but no significant interaction of facial expression and conditions of different threat predictability, neither in behavioral nor in neural data. Healthy individuals with average trait anxiety are thus able to maintain adaptive stimulus evaluation processes under predictable and unpredictable threat conditions.

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#### P17 - Age-Related aspects of Progressive Expectation Formation in the Balloon Analogue Risk Task

Zsófia Kardos<sup>1</sup>, Andrea Kóbor<sup>2</sup>, Ádám Takács<sup>3</sup>, Brigitta Tóth<sup>1</sup>, Roland Boha<sup>1</sup>, Bálint File<sup>1</sup>, Márk Molnár<sup>1</sup>

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##### *Abstract:*

The present study aimed to explore risk behavior and its neural correlates in extended sequences of decision making, particularly in old age, which represents a critical period regarding risk-taking propensity. The Balloon Analogue Risk Task was used in an electrophysiological setting with young ( $N = 17$ , age range: 21-28 years) and elderly ( $N = 18$ , age range: 62-72 years) age groups. During the task each additional pump on a virtual balloon increased the likelihood of a balloon burst but also increased the chance to collect more reward. Therefore sequential processing of risk hazards involved expectation formation about outcome contingencies. Event-related potentials associated with rewarding feedback were analyzed based on the forthcoming decisions (whether to continue or to stop) in order to differentiate between different levels of expectation towards gain or loss. In

the young, the amplitude of the reward positivity ERP component varied as a function of reward expectation with largest amplitudes for rewarding feedback followed by the decision to stop. In the elderly, however, reward positivity did not reflect expectations about reward contingencies. Behavioral indices of risk-taking propensity suggest that the elderly were characterized by more hesitation and increased tendency to avoid punishments, indicating that reward contingencies had less effect on the elderly than on the young. These findings signify that tracking sequences of reward has a key role in progressive expectation formation, and the decline of this mechanism with age could be responsible for the risk-avoidant behavior of the elderly.

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#### P18 - Effects of Aging on the Brain Electrical Activity Associated with the Involuntary Processing of Irrelevant Auditory Stimuli and the Reorienting of Attention to Target Visual Stimuli

Kenia Correa-Jaraba<sup>1</sup>, Susana Cid-Fernández<sup>1</sup>, Mónica Lindín<sup>1</sup>, Fernando Díaz<sup>1</sup>

<sup>1</sup>Universidade de Santiago de Compostela

##### *Abstract:*

The capacity to distinguish relevant information while ignoring irrelevant information is essential in everyday life and is a prerequisite for a flexible and adapted behavior. The involuntary processing of irrelevant stimuli and the subsequent reorientation to relevant stimuli can greatly affect the processing of the relevant stimuli and thus the final performance. Some studies have noted a decline in the selective processing of relevant stimuli and inhibition of irrelevant stimuli in older adults. The main aim of this study was to examine the effects of aging on the P3a and RON components of the event-related brain potentials (ERPs), associated with the orienting to unattended infrequent auditory stimuli (deviant or novel) and with the reorienting to relevant visual stimuli, respectively.

Participants, were divided into three age groups: (1) Young: (21-29 years old); (2) Middle-aged: (51-64 years old); and (3) Old: (65-84 years old), they performed an auditory-visual distraction-attention task in which they were asked to attend to visual stimuli and to ignore auditory stimuli (S: standard, D: deviant, N: novel).

Reaction times (RTs) to the target visual stimuli were longer in old and middle-aged than in young participants. In addition, in all three age groups, longer RTs were found when the target visual stimuli were preceded by novel relative to deviant and standard auditory stimuli, indicating a distraction effect provoked by novel stimuli. ERP components were identified in Novel *minus* Standard (N-S) and Deviant *minus* Standard (D-S) difference waveforms. The following results were observed for both difference waveforms: (1) in all three age groups, the P3a component comprised two consecutive phases: early-P3a (e-P3a) that may reflect the orienting response towards the irrelevant stimulation and late-P3a (l-P3a) that may be a correlate of subsequent evaluation of the infrequent unexpected novel or deviant stimuli; (2) the e-P3a, l-P3a and RON latencies were longer in the Middle-aged and Old groups than in the Young group, indicating delay in the orienting response to and the subsequent evaluation of unattended auditory stimuli, and in the reorienting of attention to relevant visual stimuli, respectively. On the other hand, the e-P3a amplitude was significantly larger in the Young group than in the Middle-aged group (in N-S) and Old group (in D-S), reflecting an age-related deficit in the orienting response to irrelevant auditory stimuli.

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#### P19 - Alexithymia and Changes in Salience Network Functional Connectivity

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**Abstract:**

Introduction Alexithymia is characterized by deficits in identifying and managing feelings (1, 2). Investigations frequently report dorsal anterior cingulate cortex (dACC) and anterior insula (AI) as regions strongly affected by alexithymia (3, 4). dACC and AI form salience network (SN) (5, 6) and are employed in detection of relevant stimuli, cognitive processing of emotions and response selection (2, 3, 5). Previous studies focused on alexithymia effects on valence processing thus our aim was to investigate how alexithymia contributes to salience network functioning. We sought to analyze intrinsic connectivity of regions in SN.

Methods 60 subjects (29 women, age= 26.65± 6.25) completed Toronto Alexithymia Scale (TAS-20= 38.58 ± 7.46) and a resting state functional magnetic resonance imaging session in 7T (Siemens, Erlangen, DE) (TR= 2.8 s, TE= 0.22 s, 280 time points, 62 slices, flip angle 80°, voxel size 2 mm isotropic). Data were preprocessed in SPM12 and DPARSFA V2.3, and functional connectivity (FC) analysis was calculated for four seed regions: L& R AI and L&R dACC. We ran a regression analysis between TAS-20 score and FC of seed regions ( $p < 0.05$  FWE corrected cluster level,  $k > 100$ ) with age and sex as covariates of nuisance.

Results There was a robust positive correlation of TAS-20 and FC of all four regions towards R Inferior Frontal Gyrus (R IFG). Both AI showed stronger connectivity towards L Superior and Middle Temporal gyrus with higher TAS-20. Additionally, R AI and L dACC were positively associated with areas Medial Frontal gyrus and Angular Gyrus.

Conclusion Alexithymia positively modulated connectivity of salience network towards several regions revealing possible mechanism of observed difficulties in relevant cue detection, reporting feelings and social cognition.

Changes in FC of SN can contribute to poor detection of important emotional cues, i.e. with L Temporal regions involved in semantic processing. Stronger FC to R IFG is indicative of a shift of attention towards exterior events which can serve as a basis of externally oriented thinking. Finally, heightened connection to Medial frontal areas which were associated with emotion suppression, may be related to the lower emotional awareness.

Our results indicate that alexithymia can be considered as a deficit in salience attribution.

References

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3. Lane *et al.* (1998);
4. Ernst *et al.* (2013);
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6. Seeley *et al.* (2007)

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## P20 - Alexithymia Decreases Emotional Brain Responses to Social but Not to Monetary Rewards

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<sup>2</sup>Stanford University

**Abstract:**

Alexithymia, a subclinical condition characterized by a lack of emotional self-awareness has been shown to impair the neural processing of social and emotional information.

Whether alexithymia alters the brain's perception of social approval in terms of social reward is currently unknown. Here, we investigated the influence of alexithymia on reward processing using a social incentive delay (SID) task versus a monetary incentive delay (MID) task in 45 healthy men who underwent functional magnetic resonance imaging. Alexithymia scores were correlated with neural activity in several regions of interest (ROIs) while participants anticipated and received either social rewards (videos of females smiling warmly and making 'thumbs-up' gestures) or monetary rewards (videos showing coins falling into a wallet). While no behavioral effects were observed, alexithymia was linked to decreased activity in the ventral tegmental area, putamen, and dorsal anterior cingulate cortex during the anticipation of social rewards ( $p < 0.05$ ), but did not modulate the

anticipation of monetary rewards. When receiving social rewards, individuals with higher alexithymia scores responded with decreased activity in the subgenual anterior cingulate cortex ( $p < 0.05$ ), but showed increased activity in the insula ( $p < 0.005$ ) and amygdala ( $p < 0.05$ ) when receiving monetary rewards. These results indicate that alexithymia decreases emotional brain responses to social rewards but not to monetary rewards. Such reduced appreciation of signs of social approval may underlie the cold and distant behavior characteristic of individuals with alexithymia and contribute to interpersonal problems associated with this condition.

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#### P21 - Alexithymia in Eating Disorders: Specific Brain Networks

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#### *Abstract:*

Eating disorders (ED) are a group of severe psychiatric disorders, including anorexia nervosa (AN) and bulimia nervosa (BN). Significant relational and emotional problems have been implicated in both disorders. Alexithymia is a deficit in identifying, describing and reporting one's own and other people's feelings. The aim of this study was to investigate the anatomical correlates of alexithymia in AN and BN. In particular, we used a voxel-based morphometry (VBM) approach to correlate the levels of alexithymia and regional gray matter (GM) density in patients with AN and BN in order to detect the brain areas involved. 21 patients with AN and 18 with BN were enrolled in the study. ED was diagnosed using the Structured Clinical Interview for Diagnosis (SCID) for DSM-IV-TR. Seventeen healthy subjects were used as a control group (CN). Alexithymia, depression and anxiety were assessed using self-administered questionnaires: the TAS-20 form, the Beck Depression Inventory (BDI) and the Symptoms Check List 90, Anxiety subscale (SCL-90 Anxiety), respectively.

We observed that in BN, alexithymia was correlated with the GM of the parietal lobe, in particular of the right angular gyrus. In AN, we did not find correlations between GM and alexithymia.

In BN, the alexithymic traits relate to a specific brain network, while no such relation was recognizable in AN: in these patients, alexithymia scores may be a consequence of an active strategy of self-isolation from feelings. These different patterns of correlations suggest that the brain functionality of these disorders is partly distinguishable.

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#### P23 - Altered Brain Oxidative Metabolism in a Rodent Neurodevelopmental Model of Schizophrenia

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<sup>1</sup>University of Oviedo, Spain

#### *Abstract:*

Schizophrenia is increasingly being considered as a neurodevelopmental disorder linked to disrupted prenatal and/or early postnatal brain development. Prenatal administration of the antimetabolic agent methylazoxymethanol acetate (MAM) at E17 is a well characterized rodent model of schizophrenia because it displays a number of histological, neurophysiological, and behavioral deficits analogous to those observed in schizophrenia patients. Here, we used the rat MAM model to evaluate possible alterations in behavior and functional connectivity during resting state, a finding widely reported by neuroimaging



studies in schizophrenia patients. MAM-treated young (2 month-old) male Wistar rats exposed prenatally to MAM at embryonic day 17 showed several behavioral alterations as compared saline-treated controls at E17. Behavioral deficits observed included decreased locomotor activity, increased anxiety tested in the zero maze, impaired spatial learning in the water maze but increased social interaction in the open field. Two weeks after completion of behavioral tests, brains were processed for quantitative cytochrome c oxidase histochemistry, a technique used to map long-term or sustained changes in brain metabolic capacity. MAM-treated rats showed significantly increased metabolic capacity in the substantia nigra (pars compacta), the periaqueductal gray, the ventral hippocampus, the perirhinal cortex and the medial septum. However, decreased metabolic capacity was found in the dorsal hippocampus and the premammillary region. Results support the hypothesis of abnormal function of the default mode brain network in schizophrenia. This work was supported by grant PSI2013-45924-P (Spanish Ministry of Science and Innovation).

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## P25 - Altering Developing Neurophysiology with Working Memory Training

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### *Abstract:*

Working memory is a basic requirement for many everyday tasks. Poor working memory skills are highly predictive of educational underachievement and developmental disorder. Despite the high level of interest in the application of cognitive training, especially in childhood, very little is known about the neurophysiological mechanisms by which training gains are achieved. I will present data from a double-blind randomised controlled training study, in which we use the dynamic electrical activity recorded using MEG to explore underlying neurophysiological changes following training in a group of children (N=27, aged 8 to 11). We used new methods to explore the spontaneous coordination of electrophysiological signals at rest. Improvements in working memory after training were significantly associated with changes in functional connectivity between areas in fronto-parietal cortex and inferior-temporal cortex. During task performance we also observed enhanced coupling between the upper alpha rhythm (at 16 Hz), recorded in superior frontal and parietal cortex, and high gamma activity (at ~ 90 Hz) in inferior temporal cortex. This altered neural network activity associated with cognitive skill enhancement is consistent with a framework in which slower cortical rhythms enable the dynamic regulation of higher frequency oscillatory activity related to task-related cognitive processes. This is the first demonstration that this hierarchically organised neuronal coupling can be measured in childhood, is associated with enhanced competence in a cognitive skill, and can be augmented by targeted intervention.

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## P26 - An ERP Study of Preoccupation Related Biases in Body Size Processing

Helen Uusberg<sup>1</sup>, Krista Peet<sup>1</sup>, Andero Uusberg<sup>2</sup>, Kirsti Akkermann<sup>1</sup>

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### *Abstract:*

Misjudging and overemphasizing one's body size is one of the key mechanisms in the etiology of eating disorders. We used EEG to investigate the attentional underpinnings of this risk factor in a social comparison setting. 36 women (age M=20.31, SD=2.01; BMI M=21.70, SD=2.56) varying in self-reported preoccupation with body image and weight viewed a series of digitally size-modified images (from -10% to +10% in 2% intervals) of themselves and a size-matched model with the task to compare each image to their actual body size ("smaller/bigger than me"). In women with high preoccupation, N170 responses were

increased to enlarged (+4% to +10%) relative to realistic body images (-2%, 0, +2%), indicating automatic body size processing. The dynamics of later ERP components suggest that at more deliberate processing stages highly preoccupied women attended selectively to size-modifications of their own images. Specifically, during the P3 window, their brain responses were increased in response to enlarged, and during the LPP window also in response to reduced (-10% to -4%) images of themselves, but not of the model. By contrast, for women with low preoccupation, the body size differentiation occurred later, was independent of stimulus identity, and apparent only for enlarged images. Behaviorally preoccupation enhanced the tendency to overestimate one's body size in relation to the model. Current findings demonstrate that preoccupation with body image involves an attentional bias towards one's own body size that may interfere with adequate social comparisons and as a result bias body size perception in relation to others.

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## P27 - An Event-Based Account of Conformity

Diana Kim<sup>1</sup>, Bernhard Hommel<sup>1</sup>

<sup>1</sup>Leiden University

### *Abstract:*

People often change their behavior/beliefs when confronted with deviating behavior/beliefs of others, but the mechanisms underlying such phenomena of conformity are not well understood. Here we suggest that people cognitively represent their own actions and those of others in comparable ways (Theory of Event Coding: TEC), so that they may fail to distinguish one from the other. This suggests that even actions without any social meaning can induce conformity effects, especially if they are similar to one's own actions. In two experiments, we show that female participants adjust their manual judgments of the beauty of female faces into the direction of distracting information without any social meaning (numbers falling into the range of the judgment scale). We also show that the strength of this conformity effect is further enhanced with distractor movies showing the actual manual decision-making act, suggesting that, as predicted, similarity between observed action and one's own action matters. Finally, in a third experiment we show that the standard conformity effect (induced by presenting "average judgments" of a reference group) falls in between the number- and movie-induced effects.

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## P28 - An Overarching Versus Fractionated Role of the rTPJ in Attention and Social

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### *Abstract:*

The right temporoparietal junction (rTPJ) has been associated with two distinct capacities: shifting attention to unexpected stimuli (reorienting of attention) and understanding others' mental states [theory of mind (ToM)]. Competing hypotheses either suggest the rTPJ representing a common region involved in different cognitive functions or consisting of subregions associated with distinct processes. In my talk, results from an activation likelihood estimation (ALE) meta-analysis will be presented in which the anterior part of the rTPJ was identified as an overarching region for reorienting of attention and ToM, thereby indicating a common cognitive underlying function. Second, findings from a transcranial magnetic stimulation (TMS) study will be shown which further supported the results of the ALE study by showing impaired performance in a reorienting of attention task (Posner) and a ToM task (Gallagher's cartoon pictures) after anterior rTPJ stimulation compared to vertex stimulation. Additional support for a fractionation within the rTPJ will be demonstrated by ALE meta-analytic results indicating a specific role of the posterior part of the rTPJ for ToM processes. Moreover, I will present meta-analytic connectivity mapping (MACM) and resting-state

functional connectivity (RSFC) data fostering the fractionation between the anterior (as overlapping) and posterior (as solely ToM related) region by showing a strong co-activation of the anterior rTPJ with the attentional network and a strong co-activation between the posterior rTPJ and the socio-cognitive network. Finally, potential mechanisms of the anterior rTPJ are discussed: the circuit breaker theory (Corbetta et al. 2008) or the conceptual update theory (Geng and Vossel 2013).

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P30 - Anxiety Dissociates the Adaptive Functions of Sensory and Motor Response Enhancements to Social Threats

Marwa El Zein<sup>1</sup>, Valentin Wyart<sup>1</sup>, Julie Grèzes<sup>1</sup>

<sup>1</sup>Ecole Normale Supérieure

*Abstract:*

Efficient detection and reaction to negative signals in the environment is essential for survival. In social situations, these signals are often ambiguous and can imply different levels of threat for the observer, thereby making their recognition susceptible to contextual cues – such as gaze direction when judging facial displays of emotion. However, the mechanisms underlying such contextual effects remain poorly understood. By computational modeling of human behavior and electrical brain activity, we demonstrate that gaze direction enhances the perceptual sensitivity to threat-signaling emotions – anger paired with direct gaze, and fear paired with averted gaze. This effect arises simultaneously in ventral face-selective and dorsal motor cortices at 200 ms following face presentation, dissociates across individuals as a function of anxiety, and does not reflect increased attention to threat-signaling emotions. These findings reveal that threat tunes neural processing in fast, selective, yet attention-independent fashion in sensory and motor systems, for different adaptive purposes.

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P31 - Associative Learning of Stimulus Relations in a CPT-Like Task. An EEG Study

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*Abstract:*

When an imperative stimulus is preceded by a signal that indicates properties of the upcoming go-signal, people implicitly learn this relation and may use it for response preparation. This phenomenon is well known from cueing studies in which cues and targets have in most cases distinct and pre-defined values. However, also in apparently regular sequences of stimuli, rules might be embedded that may lead to an association that is beneficial for response preparation.

We tested this assumption in a variant of the CPT task. A sequence of letters was presented (constant inter stimulus interval of 2s) that consisted of A-X, A-Y, B-X, B-Y pairs. A-X and B-Y pairs were more probable than the other variants (each 40%). Participants had to press a key to any X.

Responses were faster to Xs that followed an A. Both frontal N2 and frontal theta were increased when a Y followed an A compared to Ys after a B. Processing an A evoked a larger P3 but no larger CNV compared to a B. Comparing these data to data from a group of subjects that were pre-exposed with the A-X relations in a block of an AX-CPT using the same stimulus material, most of the EEG effects appeared to be more pronounced in the learning phase, indicating an on-line adaptation to the material.

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P32 - Associative Memory for Emotional Words in Communicative Context – The Effects of Emotional Congruency and Basic Emotions

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*Abstract:*

**Introduction:** Some studies have confirmed a common belief that information evoking strong emotion is better remembered. However, there are contradictory conclusions regarding the memory of its context which is particularly important in verbal communication. The aim of the study was to investigate how emotion influences associative memory of words within communicative context. We followed the model of basic emotions in order to compare specific effects related to memory of disgust and fear. Moreover, we considered the influence of an aspect that has not been examined so far, namely emotional congruency of certain information and its context.

**Methods:** A group of 20 participants (only F, M age = 25.3, SD = 3.1) took part in an experiment conducted with the use of 3T Siemens Trio MR Scanner. Stimuli included emotional words and faces selected from the available standardized affective datasets [7; 8; 9; 10]. During each of 4 encoding sessions, 60 words were shown paired with faces (both associated with disgust, fear, or neutral) so as to form emotionally congruent or incongruent conditions. The subjects were instructed to memorize the pairs in order to perform the subsequent memory test and to imagine the words as communicated from the faces. In each of 4 retrieval sessions, 105 words (60 old, 45 new) were shown and participants indicated if they have seen each word in the context of face expressing disgust (D), fear (F), neutral/ other (O) or the word is new (N). After correctly responding D, F or O, sometimes a face occurred and participants had to judge whether they have seen exactly this word-face pair.

**Results:** At the behavioural level, participants showed an above-chance performance on emotion x congruency conditions (mean 51% correct, with 4 possible answers). Analysis on the percentage of correct responses for all the conditions showed a significant effect of condition - congruent disgust was retrieved better than all the other emotional pairs. At the neuronal level, we found a significant effect of correct retrieval of emotional as compared to neutral material in the right and left hippocampus. The effect was driven mainly by the difference between BOLD contrast estimate values for emotionally incongruent and neutral stimuli.

**Conclusions:** Here we provided behavioral and neuroimaging evidence that emotion influences associative memory of verbal stimuli depending on specific basic emotions and emotional congruency between item and communicative context.

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P34 - Automatic Processing of Emotions in Obesity: Neural Correlates and the Role of Binge Eating Disorder

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*Abstract:*

The role of emotional processing in obesity has only recently become the focus of active research. Regarding the automatic emotional processing, research has shown that individuals with obesity (OB) present a tendency to inhibit attention from negative emotions. However, studies in this field are still scarce, focused on emotional awareness, and seldom

consider the presence of disordered eating behaviors. The aim of this study is to explore the neural mechanisms associated with automatic emotional processing in obesity (through the analysis of event-related potentials – ERP) and analyze whether possible impairments are related with the presence of binge eating disorder (BED).

We expect to screen 30 participants with obesity diagnosis and 30 with normal weight for the presence of BED, depression/ anxiety. Participants will also complete a dot probe task of emotional faces while EEG activity is recorded.

Data collection is still underway, but it is expected OB to show an attentional avoidance of negative emotions reporting lower reaction times and less response precision than normal weight participants, independently of self-reported depression/ anxiety. Also ERP analysis should show a decreased N2pc towards negative emotions. Greater impairments are expected to be observed in individuals with BED.

Emotional avoidance is considered a strategy to escape from personal problems and negative emotional states which has been related to OB and moreover to binge eating symptoms. Therefore, this negativity bias (if demonstrated) may occur due to the difficulties imposed by the disease and presents some clues on how OB individuals, especially with BED, cope with emotions.

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### P35 - Beware the Serpent: The Advantage of Evolutionary-Relevant Stimuli in Accessing Visual Awareness

Nuno Gomes<sup>1</sup>, Samuel Silva<sup>2</sup>, Carlos F. Silva<sup>2</sup>, Sandra C. Soares<sup>2</sup>

<sup>1</sup>Portuguese Catholic University

<sup>2</sup>University of Aveiro

#### *Abstract:*

Snakes and spiders constitute evolutionary relevant stimuli for primates, having a privileged access to defense mechanisms (compared to innocuous stimuli). However, according to the *Snake Detection Theory* (Isbell, 2009), the vital need to detect camouflaged snakes provided a strong evolutionary pressure, making this stimulus preferably processed when compared to other stimuli with less evolutionary relevance (like spiders).

Several studies have evidenced that threatening stimuli (e.g., fearful faces) hold a privileged access to visual awareness. However, no study has yet directly assessed the role of evolutionary pressure on this advantage. In the present study, we used the Continuous Flash Suppression (CFS; an interocular suppression technique), to investigate whether snakes overcame suppression and accessed awareness faster than spiders (compared to an innocuous animal stimulus, birds), especially in the stronger suppression condition.

Sixty-one university students volunteered to participate (29 in the stronger suppression condition). Participants were asked to identify the screen quadrant where the stimulus was presented in order to achieve an objective measure of conscious processing. The results showed that in the stronger suppression condition only snakes presented an advantage over the innocuous animal stimulus in emerging from suppression into awareness, which was reflected in significantly shorter response times. Thus, our findings showed that the most evolutionarily relevant stimuli have an advantage in accessing visual awareness, confirming that the privileged processing of snakes, in the most complex perceptual conditions, extends to the access to visual awareness. This result provides a further demonstration of the unquestionable role of snakes in primates' evolution.

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### P36 - Body Odors from Anxious Individuals Influence Behavioral and Psychophysiological Responses for Dynamic Emotional Faces in Naïve Recipients

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<sup>1</sup>University of Aveiro

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*Abstract:*

Despite the overwhelmingly dynamic multisensory social stimulations we are exposed to in real life, the majority of studies on the topic has tested static facial stimuli presented in one sensory modality. In the present study, we capitalize on the social informative power of body odors and we pair them with the presentation of dynamic facial stimuli, allowing for a more ecological evaluation of basic social information processing. We collected body odors from individuals experiencing an anxious – a chemosignal able to alert conspecifics to the presence of potential danger in the vicinity - as well as a resting situation. We aimed at investigating if anxiety body odors modulate the behavioral and psychophysiological responses associated with the processing of dynamic emotional faces. Fifty-two female participants watched neutral faces morphing from neutral to either happy or angry, while smelling either anxiety or neutral body odors, presented via an olfactometer, while attempting to categorize the emotion as fast as possible. Results demonstrated that compared to neutral, anxiety body odors: 1) reduced the accuracy and increased the time needed to accurately categorize dynamic facial expressions; 2) reduced the vagal cardiac activity, in line with a psychophysiological response of stress. Together, these results demonstrate that in a social situation simulating the multisensory and dynamic features of real-life social contexts, anxiety body odors triggers a stress response that seems to impair both arousal and cognitive-emotional skills.

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P37 - Body Postures Impact on Mental Representations of In- and Outgroup Faces

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*Abstract:*

The ongoing goals, needs and body states of perceivers can impact their perception. Transitive changes in body states associated with social dominance, induced through expansive and constrictive body postures, result in a specific and distinct appraisal of the relevance of threat-related facial expressions during emotion processing. In the current study, we tested whether an impact of body postures on mental representations of faces could explain these results.

In order to assess mental representations of faces implicitly, participants were assigned to one of two arbitrary groups and then asked to categorize faces into in- and outgroup members. Before performing this task, participants adopted either an expansive or constrictive body posture. Mental representations of faces were visualized using reverse-correlation methods and then rated by independent participants. Relying on the phenomenon of ingroup favouritism, we hypothesized that (1) participants would choose faces showing features they prefer into their ingroup and that (2) the body postures would modulate their preferences in a distinct manner. Ingroup face representations of participants who adopted an expansive vs. constrictive posture were rated as more fearful, more affiliative and showed more direct gaze, while there was no effect of postures on anger and dominance ratings. These preliminary results suggest that expansive postures increase preferences for affiliative social signals. This is first evidence that one's body posture influences the mental images one forms of other's faces. We are currently running further experiments to investigate the link of body postures with preferences for dominant and affiliative signals.

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P38 - Brain Correlates of Expression-Related Change Detection

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<sup>1</sup>Université François Rabelais de Tours

<sup>2</sup>Centre Universitaire de Pédopsychiatrie, CHRU de Tours

*Abstract:*

Change detection and facial expression perception are two processes that are thought to occur automatically. In electroencephalography, deviancy detection elicits a specific component, called mismatch negativity (MMN), which is also sensitive to facial expression. The aim of the current study is to explore the interaction between change detection and facial emotion processing with fMRI. Fifteen healthy participants were scanned in a visual oddball design while performing an orthogonal task. The standard stimulus was a neutral female face; deviants were pictures of the same person displaying a different neutral expression or an angry expression; mismatch responses (MMR) were calculated as the difference between activity to the deviants in the oddball sequence and activity to the same stimulus in an equiprobable sequence. An MMR ( $p < 0.001$ ; cluster FWE-corrected) was observed for both neutral and emotional changes. Neutral changes activated bilateral fusiform gyrus (FG) and inferior occipital cortex (IOC). Emotion-related MMR were observed in the visual ventral pathway including bilateral FG and IOC, in the fronto-parietal network, right amygdala and bilateral thalami; all responded more to emotional than neutral changes (one-way ANOVA). This study showed that despite controlling from refractoriness and low-level information, a clear facial expression-related MMR can be recorded in fMRI. Emotional changes activate a large network of brain regions known to be involved in expression perception and/or attention orienting. Importantly, activity in regions such as the amygdala remains even after subtracting activity related to emotion processing and neutral changes, suggesting a specific encoding of emotional change.

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P40 - Brain Responses to Vowel Change in Finnish Dyslexic Children as a Signature of Phonological Processing

Paavo H. T. Leppänen<sup>1</sup>, Natalia Louleli<sup>1</sup>, Najla Azaiez<sup>1</sup>, Kaisa Lohvansuu<sup>1</sup>, Jarmo A. Hämäläinen<sup>1</sup>

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*Abstract:*

Developmental dyslexia, a neurocognitive reading disorder, could be associated with problems in phonological processing related to poor phonemic representations. However, little is known about neurocognitive mechanisms underlying phonological processing and speech perception in dyslexic readers with and without phonological difficulties. In this study, brain event-related potentials (ERPs) to native speech sounds were investigated in Finnish school-aged participants. ERPs of 98 8-11 year old children at grades 2-4 (40 typical and 58 dyslexics, including 21 without phonological problems) were measured using a mismatch negativity (MMN) paradigm. The Finnish prototypical /y/-vowel was presented as a rare deviant stimulus (18%) embedded among a standard /i/-vowel (82%). Temporal principal component analysis (tPCA) was applied to identify pre-attentive MMN and late discriminative negativity (LDN) responses.

Typical readers showed significant MMN and LDN responses for /y/ vs. /i/ vowel difference at ca 160 and 390 ms, respectively. However, dyslexics without phonological difficulties failed to show significant MMN response. Interestingly, dyslexic readers with phonological difficulties had greater MMN amplitude compared to the two other groups. Neither of the dyslexic groups showed significant LDN. Overall, the results suggest that both dyslexic groups had atypical vowel processing. Atypically large MMN in the dyslexics with phonological difficulties could indicate less specified phonemic representations for prototypical vowels or that they are relying less on these representations. The failure of both dyslexic groups to show LDN could suggest that both groups have a deficit in later stages of speech processing following MMN which reflects earlier phase of preattentive sound discrimination.

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P42 - Cancer Patients Show Higher Anxiety Levels Compared with Non Cancer Patients Just before Undergoing Surgery

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**Abstract:**

Patients undergoing surgery tend to suffer from anxiety just before the surgery. This anxiety is related either to the anaesthesia or the surgery. Consequently, this anxiety increase during the preoperative assessment and surgical preparation may produce negative effects in the perioperative period. Our aim was to evaluate information about anxiety in patients operated in our hospital. Patients were separated into two groups: cancer patients (CP; n=29) and non cancer patients (NCP; n=14). Anxiety levels were evaluated through Beck Anxiety Inventory (BAI). Scoring the BAI is based on a 0-3 point scale per question and the total score indicates the severity of anxiety (minimum anxiety level, low anxiety, moderate anxiety and severe anxiety). Both cancer patient and non-cancer patient groups were compared through Fisher's exact test in SPSS v.19. The relative frequency distribution we found was: minimum anxiety level: 10,34 % (CP) vs 21,42 % (NCP); low anxiety: 27,58 % (CP) vs 35,71 % (NCP); moderate anxiety: 51,72 % (CP) vs 42,85 % (NCP) and severe anxiety: 10,34 (CP) vs 0% (NCP). This qualitative study revealed differences in anxiety levels between both CP and NCP groups.

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P43 - Cardiac Autonomic Correlates of Fear and Disgust Chemosignals

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**Abstract:**

Cardiac activity is related to the affective processing of stimuli perceived as unpleasant, such as disgusting and fearful scenes. However, even though such negative emotional information can be conveyed via body odors (BOs) alone, the investigation of BO-dependent cardiac autonomic activity has been so far neglected. Here, we investigated cardiac activity in participants exposed to disgust, fear and neutral BOs, collected from donors viewing videos eliciting such emotional experiences. Seventy-two participants (37 females) were exposed to a block of 20 trials of neutral BO and to a block of 20 trials of an emotional BO (either disgust or fear), in a between-subject and counterbalanced design. Time- and frequency-domain measures of heart rate variability (HRV) were calculated over the two blocks (~7 min each). Preliminary results obtained via linear mixed models analyses indicated that the parasympathetic cardiac activity (e.g., proportion of high frequency) was increased in the recipients during the exposure to the neutral BO as compared to when a negative emotional BO was presented. However, the parasympathetic cardiac activity did not discriminate between the exposure to disgust and fear BO. This effect is magnified in female. These results extend the characterization of the psychophysiological profile of BOs to cardiac activity and evaluate it in the context of participants' fear and disgust.

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P44 - Co-Regulation between Romantic Partners as Expressed through Cardiac Synchrony



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*Abstract:*

Little attention has been given to a fundamental aspect of the interpersonal processes, the physiological synchrony within this dyadic emotional system. By measuring the physiological synchrony between members of a dyad during an interactive experience it is possible to capture specific patterns of responsivity to the other's behavior, which it is not possible if only the individual measure is observed. Empirical research has documented evidence on the importance of the interplay of physiological responses in the quality of social life and long-term health, through the influence in the occurrence of the subjective experience. This issue is especially critical in marital research, considering findings from recent studies showing that the behavioral influence of each partner on the other occurs also through physiological linkage, which is defined as a coordinated oscillation of the physiological responses between partners (Butler & Randall, 2013; Saxbe & Repetti, 2010). In order to assess this mechanism more directly, we used a psychophysiological measure, as measured by the heart activity, during a dyadic couple's interaction task. An ecological laboratory-based interaction was designed to mimic the couples' daily experiences, which involve transactional emotional processes, or the reciprocal interaction of emotions, either negative or positive. We predict that differing patterns of physiological linkage will be associated with the subjective assessment of empathy.

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P45 - Cognitive Effort in Anxiety: Evidence from Pupillary Responses and Slow-Wave Cortical Potentials

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*Abstract:*

High anxious individuals exert greater cognitive effort to complete tasks. This is evident on behavioural measures of processing efficiency (increased reaction times - RTs), and activity in corresponding cortical regions (e.g. Contingent Negative Variation [CNV] at frontal sites). Increased cognitive effort is further associated with increased pupillary responses. We combined pupillometry, eye-tracking and electrophysiological (CNV) measures to examine processing efficiency in anxiety. We measured saccades (accuracy and latency), pupillary responses (diameter) and CNV during a delayed pro- and antisaccade task in which cognitive effort was manipulated (long delay vs short delay). Pupillary responses and negative CNV were larger for high-anxious individuals, particularly during long delay consistent with increased effort. Participants made errors and were slower on antisaccade vs. prosaccade trials and following short delay. Anxiety increased eye-movement errors and latencies on antisaccade trials. Our results provide evidence that compensatory cognitive effort (inefficiency) in high-anxious individuals is evident across behavioural and neurophysiological systems, and suggest these convergent measures to profile individual differences in cognitive processing biases in future studies of anxiety.

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P46 - Cognitive Phenotype of SCA36 ('Costa Da Morte Ataxia')

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### *Abstract:*

Autosomal dominant spinocerebellar ataxias (SCAs) are a heterogeneous group of neurodegenerative disorders characterized by the degeneration of the cerebellum and its connections. SCA36 is a recently described spinocerebellar ataxia, caused by an intronic GGCCTG repeat expansion in NOP56, relatively frequent among Galician patients with ataxia. Cognitive impairment, which is variable in different SCAs, has not been thoroughly assessed in SCA36. Our aim was to explore cognitive and affective areas in SCA36. We evaluated 30 SCA36 patients, from 'Costa da Morte', a coastal region in Northwestern Spain. All subjects were SCA36 mutation carriers with variable severity of motor dysfunction measured through the SARA scale. We used a battery of tests in order to assess different functions: MMSE, BDI-II, Wisconsin Card Sorting Test, Boston Naming Test, among others. Only three patients had a MMSE score below cutoff for normal general performance. Over 50% of the patients exhibit symptoms from mild to severe depression with BDI-II. The average percentile for perseverative errors was 55. All percentiles of verbal fluency were below norm data, even after adjustment for the degree of dysarthria. Our results indicate that in SCA36 there is mild impairment affecting language production from early stages, whereas frontal deficits appear in advanced cases only. There is no frank dementia. Special attention should be paid to affective aspects and mood, which are also frequently altered. Compared to what has been reported for other SCAs, SCA36 patients seem to have milder frontal-executive deficit.

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P47 - Cognitive Reinterpretation or Just Cognitive Elaboration: What Decreases Emotional Responses during Reappraisal?

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### *Abstract:*

Reappraisal is an emotion regulation strategy, which involves changing interpretation of emotional stimuli, so that they are less aversive. Reappraising decreases measures of negative affect and the magnitude of LPP (late positive potential) that is larger after presentation of emotional versus neutral stimuli. Importantly, the LPP is also attenuated in the conditions of cognitive load compared with passive tasks. As the reappraisal requires cognitive effort related to elaborate emotional stimuli, it is unknown, if observed reduction of the LPP amplitude during reappraisal is caused by the changing the meaning of the stimuli or just by its cognitive elaboration. Thus, the aim of the study was to check, if the LPP component during reappraisal may be decreased by the cognitive process other than reinterpretation. In the experiment with standardized neutral and emotional pictures, we used a between-subject design with 120 subjects divided into three groups: the reappraisal group (trained in reinterpretation), the "retro" group (trained in the task with cognitive elaboration of emotional stimuli other than cognitive change of affective content), and the control group (passive viewing with no additional task). We checked how these tasks modulate the early (400-1000ms post stimulus) and late (1500-3000 ms) LPP. The early LPP potential showed a main effect of group with the highest amplitude in the CTRL and the lowest in the REAP group. In case of the RETRO group, no differences with the remaining two groups were significant. The late LPP was similar for both REAP and RETRO groups which showed decreased amplitude comparing to the CTRL one in case of negative stimuli. The

results show that the LPP component during reappraisal may be attenuated by the process other than changing the meaning of the emotional stimuli and be related to unspecific cognitive activity.

This study was supported by the National Science Centre (DEC 2013/09/B/HS6/02662).

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#### P48 - Using Language for Social Interaction: Communication Mechanisms Promote Recovery from Chronic Aphasia

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*Abstract:*

*Introduction.* Clinical research highlights the importance of massed practice in the neurorehabilitation of chronic post-stroke aphasia. However, while necessary, massed practice may not be sufficient for ensuring progress in speech-language therapy. Motivated by recent advances in neuroscience, it has been claimed that using language as a tool for communication and social interaction leads to synergistic effects in left perisylvian eloquent areas. Here, we conducted a crossover randomized controlled trial to determine the influence of communicative language function on the outcome of intensive aphasia therapy.

*Methods.* Eighteen individuals with left-hemisphere lesions and chronic aphasia each received two types of training in counterbalanced order: (i) Intensive Language-Action Therapy (ILAT, also known as Constraint-Induced Aphasia Therapy) embedding verbal utterances in the context of communication and social interaction, and (ii) Naming Therapy focusing on speech production per se. Both types of training were delivered with the same high intensity (3.5 hours per therapy session) and duration (6 consecutive working days), with therapy materials and target utterances matched between treatment groups.

*Results.* A standardized aphasia test battery revealed significantly improved language performance with ILAT, independent of when this method was administered. In contrast, Naming Therapy tended to benefit language performance only when given at the beginning of the treatment, but not when applied after previous intensive training.

*Conclusions.* The current results challenge the notion that massed practice alone promotes recovery from chronic post-stroke aphasia. Instead, our results demonstrate that using language for communication and social interaction increases the efficacy of intensive aphasia therapy.

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#### P49 - Comparison of Two Short Periods of Maternal Separation on Adolescent Rat Social Behavior and Drug Reward

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*Abstract:*

Social environment is critical to develop drug problems, and social features play an important role in the initial use, maintenance and recovery from addictions. Maternal separation (MS) paradigm was used not as a child negligent model but as a model of physical mother absence (relevant in modern societies). In this study we investigate if short periods of early MS may disrupt the way adolescent rats interact with others and consequently their susceptibility to drug abuse. We also explore the effect of environmental enrichment (EE), during the period of MS, as a possible tool to protect adolescent rats from deleterious effects of these early life events. Two periods of MS, postnatal day (PND)2-6 and

PND10-14, for 2 hours/daily under EE or standard environment (SE) conditions were investigated, on different social behavior paradigms, on adolescent *Wistar* rats, and correlate with the expression profile of oxytocin receptor (OXTR) gene.

Sensitivity to the conditioned reward of cocaine was also evaluated. Results showed that MS during PND2-6 highly reduced social affiliation/motivation and social novelty preference indicating an inability to establish strong bonds. A tendency to express cocaine place preference was also observed in these rats. After MS during PND10-14 OXTR expression was increased in prefrontal cortex and rats were more affiliative. This study reveals that early short periods of MS are able to shape adolescent rat social behaviour and suggests that rats with less engagement of social reward systems may be more vulnerable to the rewarding effects of cocaine.

Supported by: FEDER funds through Programa Operacional Factores de Competitividade – COMPETE and Fundação para a Ciência e a Tecnologia, in the framework of the project ref. FCOMP-01-0124-FEDER-029576. Orçamento do Estado e FCT IF/00753/2014/CP1241/CT0005. FEDER funds through Programa Operacional Factores de Competitividade – COMPETE and Fundação para a Ciência e a Tecnologia, in the framework of the project PTDC/PSI-PCO/116612/2010, IF/01239/2014

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P50 - Compliance Instead of Flexibility? How Cognitive Control during Visual Search Is Altered in Elderly People

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*Abstract:*

During visual search cognitive control mechanisms guarantee the selection of currently relevant information such as the recovery from attentional capture by irrelevant objects. The present study investigated the effect of healthy aging on the attentional control of irrelevant visual information using the event-related potentials (ERPs) of the EEG. Participants performed a spatial cuing task where an irrelevant color cue was presented prior to a target with different stimulus-onset asynchronies (SOA; 200, 400, 800 ms). In one condition the target was also defined by color, therefore cue and target were contingent on attentional sets. In the other condition, cue and target did not share any features as the target was defined by shape. In the contingent condition, capture appeared independent from age and persisted over the different SOAs. However, capture effects were pronounced in elderly people. Compatible with this finding, ERP analyses revealed that after the initial selection of the color cue (indexed by N2pc) only younger adults re-oriented their attentional focus, mirrored by a subsequently contralateral positivity referred to the irrelevant color cue (i.e. distractor positivity; Pd). Prior to the onset of the target a sustained contralateral negativity referred to the color cue was observable for younger and older adults but only in the contingent condition. This indicates that spatial information of the color cue was transferred into working memory. Inhibition of the irrelevant information was reflected by a second contralateral positivity after target presentation. In contrast to younger adults, older adults showed no cue-related attentional orienting in the non-contingent task. This suggests that younger adults are more flexible in the handling of distracting information whereas older adults strictly adhere to the current attentional set.

The strict compliance with the attentional set has an influence on the cascade of cognitive control mechanism engaged during attentional capture and might provide an explanation for the stickiness of visual processing that is characteristic for older adults.

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P51 - Conditioned Excitation and Inhibition for Threat and Safety Cues in Human Visual Cortex

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*Abstract:*

In unpredictable environments stimuli that predict potential danger or its absence can change rapidly. Therefore, it is highly adaptive to prioritize incoming sensory information flexibly as a function of prior experience. Previously, these changes have been conceptualized as excitatory sensory gain increases in sensory cortices for stimuli that acquired fear relevance by associative learning. However, the role of safety cues in sensory short-term plasticity changes has not been investigated to such an extent. Interestingly, early formal descriptions of associative processes in discriminant fear conditioning by Rescorla and Wagner predict both, conditioned excitatory and inhibitory processes in response systems. First, we replicate previous findings of increased neuromagnetic steady state visual evoked fields (ssVEF) for acquired fear relevant stimuli. Critically, we demonstrate learning dependent conditioned inhibition of fear irrelevant stimulus driven ssVEF responses in visual cortex. The results are discussed in the light of the Rescorla-Wagner model and current neurobiological findings.

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P52 - Conflict Resolution Skills: Are We Capable of Being Concordant?

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<sup>2</sup>Ball State University, Indiana

*Abstract:*

Psychophysiological concordance has grown in interest and relevance in research, since there is evidence that it is an important indicator of emotional coregulation in interpersonal experiences. Studies have also shown that this phenomenon is also related to other more complex phenomena, such as empathy and the ability to manage potentially stressful situations. On the other hand, problem-solving skills are crucial in society, as a basic coping strategy to the individual in their living contexts, particularly within intimate relationships. The main goal of this study is to understand whether there is an association between psychophysiological linkage and problem-solving ability. We assume that a higher level of linkage will be associated with greater conflict resolution capability. For the purpose of this study, the participants (N=31) completed a self-report measure related to conflict resolution strategies and, attended in-person data collection sessions with their romantic partners, where it was measured participants' skin conductance level and interbeat interval of the heart, to estimate the psychophysiological concordance within the romantic dyad. Here we will discuss the methodological challenges of such approach, recent scientific findings demonstrating the significant contribution of exploring the physiological linkage in dyadic settings, and issues related with the practical application of this knowledge for assessment and intervention.

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P54 - Controlled and Automatic Functions in Risk-Taking Behavior

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*Abstract:*

In our daily life, we experience continuous fluctuations in risk, to which we have to adapt. The sequential processing of risky choices evokes expectations about outcome contingencies. We aimed to investigate the contribution of model-based control functions (executive functions, EFs) and automatic processes (implicit learning) to risky decision-making. Healthy adults participated in the Balloon Analogue Risk Task (BART) while ERPs were recorded. Participants were assigned to low EFs and high EFs groups based on their performance on a neuropsychological test battery measuring shifting, updating, and inhibition. In the BART, each balloon pump was associated with either a reward or a balloon pop with unknown probability. The feedback-related negativity (FRN) associated with the rapid evaluation of negative outcomes was larger in the high EFs group than in the low EFs group. As the FRN has been found to reflect salience prediction error, we suggest that the high EFs group formed internal models about the structure of the task, and the related expectations were violated by the outcomes. In behavioral follow-up studies, we investigated individual differences in learning capacities under ambiguity and the role of explicit strategies in the BART. Results suggest that both EFs and implicit learning contribute to risk-taking behavior. In sum, risky situations trigger model-based and automatic processes at the same time.

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P55 - Creative Boost – Unleashing Creativity Using TDCS in Japan

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*Abstract:*

Recent studies show that damage to the left inferior frontal gyrus (IIFG) may have a 'releasing effect' of creativity, suggesting that these areas may 'inhibit creativity'.

Based on these findings and on the twofold model of creativity, a novel neurocognitive model is suggested according to which creativity involves two recursive stages: a generation phase that is mediated by a fronto-parietal network and an evaluation phase, mediated by the IIFG.

Our aim was to explore cultural differences in creativity by examining the role of the IIFG using tDCS. Since in East-Asian cultures uniqueness is discouraged, original ideas are more likely to be inhibited during the "evaluation phase". Thus, we hypothesized that inhibition of the IIFG using cathodal stimulation will enhance creativity by decreasing the evaluation stringency.

First, we compared Israeli and Japanese students on their creativity level, in both phases. Creativity was measured by the "Alternate Uses Task" (AUT; Guilford, 1978). Evaluation was measured by a new task; evaluating the appropriateness of ideas generated by others. Israelis were more creative and evaluated others' ideas as more appropriate compared to Japanese.

Then, we recruited 30 Japanese students and divided them into two groups (Anodal/Cathodal). Each participant underwent the experiment twice: under stimulation and under sham.

Significant differences were found between the groups in both tasks: Anodal stimulation decreased creativity and the rating of appropriateness compared to sham, while Cathodal stimulation increased both, indicating less stringent evaluation.

Thus, temporary inhibition of the evaluation network may influence creativity, even in a culture that is perceived as less creative.

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P56 - Deconstructing Exogenous Attention to Fear: Behavioral and Electrophysiological Correlates

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*Abstract:*

Research has consistently shown that fear stimuli automatically attract attention in order to activate the defensive response systems. Recent findings have provided evidence that snakes tuned the visual system of evolving primates for their astute detection, particularly under challenging perceptual conditions. The goal of the present study was to measure behavioral and electrophysiological indices of exogenous attention to snakes, compared with spiders - matched for rated fear levels but for which sources of natural selection are less well grounded, and to innocuous animals (birds), which were presented as distracters, while participants were engaged in a letter discrimination task. Duration of stimuli, consisting in a letter string and a concurrent distracter, was either presented for 180 or 360 milliseconds to explore the modulating role of task demands. Results showed a specific early (P1) exogenous attention-related brain potential with maximal amplitude to snakes in both durations, which was followed by an enhanced late attention-related potential (LPP) showing enhanced amplitudes to spiders, particularly under the longer exposure durations. These results suggest that exogenous attention to different classes of fear stimuli follows a gradual process, with the most evolutionary-driven stimulus, i.e., snakes, being more efficient attracting early exogenous attention, thus more dependent on bottom-up processes.

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P57 - Different Cortical Mechanisms for Spatial and Feature-Based Attention in Visual Working Memory: A TMS Study

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*Abstract:*

Attention can be deployed to representations in visual working memory (VWM), ensuring that relevant information is maintained. We investigated whether the attentional selection of representations can operate on features just as well as on spatial information, and we used transcranial magnetic stimulation (TMS) to test whether these attentional mechanisms can be dissociated based on the site of cortical stimulation. During the retention interval of a VWM task, a cue was presented, which was either uninformative or indicated the item that would be tested. The test item was cued by its location (spatial attention) or by its shape (feature-based attention). During cue presentation, TMS was applied to the supramarginal gyrus (SMG), which has been implicated in spatial attention, or to the lateral occipital cortex (LO), which is involved in representing object shape. We observed improved memory for objects cued by location and shape, confirming that both spatial and featural information can be used for selecting representations in VWM. Importantly, stimulation of SMG selectively facilitated spatial attention and stimulation of LO selectively facilitated feature-based attention. These results show that spatial and feature-based attentional mechanisms in VWM recruit distinct cortical regions. The same regions are involved in attention to external events, indicating that attention in the mnemonic and in the perceptual domain are similarly implemented at the neural level. In general, these findings extend our understanding of how attentional mechanisms operating on different types of information optimize the use of the highly limited VWM system, allowing for a flexible updating of its contents.

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P58 - Disentangling the Effects of Regulating Positive and Negative Emotions in Depression - An fMRI Study

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*Abstract:*

The critical role of emotion regulation for mental health has frequently been demonstrated. However, depressed patients (DP) show behavioral and neural dysfunctions during emotion regulation.

Using fMRI, we examined for the first time how changing causal attributions of positive and negative events regulates emotions in DP and healthy controls (HC). Due to the self-relevance of facial expressions, pictures of happy and sad faces were presented. Participants were instructed to a) objectively view these pictures ("implicit regulation"), or imagine that the person on the picture was a close person and was b) happy/sad because of them ("internal attribution") or c) because something else happened ("external attribution").

First analyses show emotion- and group-specific activations within the emotion-regulation-network. DP, compared to HC, show increased activation in the fusiform face area, implying a greater emotional reactivity. While implicitly regulating sadness ("implicit regulation">"external attribution"), HC display activation in the putamen, pointing to successful down-regulation, whereas DP engage the posterior hippocampus, suggesting retrieval of autobiographical memories. Regulation of positive emotions yielded significant effects only in HC, indicating a critical deficit in DP when asked to regulate happy feelings. Interestingly, behavioral data indicate successful emotion regulation in both groups.

Emotion-specific activations within both groups emphasize the need to assess regulation of both positive and negative emotions. Particularly regulation of positive emotions has been understudied but reveals interesting insights, probably targeting a key impairment in these patients. Future analyses, including more participants, could elucidate the influence of clinical parameters (e.g. remission status) on emotion regulation.

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P59 - Dismissing Attachment Characteristics Dynamically Modulate Brain Networks Subservient Social Aversion

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*Abstract:*

Attachment patterns influence actions, thoughts and feeling through a person's 'Inner Working Model'. Speech charged with attachment-dependent content was proposed to modulate the activation of cognitive-emotional schemata in listeners. We performed a 7 Tesla rest-task-rest fMRI-experiment, presenting auditory narratives prototypical of dismissing attachment representations to investigate their effect on 23 healthy males. We then examined effects of participants' attachment style and childhood trauma on brain state changes using seed-based functional connectivity (FC) analyses, and finally tested whether subjective differences in responsivity to narratives could be predicted by baseline network states.

In comparison to a baseline state, we observed increased FC in a previously described 'social aversion network' including dorsal anterior cingulate cortex (dACC) and left anterior



middle temporal gyrus (aMTG) specifically after exposure to insecure-dismissing attachment narratives. Increased dACC-seeded FC within the social aversion network was positively related to the participants' avoidant attachment style and presence of a history of childhood trauma. Anxious attachment style on the other hand was positively correlated with FC between the dACC and a region outside of the 'social aversion network', namely the dorsolateral prefrontal cortex, which suggests decreased network segregation as a function of anxious attachment. Finally, the extent of subjective experience of friendliness towards the dismissing narrative was predicted by low baseline FC-values between hippocampus and inferior parietal lobule.

Taken together, our study demonstrates an activation of networks related to social aversion in terms of increased connectivity after listening to insecure-dismissing attachment narratives. A causal interrelation of brain state changes and subsequent changes in social reactivity was further supported by our observation of direct prediction of neuronal responses by individual attachment and trauma characteristics and reversely prediction of subjective experience by intrinsic functional connections. We consider these findings of activation of within-network and between-network connectivity modulated by inter-individual differences as substantial for the understanding of interpersonal processes, particularly in clinical settings.

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#### P61 - Dissociable Mirroring of Deceptive Intention and Kinematic Alterations into the Observers Motor System during Action Observation

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#### *Abstract:*

Social interaction often requires reading others' intentions by observing their movements. It has been revealed that action simulation is crucial in detecting others' deceptive intent: the observation of deceptive actions facilitates the observers' motor activity more than seeing him acting truthfully, suggesting that motor resonance is sensitive to deceptive intentions. However, one can alternatively hypothesize that this facilitation mirrors the kinematic alteration necessary to attain deceptive vs. truthful actions rather than the deceptive intention. Here, we tested these alternative hypotheses by using transcranial magnetic stimulation to measure corticospinal excitability (CSE) from hand and forearm muscles. Participants watched videos of an actor lifting a cube and judged whether the cube was heavy or light. The videos were taken in three conditions where the actor was asked to lift the cube after receiving truthful information on the object weight and being asked to provide either i) truthful (true condition) or ii) deceptive (deceptive condition) cues to the observers or iii) after receiving fooling information and being asked to provide truthful cues to the observer (deceived condition). Thus, we independently manipulated actor's intention and kinematics alterations. According to previous studies, CSE increased during the observation of deceptive actions; however, a decrease of CSE occurred in the deceived vs. the true and deceptive conditions. Importantly, while deceptive actions enhanced CSE for both muscles, perceiving kinematic alterations affected CSE in a muscle-specific way. This suggests that deceptive intention is actually coded by the observer's motor system and different hierarchical levels of action representation may modulate its activity via dissociable processes. Starting from these results we are now investigating the role of the mirror neuron system and of the mentalizing system in mediating these effects.

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#### P62 - Do We Fail to Remember or Succeed to Forget? – An fMRI Study of Intentional Memory within the Discrete Emotion Framework

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**Abstract:**

The classical view on remembering (interpreted as success) and forgetting (interpreted as failure) was recently argued by research suggesting that both processes may be studied as intentional acts (Anderson & Hanslmayr, 2014). Although, the intentionality of memory was shown to be influenced by emotion (Nowicka et al., 2011), it is unclear whether this relationship holds true irrespective of the kind of emotional experience.

The item-method *directed forgetting* paradigm (Wylie et al., 2008) was adopted in a pilot behavioral (25 F) and a follow-up fMRI (18 F) experiment. During the *study phase* subjects viewed neutral (60) and emotional (30 fear, 30 sadness) words (Riegel et al., 2015; Wierzbą et al., 2015), which they were instructed either to *remember* or to *forget*. In the *test phase* (without fMRI) subjects indicated whether the presented words (120 old, 120 new) had occurred previously, irrespective of the original instruction.

Consistently with previous research, our study revealed intentional mechanisms to be involved in memory processes with significantly better memory performance for *to-be-remembered* (TBR) than *to-be-forgotten* (TBF) items.

Characteristic pattern of brain response corresponding to specific instruction types was observed in middle (MFG) and superior frontal gyri (SFG) revealing more activity during the encoding attempt (TBR>TBF) and inferior parietal lobule (IPL) associated with suppression attempt (TBF>TBR). Interestingly, activation in parahippocampal gyrus (PHG) was found for the memory outcome contradictory to the instruction.

Although the cognitive control of memory processes was not influenced by emotion category at the behavioural level, the accompanying brain patterns were observed for fear and not for sadness.

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P63 - Does Neuroticism Affect Morning Cortisol Release in Healthy Older People?

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**Abstract:**

Certain brain structures such as the hippocampus, amygdala and prefrontal cortex may participate in the regulation of the cortisol awakening response (CAR), a discrete component of the HPA function that has been widely related to health and some personality traits. Aging affects the functioning of these structures and, consequently, CAR regulation. Considering the potential effect of CAR on health and the damaging or protective role that neuroticism and extraversion can have, respectively, on wellbeing, we aimed to explore the relationship between these personality dimensions and the CAR in people aged 55 or more. To do so, morning saliva samples were collected on two consecutive weekdays from a total of 160 older people. Neuroticism and extraversion were assessed using the Eysenck Personality Questionnaire-Revised, short form (EPQ-RS). Our results showed that neuroticism was related to overall morning cortisol concentrations (AUCg), but not to the increase with respect to the concentrations at awakening (AUCi). When we explored sex as a moderator, neuroticism was related to higher AUCi in women, although this relationship was not significant in men. No significant relationships were found between extraversion and AUCi or AUCg, regardless of sex. In conclusion, neuroticism was the only personality trait studied that was related to the activity of brain structures involved in HPA function in aging, emphasizing its relevance in health alterations associated with HPA-axis functioning.

P64 - Does Pain Interfere with Attentional Capacity in Fibromyalgia Patients?: An ERP Study Using An Auditory Oddball Paradigm

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**Abstract:**

Fibromyalgia (FM) is a chronic pain syndrome associated with attention dysfunction. It is well-known that pain demands attention and interferes on cognitive performance. Under this perspective, attention deficits in FM patients could be due, at least in part, to the persistent involvement of attentional resources in pain processing. P300 component of event-related potentials (ERP) has been studied as a neural index of attentional capacity in the field of pain and FM. Given that current evidence about neural substrate underlying the altered nociceptive and attentional processing in FM is still scarce, research on electrophysiological measures would be helpful.

With the aim to explore the effect of pain on attentional capacity, 18 FM patients and 21 healthy controls (HC) were asked to perform in an oddball paradigm. Four series of two auditory stimuli were presented: low frequent (1000Hz, *standard*) and high infrequent tones (2000Hz, *target*). Participants were asked to silently count target stimuli. Simultaneously, they were requested to submerge their left hand in either room temperature water (21-23°C, *neutral condition*) or cold water (10-12°C, *pain condition*). ERPs were recorded at sixty electrodes homogeneously distributed over the scalp. Temporal and Spatial Principal Components Analysis were employed to quantify and define the P300 component. sLORETA algorithm was used to inform on its neural origin.

In spite of no differences were found on behavioral measures, ANOVAs indicated that the fronto-central P300 was sensitive to the experimental manipulations ( $p < 0.05$ ). A main effect on P300 amplitude was found. Specifically, diminished amplitudes were observed under pain condition. Interaction effects showed a reduced P300 in FM under neutral condition compared to HC. In addition, HC showed a lower amplitude of P300 under pain condition compared to neutral condition. Contrary to expectations, no significant differences were found between groups on P300 in the pain condition or between conditions in the FM group. sLORETA located its neural origin in the superior frontal gyrus (BA11).

The reduced P300 amplitude in the neutral condition suggests an altered allocation of attentional resources in patients with FM. This deficit could, paradoxically, prevent their cognitive functioning from being interfered by pain, explaining the lack of pain effects on P300 in FM patients. The fronto-parietal attentional network seems to be involved in these attentional processes.

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P65 - Does Self Equal Value? An fMRI Study on the Neural Distinction of Self- and Value-Related Processing in VMPFC

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**Abstract:**

Humans usually overestimate the value of entities that are self-relevant (e.g. through ownership or similarity) and identify disproportionately often with those that seem highly valuable. This natural confound between self and valuation raises the question whether the two are inherently indistinguishable, or related, but separate concepts. Neuroimaging might address this question by identifying physiological structures underlying self- and value-related computations. Functional overlap would be consistent with some degree of shared processing. A dissociation implies partially independent functioning. Although prior work found overlap between self- and value-related regions in VMPFC, those studies that were

focused on valuation have failed to control for the stimuli's self-relevance and vice versa. Overlapping activations might thus be explained by conceptual confounds rather than true indistinguishability.

In five behavioral studies (N = 413) we developed a new experimental procedure to address this shortcoming and applied it in a subsequent fMRI study (N = 60). fMRI participants first rated the self-relatedness and value of personality traits one week before scanning, and were then re-exposed to these traits inside the fMRI scanner, performing a task unrelated to self and value.

Using pre-scan ratings as parametric modulators, we identified non-overlapping clusters modulated by self (anterior) and value (subgenual) in VMPFC, suggesting some degree of dissociability. Next, we controlled for self-relevance when analyzing valuation and vice versa by removing shared variance from each predictor. After orthogonalization, the self cluster remained significant whereas the valuation cluster was marginally significant, suggesting that self-related thought contains components that are independent from value-related processing.

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#### P66 - Does the Preparation of a Pain-Related Movement Enhance Somatosensory Processing?

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##### *Abstract:*

**Background.** Detection of somatosensory events on the skin is typically reduced before and during movement, due to the brain's ability to filter out irrelevant information, i.e., sensory suppression. Anticipation of pain, however, may enhance somatosensory processing by guiding attention towards body parts under threat. Up to date, somatosensory processing in a context of pain-related movement has not been examined.

**In this study,** we investigated whether somatosensory evoked potentials (SEP) are enhanced when preparing a pain-related versus a pain-free movement.

**Method.** Healthy participants (n=40) were asked to respond to a cue by performing a left or right hand movement. Importantly, participants learned that one of both movements was associated with a painful electrical stimulation on the moving hand. SEP were registered to an innocuous tactile stimulus that was administered on the left or right hand in the timeframe between the cue and the execution of the movement.

**Results.** We expected that during preparation of a pain-related movement tactile stimulation on a location congruent to the threat (right/left hand) would elicit different amplitudes for sensory suppression and attention components, indicating enhanced somatosensory processing. Data have been collected, and results will be presented at the conference.

**Discussion.** Enhanced somatosensory processing would suggest that the anticipation of a painful movement leads to attentional prioritization of the body part under threat. The possible role of malfunctioning sensory suppression in pain-related movement impairment will be discussed, as well as the use of this paradigm to study somatosensory processing during movements in chronic pain patients.

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#### P68 - Dual-Hemispheric TDCS Shutdown the Effect of Anodal TDCS over the Right Inferior Frontal Gyrus on Proactive and Reactive Prepotent Response Inhibition

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*Abstract:*

**Aim:** The aim of this study was to assess the effects of dual-hemispheric Transcranial Direct Current Stimulation (tDCS) over the Inferior Frontal Gyrus (IFG - anode over the right IFG - cathode over the left IFG) as compared to uni-hemispheric anodal tDCS and sham tDCS, in proactive inhibition of prepotent responses.

**Methods:** A total of sixteen-college student volunteers (age:  $21.5 \pm 4.5$ , 11 females) participated in this study. Participants were randomized to receive 1. Uni-hemispheric tDCS (35/100 cm<sup>2</sup>); 2. Bi-hemispheric tDCS (35/35 cm<sup>2</sup>), and 3. Sham tDCS, while performing a prepotent inhibition task.

**Results:** There were significant effects in terms of switch costs accuracy [ $F(2,30)=5.284, p=.007, \eta_p^2=.280$ ]. Post hoc pairwise LSD comparisons showed that uni hemispheric tDCS ( $M=-.754, SE=.827$ ) significantly decreased the switch cost when compared to both dual hemispheric tDCS ( $M=2.779, SE=.742$ ) ( $p=.002$ ) and sham tDCS ( $M=-1.885, SE=.903$ ) ( $p=.035$ ). There were significant effects in terms of switch cost for response times [ $F(2,30)=4.737, p=.016, \eta_p^2=.240$ ]. Post hoc pairwise LSD comparisons showed that uni-hemispheric tDCS ( $M=42.278, SE=7.024$ ) significantly increased the switch cost when comparing to dual hemisphere tDCS ( $M=6.509, SE=13.538$ ) ( $p=.0154$ ) and sham tDCS ( $M=20.212, SE=10.220$ ) ( $p=.042$ ).

**Main conclusion:** Uni-hemispheric bilateral tDCS increased accuracy, with a tradeoff in terms of performance when comparing to dual-hemispheric tDCS in prepotent inhibition task. Therefore these results suggest that uni-hemispheric rather than dual-hemispheric tDCS increase the inhibitory control by a top-down mechanism as reflected by the Speed-Accuracy Tradeoff (SAT)

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P69 - Dynamic Disconnection of the Supplementary Motor Area after Processing of Dismissive Biographic Narratives

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*Abstract:*

To understand the interplay between affective social information processing and its influence on mental states we investigated changes in functional connectivity (FC) patterns after audio exposure to emotional biographic narratives.

While being in the 7T MR scanner, healthy male participants listened to narratives about early childhood experiences of 3 patients, each having either a secure, dismissing, or preoccupied attachment representation. Directly after having listened to each of the 3 prototypical narratives, participants underwent a ten minutes resting-state fMRI scan. To study changes in FC pattern between conditions, 3 post-task conditions were compared to a baseline condition. Differences in connectivity pattern as well as specific regional alterations between distributed brain regions were quantified using Network-based statistics (NBS) and graph-theoretical local metrics, respectively. Using NBS, a 9-region network showing reduced FC after having listened to the dismissing narrative was identified. Post-task changes in nodal graph metrics were only found in the left Supplementary Motor Area (SMA), namely a decrease in the nodal graph metrics degree and strength exclusively after listening to the dismissing narrative. For a post-hoc analysis of dynamic local graph metrics, the dataset was split into 3 non-overlapping time-intervals of equal length, of which degree and strength of the left SMA were computed. Dynamic characteristics in FC of the

left SMA showed a significant decrease in the dismissing condition when compared to the other conditions in the first 3 minutes of the scan, but in the 2 subsequent intervals the differences faded away.

In this post-task resting-state fMRI study, we identified changes in intrinsic functional connectivity networks evoked by exogenous auditory stimuli with high social affective content. Nodal graph metrics and NBS converge on reduced FC measures exclusive in left SMA in the dismissing condition, which may specifically reflect ongoing network changes underlying prolonged emotional reactivity to attachment-related processing. Results of the dynamic timeseries analysis emphasize that the observed effects in the static whole timeseries emerge from brain state changes occurring during the initial 3 minutes of the resting phase after exogenous auditory stimulation. Evidence from the current study clearly supports the relevance of the left SMA regarding emotional reactivity to stimuli with negative valence.

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#### P70 - Dynamics of Local Field Potential Power of Subthalamic Nucleus in Relation to Scalp Recorded Electrical Activity of Resting Human Brain

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##### *Abstract:*

**Objective:** Subthalamic nucleus (STN) is known to have central position in basal ganglia-thalamocortical circuits. Subthalamo-cortical interactions, however, are not precisely known yet. While intracranial EEG directly explores STN, scalp EEG informs about dynamics of cortical activity, which in rest displays discrete periods of electrical stability- functional microstates. To assess subthalamo-cortical relationship, we analysed STN and scalp EEG signals.

**Methods:** Simultaneous scalp (51-63 electrodes) and intracranial (from STNs) EEG was obtained from six Parkinson disease patients in rest. Topographic analysis was conducted to identify microstate dynamics. Correlations between scalp and STN signals were calculated.

**Results:** Time course of mean scalp power significantly correlated with that of local field potential power of both STNs (STN-LFP power) in delta, theta, alpha, beta, gamma, and 1-40 Hz frequency bands in all subjects. Microstate analysis identified typical four scalp topographies in all subjects. No significant correlations were found between time course of spatial correlation coefficients of template topographic maps and that of STN-LFP power in any frequency band.

**Conclusion:** While STN-LFP power was related to scalp EEG power in rest, it was not related to occurrence of scalp topographies.

**Key message:** Although maybe related to cortical activity, STN activity might not be related to occurrence of microstates in resting conditions.

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#### P71 - Early Effects of Emotions associated to Human Faces in Event-Related Brain Potentials

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##### *Abstract:*

Facial expressions of emotion are preferentially processed over neutral faces due to their high relevance to the human's social life. This processing advantage has not only been demonstrated at the behavioral level but is also reflected in emotion-related modulations of several components of event-related potentials (ERPs). Recently, it has been proposed that inherently neutral stimuli might gain increased salience through learning mechanisms. In the present study, we aimed at investigating whether acquired emotional valence would result in processing advantages similar to emotional expressions by employing an associative

learning paradigm. In the learning session, participants (N= 24) learned to categorize inherently neutral faces as positive, negative, or neutral by receiving monetary gain, loss, or zero outcome. ERPs were recorded in the test session while participants performed a gender decision task on these faces, as well as on faces expressing happy, angry or no emotion. Whereas ERP effects to emotional – primarily angry – expressions occurred in well-established emotion-related ERP components (EPN, LPC) 150 ms after stimulus onset, ERP effects of associated valence occurred as early as 50 ms with distinguishable scalp distribution, indicating that learned emotional salience modulates very early perceptual processing stages. Interestingly, these P1-like modulations were restricted to reward associations. However, the absence of any later ERP modulations by associated valence indicates that elaborate, sustained relevance processing is restricted to biologically determined salience, as in the case of inherent facial expressions of emotion.

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#### P73 - EEG Responses to Auditory Vs. Visual Artificial Grammar Learning

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##### *Abstract:*

In a previous study, we saw a typical centro-parietal P600 component in response to structural violations of an auditory-presented artificial grammar. The P600 was independent from the surface features of the stimuli (Associative-Chunk Strength, ACS) and it was visible in preference tests (like/dislike the sequence) as well as in grammaticality classification tests (grammatical vs. non-grammatical sequence). In the present experiment, we did a visual presentation of the same grammar, using the same stimulus presentation rate (3.03 Hz). Although there was an ACS-free component peaking around 600 ms in the grammaticality classification test, its topography was anterior, and there were no significant late components in preference tests. In order to know whether this might be due to decreased levels of entrainment to stimulus presentation rate in the visual modality, we did frequency analyses of baseline tests in the two modalities. We found increased entrainment to the target frequency in the visual domain, indicating no evidence that the quality of entrainment accounts for modality effects on artificial grammar learning-related ERPs, at least in the expected direction.

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#### P77 - Effects of Binge Drinking on Regional White Matter: A Preliminary MRI Study

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##### *Abstract:*

The intake of large amounts of alcohol in a short time followed by a period of abstinence is a very common pattern of consumption among young people. This pattern of abusive drinking is known as binge drinking (BD). Throughout adolescence, important changes occur in brain morphology, including synaptic pruning and myelination that reflect specific regional modifications in the white and gray matter brain tissues. Consequently, significant exposure to alcohol during this period may adversely affect a wide variety of neuromaturation processes.

This study examined regional white matter volumes in a group of 11 young adults that met the criteria for binge drinking (BD; 6 women, 5 men; mean age: 20) and 11 age and sex matched healthy controls.

Magnetic resonance imaging scans were obtained on a Siemens 3T magnet and were used to measure white matter volumes. Results revealed significantly increased white matter

volumes in the BD group in the left caudal middle frontal gyrus and in the right caudal anterior cingulate gyrus, when compared with healthy controls.

This study indicates larger frontal white matter volumes in the BD group, but no assessment of white matter integrity was performed. The pattern of increased regional white matter may indicate that developmental factors such as gray matter pruning and white matter growth could contribute to brain alterations in BD. Future studies should assess white matter integrity with Diffusion Tensor Imaging (DTI) and the behavioral/functional significance of these alterations.

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#### P78 - Effects of Excessive Violent Game Playing on Recognition: An Event Related Brain Potential Study

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##### *Abstract:*

The goal of the study was to investigate the effects of violent game addiction on emotional memory recognition using event-related brain potentials (ERPs). Forty-four participants (24 female, 20 male; 18 to 31 years) were separated into two groups, namely addicted (N = 23) and non-players (N = 21) based on the time they spend for violent game playing (per week), DSM based pathological game addiction symptoms, and their scores on the Game Addiction Scale. All the participants were right-handed, had a normal or corrected-to-normal vision, and had no history of neurological, psychological or memory diseases. A word list (consisted of violent and non violent adjectives) was used. During the encoding phase, all words were shown and the participants were asked to learn the presented words, which they will be asked later. During the recognition phase, in addition to previously shown words, new words (consisted of violent and non-violent adjectives) were presented randomly and participants were asked to evaluate whether they have seen the presented word previously. Stimulus presentation, recording, storage, and analysis were carried out using a 32 channel EEG/EP NeuroScan system. EEG activity was recorded with 30 electrodes placed. During recognition phase, N1, N2, P2, and P3 peaks were observed at parietal and fronto-central regions. Amplitude and latency of the peaks of addicted and non-players were not different. Also, correct and incorrect recognized items produced similar ERP profiles. The results showed that game addicts had no deficiency for ERPs obtained during emotional memory recognition.

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#### P79 - Effects of Goal Relevance on Performance Monitoring Revealed Using Event-Related Brain Potentials (Erps)

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##### *Abstract:*

The feedback-related negativity (FRN) ERP component provides a reliable neurophysiological marker of performance monitoring (PM). It is usually larger for negative compared to positive feedback, and for unexpected relative to expected feedback information. In a series of ERP studies, we assessed whether these PM effects could be modulated by goal relevance, defined as feedback's informativeness and/or impact on a person's goals. 64-channels EEG was recorded while participants performed a speeded Go/NoGo task across successive blocks in which the feedback on task performance was varied systematically, and could have been either relevant or not (based on instructions and



a visual cueing method). Our results show that the FRN component was larger for (frequent) negative compared to (deviant) positive feedback exclusively when the feedback was relevant (Experiment 1). When the probability of positive and negative feedback was balanced (Experiment 2), this FRN effect was absent and a differential valence effect was observed later, at the P300 level. However, across these two experiments the FRN was always larger for irrelevant than relevant feedback. Moreover, the subsequent P300 component was larger for feedback in the relevant than the irrelevant blocks. Interestingly, in both experiments, a larger correct-related negativity (CRN) in the irrelevant than relevant context was also observed, confirming that when PM cannot operate based on external feedback information, internal monitoring is transiently enhanced. Altogether, these ERP findings suggest that PM is flexible and readily shaped by the appraisal of the (motivational) relevance of actions.

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## P81 - Effects of Social Threat on Attention and Action Selection in a Realistic Social Context

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### *Abstract:*

Evolutionary theories suggest that emotional displays serve a communicative function by providing information about the individuals expressing them, or the surrounding environment. Consequently, individuals who more efficiently respond to these signals have a survival advantage. This evolutionary framework implies that i) emotional signals have co-evolved with recipient's responses, and ii) the recipient's responses reflect the social function of the perceived expression, particularly in a context demanding adaptive motor responses such as a context of threat.

In order to test whether emotional signals motivate specific decisions of action in a threatening context, we selected threat-related emotions differing in terms of their social functions, namely anger and fear. Moreover, we implemented paradigms targeting different aspects of the motor process: action selection and spatial attention deployment. Indeed, studies have shown that observers' current planned actions impact the appraisal of their environment, notably by adjusting the spatial resolution of the visual system according to actions' endpoints. Thus, if emotional displays are perceived as opportunities for action, and if angry and fearful expressions prompt different motor actions reflecting their social functions, the observers' appraisal of space should be impacted accordingly.

Through two behavioral paradigms where participants faced naturalistic social environments, we have shown that these emotions induced opposite effects on both action and attention, consistent with the different information they transmit to the observer: while anger signals a direct threat and prompts avoidance behaviors, fear elicits affiliative approach behaviors. Movement kinematics and pupil dilation further support the governance of these behavioral tendencies by distinct mechanisms.

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## P82 - Effects of Stress on Neural Processes Underlying Empathy and Their Relation to Prosocial Behavior

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*Abstract:*

Stress is omnipresent in modern life but little is known on how it affects social cognition. Empathy – i.e., sharing and understanding the emotions of others – represents a particularly important sociocognitive skill and a crucial prerequisite for successful social interactions. We used fMRI to assess effects of acute psychosocial stress (induced by the Montreal Imaging Stress Test, MIST) on neural correlates underlying bottom-up components of empathy (i.e., affect sharing /emotion contagion) and their top-down modulation by perspective taking and cognitive appraisal during an empathy for pain paradigm. Participants (N=75) were randomly assigned to a stress and a control group. The results showed that when watching painful situations of others, stressed participants showed increased activation in brain areas associated with bottom-up emotion contagion – such as the anterior insula, anterior midcingulate cortex, and primary somatosensory cortex. Furthermore, activation in these areas correlated with the amount of money participants shared in a dictator game. However, stressed participants also showed stronger bottom-up responses during situations which were actually not painful for the other, but required cognitive reappraisal and perspective taking. Our results imply that while stress intensifies emotion sharing, this comes at the cost of reducing the ability to flexibly regulate the affective response. Moreover, the changes in bottom-up empathic responses have direct effects on prosocial decision making. This has crucial implications for our understanding of how stress affects social cognition and social decision making.

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P83 - Effects of Testosterone on Experimentally Induced Aggression

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*Abstract:*

There are numerous studies investigating the association of neuroendocrine responses and aggression. Most studies highlight the important role of a combined presence of high testosterone and low cortisol as related to enhanced aggressive behavior. Aiming to further explore this relationship on neural responses a provocation paradigm (modified Taylor aggression paradigm, mTAP) was applied to 90 healthy young males in a 3T scanner. In a double blind placebo controlled study design half of the participants (T) were administered 5 g of Testim (50 mg testosterone), the other half (P) received a color and consistence matching placebo gel. The task was conducted 4 hours after the application as previous studies reported a peak for the testosterone increase after this time span, which was confirmed in the current study. The T group exhibited significantly increased testosterone levels compared to a baseline measurement and compared to the P group before task execution, but testosterone levels were not affected in response to the task in either group. Examining aggressive reactions, provocation resulted in higher aggression in the P and the T group. Contrasting aggressive responses after maximal versus no provocation, the T group showed more pronounced activation in the ventromedial prefrontal cortex. A similar pattern was observed contrasting reactions to high provocation against reactions to winning. Instead for the P group no activation differences were observed for these contrasts. Our results highlight the modulating role of testosterone on neural responses to aggression.

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P84 - Effects of the Extract from the Fruit Hull of Mangosteen on Acetylcholinesterase Activity and Memory of Healthy and Scopolamine-Induced Amnesic Rats

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*Abstract:*

The extract from the fruit hull of mangosteen (GME) possesses many biological activities. We investigated the effects of GME on memory and brain acetylcholinesterase (AChE) activity of healthy rats and scopolamine-induced amnesic rats. Eight weeks old male Wistar rats (normal saline- and scopolamine-treated rats) received vehicle, vitamin E (40 mg/ml/kg), GME (500, 1000 or 2000 mg/ml/kg) orally once daily for 30 days, n=8 each. Spatial memory and learning were tested by Morris water maze test consisting of 21 training trials (3 times/day, day 24-30) and probe trial on day 30. Rats were then decapitated and brains were removed. AChE activity of homogenized brains (cerebral cortex, hippocampus, and basal forebrain) was determined. In normal saline-treated rats (but not in scopolamine-treated rats), time spent in target quadrant was significantly increased by vitamin E and GME (500 mg/ml/kg) when compared to vehicle group. No significant difference was found in the number of entry into the target quadrant between groups. AChE activity in cerebral cortex and hippocampus was increased by GME in scopolamine-treated rats, but was decreased in normal saline-treated rats. In contrast to those findings, AChE activity in basal forebrain was decreased by GME in scopolamine-treated rats but was increased in normal saline-treated rats. Thus, memory enhancing and anti-acetylcholinesterase actions of GME were shown in normal rats, but not scopolamine-induced amnesia model. Memory enhancing effects of GME may be caused by its anti-acetylcholinesterase activity. GME may be useful for the prevention of the development or progression of cognitive impairment caused by natural aging.

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#### P85 - Effects of Time on Task and Pauses on EEG Spectral Power

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##### *Abstract:*

Prolonged cognitive activity may lead to a state of mental fatigue, which is characterized by a decline in task performance with increasing time on task. Depletion of resources and decline in motivation are discussed as possible mechanisms underlying mental fatigue. EEG spectral power at lower frequencies has been identified as an electrophysiological correlate of mental fatigue. Especially theta and alpha band power increases with time on task and decreases during experimental pauses. Since older adults seem to be particularly affected by time on task effects we investigated a group of older and a group of younger adults performing the Simon task for 3 hours. The experimental blocks were interrupted by both short and long pauses. In this monotonous experimental setting motivational aspects should also be addressed. Spectral power estimates for frontal and occipital recording sites were calculated for small time windows to obtain a high temporal resolution. Time on task effects were as expected. In both age groups response times and spectral power at both recording sites increased with time on task. Overall, the effects of pauses were more pronounced for older adults. The decrease of response times as well as the decrease of frontal theta and alpha power during pauses was stronger for older compared to younger adults. Unexpectedly, we found diverging effects of long pauses on occipital spectral power across age groups. Occipital theta and alpha power increased in younger adults, but decreased in older adults. This may reflect a difference in motivation between the age groups. The younger adults seemed to be more affected by the monotonous aspect of the task.

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#### P86 - Effects of Volume Level and Emotional Content on Spoken Word Processing

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##### *Abstract:*

For visual stimuli of emotional content as pictures and written words, stimulus size has been

shown to increase emotion effects in the early posterior negativity (EPN), a component of the event-related potentials indexing attention allocation during visual sensory encoding. In the present study, we addressed the question whether this enhanced relevance of larger (visual) stimuli might generalize to the auditory domain and whether auditory emotion effects are modulated by volume. Therefore, subjects were listening to spoken words with emotional or neutral content played at two different volume levels while event-related potentials were recorded. Negative emotional content led to an increased frontal positivity and parieto-occipital negativity – a scalp distribution similar to the EPN – between ~ 370 and 530 ms. Importantly, this emotion-related ERP component was not modulated by differences in volume level, which impacted early auditory processing, as reflected amplitudes of the N1 (80-130 ms) and P2 (130-265 ms) component as hypothesized. However, contrary to effects of stimulus size in the visual domain, volume level did not influence later ERP components. These findings indicate modality-specific and functionally independent attention mechanisms triggered by emotional content of spoken words and volume level.

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#### P87 - Electrocortical Effects of Reappraisal Are Attenuated during Additional Attentional Task

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##### *Abstract:*

Reappraisal is an emotion regulation strategy, which involves generating more positive interpretation of unpleasant stimuli. It decreases the late positive potential (LPP) – the marker of emotional processing. In the study, with the 2x2 design, we explored how additional task during reappraisal could interfere with these regulatory effects. 93 subjects were identifying a small, subliminally presented letter against the standardized, emotional pictures (negative or neutral). Two conditions were possible, signaled by a cue before each trial: identify the letter in unexpected location or ignore the letter. We assigned subjects to one of the two groups: the reappraisal (with instruction to reinterpret the images if they become unpleasant) or the control one (with instruction to passively view the pictures). The LPP evoked by negative slides was decreased in the reappraisal group comparing to the control one. However, this attenuation of amplitude was similar irrespective of the picture type and affected also neutral images. Observed lack of specificity of reappraisal may suggest involvement of more general, tonic attenuation of visual processing in this group. Furthermore, the conditions, where the attention was required to identify the letters, were related to increased latency of the reappraisal effect (approx. 0.5s for the ignore condition, and 2.5s for expected location). This interference shows that both tasks compete for cognitive resources and are possibly based on serial processing. As long as the voluntary attention is oriented towards concurrent stimuli, the regulatory effects are weakened. This study was supported by the National Science Centre (DEC 2013/09/B/HS6/02662)

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#### P88 - Electroencephalographic Evidence of Altered Top-Down Attentional Modulation in Fibromyalgia Patients during a Working Memory Task

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##### *Abstract:*

Patients with fibromyalgia (FM) frequently report attentional deficits and working memory impairments, cognitive dysfunctions that interfere with their daily life activities. In order to provide better knowledge about these impairments, we recorded electroencephalographic activity of FM patients and healthy controls while they performed a 2-back task. We analyzed time-frequency midfrontal theta and posterior alpha power;

oscillatory activity related to attentional processing and mental effort. We also measured theta phase synchronization values between midfrontal areas and the rest of the scalp electrodes; an index related to the entrainment and information transfer across distant brain regions when the need for top-down control is required. Time-frequency analysis showed that FM patients had reduced midfrontal theta power increase and reduced posterior alpha decrease than healthy controls. Patients also showed reduced functional connectivity in theta band between midfrontal locations and the rest of the electrodes. These results suggest that the working memory impairment reported for chronic pain patients can be related to deficits in attentional modulation -reflected by lower theta and higher alpha power-; and reduced recruitment of additional brain areas -observed by less theta phase connectivity-. Differences in theta band also suggest the implication of medial frontal cortex in the attentional deficits of chronic pain patients.

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P89 - Emotion Comprehension and Recognition in Drug-Resistant Temporal Lobe Epilepsy

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**Abstract:**

**Background:** Temporal lobe structures have been known as one of the parts of the brain prominent in emotional intelligence. Despite the connection between the occurrence of epileptic focus in the temporal lobe and lower ability of emotion analysis by limbic structures, the subject of emotion recognition in patients with temporal lobe epilepsy is still one of inadequate attention.

**Methods:** 10 patients with drug-resistant temporal lobe epilepsy were recruited for the study as well as a control group (n=10) consisting of healthy subjects, matched to the study group in terms of age, sex, handedness and level of education. The subjects from both groups were evaluated with a set of tests measuring: emotion recognition with the use of faces (SIE-T test) and eyes (RME test) photographs, as well as metaemotional processes (TRE test).

**Results:** The results of the research supported the hypothesis about the lowered emotion recognition from face pictures (but not from eyes) in patients with TLE which matches previous findings. Likewise, emotion comprehension was impaired in the group of patients with TLE compared with healthy controls.

**Conclusions:** Temporal lobe epilepsy can affect the ability of recognizing and understanding emotions. In future research, it seems viable to increase the number of participants and investigate the credibility of the hypotheses. Therefore, more attention should be put on measuring metaemotional intelligence level because very few studies investigated this issue before in a group of patients with intractable epilepsy.

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P91 - Emotional and Cognitive Modulation of Pain - An EEG Localization and Effective Connectivity Study on Pain Catastrophizing

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**Abstract:**

Emotional states and cognitive processes have an important impact on the way one perceives the pain. Pain catastrophizing, defined as a tendency to exaggerate the threat value or seriousness of the experienced pain, is a risk factor for pain chronification. The goal of this study was to examine the neural correlates of pain catastrophizing in healthy

participants. EEG data of 64 channels were collected from 30 participants during induced state of pain-related, depressive, positive and neutral reflection conditions. Pain catastrophizing was measured using The Pain Catastrophizing Scale (PCS). It was hypothesized that pain catastrophizing is negatively correlated with the activity of the regions involved in cognitive and emotional modulation of pain the information flow within this circuitry. Independent EEG components were identified by the ICA algorithm and then localized using DIPFIT2. The Directed Transfer Function (DTF), a method to assess effective connectivity, was also used. Interactive effects between PCS score and the condition valence were found in the anterior cingulate cortex (as measured by alpha power) and in the left temporal cortex (as measured by the beta power). We also found that PCS score can predict beta information flow from the left dorsolateral prefrontal cortex to the left temporal cortex. We conclude, that pain catastrophizing may be related to the attenuated processing of the affective dimension of the pain manifested by the relationship with the ACC and temporal lobe structures activations and to the attenuated top-down modulatory mechanisms performed by prefrontal cortex on temporal regions.

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#### P93 - Emotional Processing in Preschool Children: Magnetoencephalographic Correlates

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##### *Abstract:*

Emotional cues motivate selective attention and elicit specific components of the event-related potential. In adults, the processing of emotional cues is linked to the Early Posterior Negativity (EPN, 150-300 ms) and the Late positive potential (LPP, > 300 ms). In school-age children, the LPP is clearly present, while the EPN could only be found using high trial numbers and an individualized stimulus selection. Studies in preschool children are scarce and to date only LPP-modulations were reported. Given the potential vital importance, the motivation of selective attention by emotional cues should mature very early. Hence, we hypothesized that both EPN and LPP can be found already at preschool age. To this end, we used a Rapid Serial Visual Presentation (RSVP) paradigm, which allows the presentation of a high number of stimuli in short time. Preschool children aged 4 to 6 years saw neutral, pleasant and unpleasant scenes in a rapid continuous stream (360 trials), while event-related magnetic fields were recorded with whole-head magnetoencephalography (MEG). To enable an individualized stimulus selection, children rated all presented pictures twice on a 3-point smiley-scale, with one week between rating sessions. Preliminary data analyses of 14 participants already show a clear LPP-M effect in response to both unpleasant and pleasant scenes, while an EPN effect is not yet statistically significant. Data analyses including the full sample of at least 20 participants and an individualized stimulus selection will be reported and discussed.

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#### P94 - Emotional Responses to Expressive Affective Body Movement (Dance) and Music in Adults with and Without Autism Spectrum Disorder

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##### *Abstract:*

Autism Spectrum Disorder (ASD) is clinically defined by impairments in reciprocal social-emotional behaviours that includes difficulties in recognising emotional expressions in faces, voices and whole-body movements. Interestingly, however, individuals with ASD can discriminate different emotions in music and language and the affect expressed in these stimuli also elicits relatively typical psychophysiological responses in this population. These preserved emotional responses are in conflict with the notion that ASD represents an

impairment in social-emotional processes, because language and music are *de facto* social stimuli. It is, however, possible that individuals with ASD may have specific difficulties processing emotions as expressed by the human body. To examine this issue we compared the subjective and physiological emotional responses of 14 ASD and 16 typically developing (TD) adults to ballet dance movements and classical music extracts that were taken from the same live performances. Participants were asked to classify the emotion they felt (happiness, sadness, excitement, peacefulness, fear, anger) in response to a series of thirty-two, 30 second dance movements and music excerpts that were of either positive or negative valence. Participants also rated these stimuli in terms of the intensity with which they felt the indicated emotion and their galvanic skin responses and heart rate were monitored to provide indices of psychophysiological emotional responses.

At the subjective level, both ASD and TD participants reported feelings that were largely congruent with the emotions expressed in music. However, for dance stimuli this was only the case for TD participants. The subjective reports of ASD participants did not discriminate between the positively and negatively valenced dance movements. At the physiological level, neither group demonstrated clearly differentiated responses to the positive and negative affect expressed in either stimulus type, which may reflect low statistical power in the currently relatively small sample of participants. The implications of these observations for pertinent social-cognitive accounts of ASD will be discussed.

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#### P95 - Emotions in Institutionalized Young Children with Special Needs

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##### *Abstract:*

**Introduction:** Emotions are biological basis and the main source of an infant's development. Research showed that biological reasons and social environment can influence children's ability to recognize and generate emotional expressions. Children with special needs (SN) may show unusual emotional reactions and not recognize parent's emotional feedback. The most vulnerable group are SN children living in institutions. Investigations demonstrate a positive impact of early intervention programs on development of SN children. But there is a lack of research data on characteristics of emotions in SN children (especially institutionalized) that could help to understand the trajectory of their emotional development and create congruent early intervention programs.

**Method:** Participants included SN children aged 9 to 44 months old from different institutions: family-like (FO) and traditional orphanage (TO). Children had different medical diagnoses and were combined into a unified research group by the Functional Abilities Index. Emotions were measured using Dyadic Affect Manual (Osofsky, Muhamedrahimov, Hammer, 1998) in a set of episodes: child-caregiver interaction – separation – reunion.

**Results:** it was found that in separation SN children from TO demonstrated positive affect and motor activity of higher intensity than FO children. As separation with primary caregiver causes stress for young children, this fact indicates the strategy of manifesting positive emotions (probably false positive) and activity (believably senseless movements) instead of genuine negative emotions and following the caregiver.

**Conclusion:** We hope that institutionalized SN children experiencing family-like care may develop effective regulation strategies and successfully adapt to the new social environments including substitute families.

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#### P96 - Emotions Perception in Parkinsonian Patients: A Study on Facial Expressions and Music

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*Abstract:*

In the last decades, a number of studies have focused attention on non-motor symptoms and their impact (Martinez-Martin P, 2011). Having difficulty in recognizing emotional information parkinsonian patients often show behaviors that may affect social relationships. Numerous studies have investigated the facial expressions decoding in patients with Parkinson's disease and deficits were found in different domains (Blonder, 1989 Yip, 2003). At the opposite, studies on the decoding of emotional meaning expressed in music are still few.

We examined 24 patients with MP deemed eligible for the study after analyzing the psychocognitive tests a group of 16 people with idiopathic Parkinson Disease (10 men) participated to the study. The parkinsonian group was paired with a control group consisting of 16 people (10 men). The two groups were matched for age, years of education and gender.

We used a standardized battery of faces with emotional expressions and a set of 18 music tracks previously validated with respect to their power of eliciting emotions. Main results indicated that parkinsonian patients have severe difficulties in recognizing the emotion of fear expressed by a face (chi-square = 10.341,  $p < 0.002$ ). This is coherent with previous studies (Blonder, 1989) (Yip, 2003) (Kan, 2002; Assogna, 2008; Gray, 2010).

Parkinsonian participant also reported difficulty in recognizing fear in music. However, the most significant datum relates to sadness. In fact, while all healthy subjects correctly recognized sadness, none parkinsonian subject was able to do the same, failing in perceiving this emotion in the proposed music tracks.

In conclusion, our study confirms that parkinsonian patients suffer from specific deficits in emotional decoding, suggesting the need to approach this domain in order to improve the quality of life.

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P97 - Enabling Effect of D2:D4 and Competitiveness in the Outcome of Competition

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*Abstract:*

Competition involves confrontation between individuals to achieve a goal and/or maintain status. Daily, individuals face situations where they have to compete against each other and, in these contexts, one can win or lose. The literature indicates that testosterone (T) can act as facilitator in competition and challenge situations so that high levels of T are related to a tendency to seek confrontations and increased competitiveness. One indicator that is currently being used is the D2:D4 (ratio of the difference in the length of index and ring fingers) as an index of prenatal exposure to T. The main objective of this study was to analyze the importance of D2:D4 and competitiveness in the outcome of a laboratory competition in men and women. To do this we have been studied 77 subjects (48 women and 29 men) in a competitive situation with real outcome (winners vs losers), measuring the ratio D2:D4 of both hands, interpersonal competitiveness and performance. Our results show higher estimated levels of prenatal T and interpersonal competitiveness in winners than losers and this effect occurs in both sexes. It has been found a positive correlation between D2:D4 competitiveness in women. These results suggest that a greater prenatal exposure to T may induce higher levels on competitiveness in adult life which would facilitate the achievement of victory in competitive situations.

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P98 - ERP Correlates of Implicit Probabilistic Sequence Learning

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*Abstract:*

Probabilistic sequence learning (PSL) is a crucial mechanism of the brain that enables the extraction of statistical regularities in our environment and is involved in the acquisition of cognitive and motor skills. Although behavioral studies identified the subprocesses of PSL, the temporal dynamics of the related neural mechanisms have remained unclear. Therefore, we aimed to investigate whether changes in PSL subprocesses as a function of time at the behavioral level are reflected in ERPs. Healthy young adults ( $N = 29$ ) performed the Alternating Serial Reaction Time task, which separately measures the sequence-specific and general skill learning subprocesses of PSL. We measured RTs and ERPs time-locked to the onset of the stimulus in a learning phase and a testing phase after 24 hours. According to RTs, sequence-specific learning was enhanced as the task progressed in the learning phase, and this knowledge was retained after 24-hour delay. Although the early parietal negative ERP component between 100-200 ms was not sensitive to sequence-specific properties, the centroparietal negative ERP component between 250-450 ms was larger for low-probability stimuli than for high-probability ones suggesting a mismatch with the implicit expectation of the subsequent stimulus. This sequence-specific difference was also present in the testing phase. In addition, the larger parieto-occipital positive component between 450-550 ms in the testing than in the learning phase might reflect the presence of elaborative processes in the reactivation of consolidated memory traces. These results give insight to the dynamic change of multiple processes that occur during implicit memory formation and consolidation.

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P99 - Executive Functions in High Functioning ASD

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*Abstract:*

Autism Spectrum Disorders (ASD) are characterized by a wide range of impairments in different areas of development, including social interaction and communication, and by a restricted and repetitive pattern of behaviours, interests or activities. Additionally to these core symptoms, deficits in executive functions have been reported.

The term "executive function" (EF) refers to a range of processes such as working memory, inhibitory control and attentional shifting, which are believed to depend on frontal lobe activity and underlie goal-directed responses to novel and challenging situations.

Nevertheless, the primacy of executive functions among the autistic symptoms is a topic of debate, particularly in terms of planning and shifting.

Therefore, in this study we compared two domains of executive functions (response inhibition, and flexibility/shifting), in a group of children with high functioning ASD. The current study investigated executive functions in 4 children with AS (mean FSIQ:  $96.8 \pm 17.5$ ) and 4

children with typical development (FSIQ:  $113.8 \pm 16.9$ ) matched by age and sex (2 males, mean age:  $14 \pm 3.2$ ), using two neuropsychological tests: the Wisconsin Card Sorting Test (WCST) to assess cognitive flexibility and the Stroop task to assess response inhibition.

Results showed increased perseverative errors in the ASD group (100 AS group vs 129 in typically developing test) and lower interference score (53 vs 50 in typically developing group).

These results were associated with behavioral problems, measured by the CBCL, in the ASD group.

Overall, these preliminary findings are in accordance with evidence showing pervasive impairment across a broad range of EF tasks, namely in inhibition, working and flexibility/shifting and are possibly contributing to ASD behavioral profile.

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#### P100 - Executive Functions in Obsessive Compulsive Disorder

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#### *Abstract:*

Obsessive compulsive disorder (OCD) is a heterogeneous condition characterized by intrusive thoughts, urges, and images (obsessions) and by repetitive, mental acts, or ritualized behaviours (compulsions) performed to reduce anxiety and obsessions. Dysfunctions in the orbitofrontalstriatal circuit have been hypothesized to play a crucial role in its pathophysiology. Consequently, neuropsychological functions subserved by this system such as executive functions would be affected in OCD. However the last research show controversy about the affected neuropsychological domains in OCD. Our objective to compare executive functions involved in cognitive flexibility and response inhibition between a sample with OCD and control subjects.

Our sample is constituted by 5 OCD patients and 5 age-matched and gender-matched controls. Executive functions assessment was carried out with the Wisconsin Card Sorting Test (WCST) and The Stroop Task. Comparison of groups was performed by non-parametric Mann-Whitney Test.

In the OCD group the Stroop interference median score was 44 and 54 in the control group. These differences were marginally significant ( $p=0,056$ ). In the WSCT test, total errors median scores were 91 in OCD group and 103 in control group. These differences were not significant ( $p=0.151$ ).

The results suggest a dysfunction in response inhibition but not in mental flexibility in the OCD group as compared with the control group.

Although mixed findings have been found in mental flexibility domain, impairments in response inhibition have been consistently reported in previous studies, being proposed as endophenotypic marker for OCD by some researchers.

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#### P101 - Facial Electromyographic Activity in Response to Social Feedback during Metacognitive Judgments: A Cross-Cultural Study

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*Abstract:*

People modulate their metacognitive evaluations, such as their level of confidence, as a function of information provided by other social agents. Cultural values may influence how people construe themselves and their relation to the world, and therefore may influence social cognition and contextual self-judgments (Chiao and al., 2009). In this study we investigated whether participants' culture would influence the filtering of social information regarding one's own cognitive performance. We confronted French and Japanese participants with videos of social agents expressing opinions about a perceptual decision they just performed. The social agents were manipulated to appear either competent or incompetent for the task. At the end of each trial, the participants were asked to rate their confidence in their previous response. Using electromyography, we recorded participants' facial muscle activity of the corrugator and of the zygomaticus, reflecting respectively negative and positive experience associated with the social feedback. Overall, behavioral data indicated that Japanese and French participants' confidence increased with the perception of an agreement as compared to disagreement or uncertainty of the social agent. This effect was reduced for the incompetent social agent but not completely inhibited. Interestingly, facial electromyographic activity differed between French and Japanese participants. We observed an increase of zygomaticus activity when French participants saw an agreement expressed by a competent social agent and this effect increased with task difficulty. In this same condition, we observed a deactivation of corrugator for Japanese participants. These results will be discussed regarding the interdependent/dependent view of self (Kitayama and Markus, 2003).

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P102 - Fearful Facial Crowds Influence the N170 of Target Face Processing in Individuals with Schizophrenia and Healthy Controls

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*Abstract:*

Unattended context, especially when it contains threatening content, influences how neural structures process attended target faces and has behavioral consequences such as increased reaction times and decreased accuracy.

Individuals with schizophrenia (Sz) have deficits in integrating social contextual information. It is unknown how this deficit manifests itself within an unattended threatening context. The present study investigated the influence of task-irrelevant emotional context on face processing in 14 individuals with Sz and 14 matched healthy controls using simultaneous EEG-fMRI.

Target face presentations were preceded by the presentation of a surrounding crowd of either happy, neutral or fearful faces or a scrambled control. Participants identified target face emotions and rated their intensities.

Target faces were better recognized but perceived as less intense in facial crowds compared to scrambled control stimuli. Individuals with Sz identified the depicted emotion less accurately and more slowly than healthy controls, and their corresponding P1 and N170 amplitudes were reduced. In both groups, however, target faces preceded by fearful crowds had reduced N170 but not P1 amplitudes, suggesting a threat-specific influence on the N170 component of face processing.

Results replicate previous findings of impaired emotion recognition accuracy and reduced P1 and N170 amplitudes in Sz. However, despite impaired processing of emotional stimuli in

Sz, a threat-specific influence on subsequent target faces was observed in both Sz and controls. Present findings thus suggest that despite present face processing deficits, individuals with Sz integrate threatening contextual information on a neural level in a manner that is similar to healthy controls.

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#### P103 - Feedback Processing during Performance on the Halstead Category Test and Its Relation to Externalizing Behavior

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#### *Abstract:*

The Halstead Category Test (HCT) is a neuropsychological test commonly used in the assessment of executive cognitive function. Performance on the test depends on the person's ability to extract abstract principles and adjust behavior as a function of positive or negative feedback to their previous response. Studies investigating the electrophysiological correlates of performance on the HCT are lacking. It has been established that the externalizing dimension of personality is a high-risk factor for antisocial and violent behavior and psychopathy. A common behavioral pattern of externalizing is an apparent failure to learn from experience, which suggests that it may involve a deficit in executive functioning, specifically in the ability to self-monitor ongoing behavior for errors. The present study examined the ERP correlates of feedback processing during the HCT in a sample of 58 participants varying in their level of externalization (20 low, 20 medium and 18 high externalizers). A positive deflection approximately 500 ms after feedback onset was observed, with maximal amplitude at medial locations, encompassing frontal-parietal regions. Significant differences between correct and incorrect feedback trials were observed at frontal and fronto-central locations, with errors eliciting globally higher amplitudes than correct responses. Significant differences between externalization groups were also observed at bilateral parieto-occipital and occipital regions, and marginally significant differences at left central and parietal regions. Generally, amplitudes were lower for the high externalizing group than for the medium group, with high and low groups not differing significantly. These results suggest differences in feedback processing associated with externalizing behavior.

*Funding:* This research was supported by Bial Foundation with Grant Ref 136/08 to Isabel M. Santos and by funding from Foundation for Science and Technology (FCT) and the POPH/FSE Program (grant reference SFRH/BPD/101112/2014) to Ana R. Teixeira.

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#### P104 - fMRI Exploration of Empathy Networks in Eating Disorders

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#### *Abstract:*

Patients suffering from Eating Disorders are characterized by a variety of emotional deficits, very likely including dysfunctional empathy. Here, twenty-five patients with Anorexia Nervosa (AN) and 19 patients with Bulimia Nervosa (BN), were enrolled in the study. Eighteen healthy

women were recruited as controls (CN). The enrolled patients had first a clinical, neuropsychological and psychological assessment and then an MRI scan. The MRI protocol included a resting-state scan, an affective empathy paradigm and a high-resolution anatomical T1-weighted sequence. In the functional task, to explore affective responsiveness, we presented short sentences describing real-life situations, which are likely to induce three basic negative emotions (anger, fear, disgust). Participants were asked to imagine how they would feel if they were experiencing those situations. Left and right amygdala were chosen as regions of interest testing for differences among groups in resting state functional connectivity (RSFC), affective responsiveness activations and gray matter (GM) volumes. While amygdala RSFC, volumes and the behavioral performance were similar among AN, BN and CN, lateralization of amygdala activation during affective responsiveness was significantly different, with AN showing mainly left, BN right and CN symmetric activations. The results are interpreted in the light of theories of emotional homeostasis and of different contributions in empathy processing from hemispheres, as both are involved in emotional and empathic functions, but could differ for strategies and influence of the peripheral nervous system. Patients did not demonstrate behavioral deficits, but had different neural activation further supporting the notion of high heterogeneity between Eating Disorder patients.

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#### P105 - fMRI Neurofeedback Enhances Cognitive Reappraisal in Post-Traumatic Stress Disorder

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##### *Abstract:*

Deficits in emotion regulation are a prominent feature of post-traumatic stress disorder (PTSD). Cognitive reappraisal is an effective strategy for emotion regulation and frequently used in cognitive-behavioural treatment. However, PTSD patients often have difficulties reappraising negative stimuli. The lateral prefrontal cortex (LPFC) supports emotion regulation by modulating amygdala activity. In PTSD patients, LPFC responses to emotional stimuli are reduced, along with elevated amygdala responses (Hayes et al., 2012). Neurofeedback based on real-time functional magnetic resonance imaging (rt-fMRI) enhances cognitive reappraisal and the regulation of amygdala involvement (Sarkheil et al., 2015).

In the present study, neurofeedback on left LPFC enhanced emotion regulation in PTSD patients. Ten patients with PTSD after accident or assault and 10 healthy controls trained cognitive reappraisal of images with negative valence. In 2 neurofeedback sessions, participants received feedback on their LPFC activity to each image during the cognitive reappraisal. Viewing (without regulation) served as a baseline condition. In 2 control sessions, no feedback was given. A cross-over design allowed for comparison between cognitive reappraisal with and without enhancement by neurofeedback.

All subjects activated LPFC during cognitive reappraisal. In particular in the patients, the LPFC activation was stronger under neurofeedback. Results from follow-up catamnesis of PTSD-related symptoms will be presented on the conference.

The current study provides first evidence that neurofeedback enhances common psychotherapeutic strategies to improve emotion regulation in patients with PTSD.

Support provided BMBF (APIC 01EE1405B).

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#### P106 - From Virtual to Robotic Representations of the Human Body: Behavioural, Physiological and Bci Studies Using Immersive Technologies

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**Abstract:**

The mental representation of one's body is crucial for acting efficiently in the world. Yet, following a spinal lesion, the integration of multisensory information is impaired and brain plasticity mechanisms may intervene altering the brain's representation of the body. Recent technologies that enable people to control and feel external devices as part of their own body hint to better understand how multisensory signals may elicit optimal embodiment sensations of the controlled surrogate within virtual and robotic immersive scenarios. We investigated the contribution of brain plasticity in healthy and spinal cord injured (SCI) people to elicit bodily illusions. In particular we studied the role of body visual discontinuity, visuo-tactile and proprioceptive information in the feeling of owning an external limb and illusory movement perception.

These studies involved the development of two different brain-computer interface (BCI) applications where healthy and SCI people controlled a robot to navigate and socially interact in a remote environment. SCI people could instruct virtual and robotic surrogates similarly to healthy people and could perceive a sense of control over their actions.

Nonetheless, SCI patient had lower accuracy in using the developed BCI interfaces, suggesting that structural and functional brain changes after brain-body interruption may be crucial to design flexible BCI technologies. Finally, the integration of BCI and the neuroscience of body ownership may improve the development of embodied systems and the accuracy BCI's end-users have in controlling external devices within immersive environments.

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P108 - Functional Neuroimaging of Value-Based Biases in Emotion Perception: Exploring (Sub)Optimality and the Role of Autistic Traits

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**Abstract:**

Facial emotion perception is characterized by perceptual uncertainty and influenced by context. One contextual factor that causes bias in emotion perception is personal utility. In a pilot study we found that varying monetary incentives for decision strategies reliably shifts biases, i.e., intensity thresholds at which faces are categorized as emotional, in predictable directions. This is in line with the theoretical assumption that individuals are more likely to interpret an ambiguous facial expression as sad in situations in which detecting another person's sorrow is more relevant to them. Optimal emotion perception requires individuals to adjust bias relative to sensitivity, similarity of facial stimuli, and situational utility. Using neuroimaging we investigate the brain mechanisms leading to optimal vs. suboptimal perceptual decision-making in emotionality judgments. Recent findings indicate that autistic perception is characterized by a lower sensitivity to contextual factors, such as statistical information. Looking at the role of autistic traits, we address the question of whether this decreased context sensitivity also entails personal utility. Sixty healthy adults undergo functional magnetic resonance imaging (fMRI) while completing a signal detection task using emotional stimuli morphed across an intensity spectrum. Participants repeatedly guess the emotional outcome of a fictitious story from different facial expressions of the protagonist. Utility is manipulated by changing financial payoff contexts, incentivizing in turn more liberal or more conservative category boundaries. Autistic traits, and the relation of response criteria to theoretical lines of optimal response are then used as main regressors in fMRI analysis. A behavioural pilot study with sixty participants has demonstrated that varying

the utility of detecting emotionality causes individuals to shift their category boundaries accordingly. Analysis of the MRI experiment is still ongoing. Results will inform a theoretical neural model on value-based categorization and optimality in emotion perception, and will help constrain theoretical assumptions on emotion perception and context sensitivity in autistic perception.

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P110 - Gaze Contact Effects on Social Preference and Face Recognition in Alzheimer's Disease

Lopis, Desirée<sup>1</sup>, Baltazar, Matias<sup>1</sup>, Geronikola, Nikoletta<sup>1</sup>, Beaucousin, Virginie<sup>2</sup>, Conty, Laurence<sup>1</sup>

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*Abstract:*

**Background:** Direct gaze (i.e. another individual's gaze directed to the observer that leads to eye contact) influences positively a wide range of cognitive processes. In particular, perceiving a direct gaze stimulates memory for other's faces and increases their likability. Alzheimer's disease (AD) results in social withdrawal and cognitive decline. However, patients show preserved eye contact behaviors. This suggests that eye contact effects may also be preserved in AD and could be used to compensate for cognitive and social deficits. In order to start investigating this hypothesis, the aim of this study was to address whether the positive effects of gaze contact on memory for faces and likability of others are preserved in patients with early AD.

**Method:** Sixteen AD patients ( $15 \leq \text{MMS} \leq 24$ , mean age 83.4 years), 15 elderly (mean MMS 27.9, mean age 80.5 years) and 22 young participants (mean age 24.1 years) participated in our study. In phase 1, participants were presented with 20 faces displaying either direct or averted gaze and performed a social-evaluation task: they rated the faces' degree of likability on a Likert scale ranged from 1 ("Not at all likable") to 5 ("Very likable"). After a five-minute interfering verbal task, participants were submitted to a surprise recognition test: they were shown 20 pairs of faces with closed eyes and were asked, at each trial, to report which of the two faces they had seen before.

**Results:** Results showed that AD patients judged the faces more likable when displaying direct than averted gaze ( $p < .01$ ). This effect was marginal for the elderly participants ( $p < .09$ ). Recognition was also better for faces previously seen with direct than averted gaze for AD patients ( $p < .05$ ) but not for elderly participants. Regarding the young control group an effect of direct gaze was observed only in the recognition task that was marginal ( $p < .08$ ).

**Conclusion/Perspectives:** Despite the fluctuations of the effects observed in our control groups – that probably reflect a lack of sensitivity of our design for non-pathological subjects - AD patients showed better performance in face recognition for targets initially displayed with direct rather than averted gaze. Direct gaze also led to more positive appraisal of other's in AD patients as well as in elderly participants. Our data suggest that direct gaze effects are preserved at the early stages of AD and may therefore be used as therapeutic tools to improve the quality of patients' social interactions.

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P111 - Go-N2 and Nogo-N2 Event-Related Potential Components as Biomarkers of Amnesic Mild Cognitive Impairment

Susana Cid-Fernández<sup>1</sup>, Mónica Lindín, Fernando Díaz

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*Abstract:*

People with amnesic Mild Cognitive Impairment (aMCI) subtypes (single-domain aMCI [sdaMCI] and multi-domain aMCI [mdaMCI]) show a greater risk of developing Alzheimer's disease (AD) than healthy population. The event-related potential (ERP) technique has

optimal characteristics for the search for biomarkers for aMCI diagnosis. Thus, the aims of this study were (1) to evaluate possible differences between healthy, sdaMCI and mdaMCI adults in the parameters of the NoGo-N2 (related to inhibition processes) and Go-N2 (related to stimulus evaluation in working memory) ERP components, and (2) to identify potential sdaMCI and mdaMCI biomarkers. Twenty healthy control (52-85 years), 22 sdaMCI (51-87 years), and 12 mdaMCI (62-85 years) adults performed a distraction-attention Go/NoGo task, where auditory-visual stimuli pairs were presented in each trial. Go-N2 amplitudes in the Deviant-Go condition (deviant auditory stimulus + Go visual stimulus) were larger for the Control than for the sdaMCI group. Go-N2 latencies in the Standard-Go condition were longer for the mdaMCI than for the Control group. Finally, NoGo-N2 amplitude in the Novel-NoGo condition (novel auditory stimulus + NoGo visual stimulus) was larger in the Control than the sdaMCI and mdaMCI groups. Thus, compared to controls: (1) sdaMCI adults seem to mobilize less processing resources for the Go stimuli evaluation, while mdaMCI participants show a lengthening of this process, and (2) both aMCI subtypes show impairment in inhibition processes. In sum, Go-N2 and NoGo-N2 showed differences between aMCI and control participants, but a decrease in NoGo-N2 amplitude seem to be the more optimal biomarker of each aMCI subtype.

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#### P112 - Happy and Blind to Response Errors? Insights from Error-Related Brain Potentials

Katharina Paul<sup>1</sup>, Wioleta Walentowska<sup>2</sup>, Jasmina Bakic<sup>1</sup>, Thibaut Dondaine<sup>3</sup>, Gilles Pourtois<sup>1</sup>

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#### *Abstract:*

Goal adaptive behavior requires the rapid detection of conflicts between actions and intentions/goals. While many studies have focused in the past on the influence of negative affect on this cognitive control process (and more specifically, on error monitoring), little is known by comparison about possible modulatory effects of positive affect on it. To address this question, we used a standard (positive) mood induction procedure (based on guided imagery) and asked participants to carry out a speeded Go/NoGo task, while high density EEG was recorded concurrently. As an active control condition, we used a group with neutral mood. ERP results showed that the ERN (error-related negativity) component, reflecting early error detection within the dorsal anterior cingulate cortex, was not influenced by (positive) mood. In contrast, the subsequent Pe (error positivity) component, related to the appraisal of the motivational significance of errors, was reliably smaller in the happy relative to the neutral mood group. Complementing source localization analyses showed that this effect was explained by a decreased activation within the posterior cingulate and insular cortices. These results were obtained in the absence of group differences regarding behavioral performance and tonic arousal. These findings suggest that happy mood likely decreases and changes the motivational significance of worse than expected events (Pe), while leaving their earlier automatic detection (ERN) unaltered. We discuss these new results in terms of dynamic changes in the complex interplay of performance monitoring with motivation.

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#### P113 - Heartfelt Self: Cardio-Visual Stimulation Affects Self-Face Recognition and Interoceptive Cortical Processing

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<sup>1</sup>University of Oxford

<sup>2</sup>Royal Holloway University of London

#### *Abstract:*



The sense of body-ownership relies upon the integration of bodily signals conveyed by different sensory modalities (e.g. vision/touch), such that the simultaneous integration of several exteroceptive signals can alter body-ownership. For instance, watching the stroking of an artificial hand synchronously with one's hand leads to the illusory effect that the artificial hand is part of one's own body. However, still little is known about how the brain integrates multisensory signals from outside and inside the body (interoceptive signals) to produce the sense of body-ownership. Across two experiments, we investigated whether recently described methods of multisensory integration across exteroceptive and interoceptive domains modulate self-identification with the face of another. For that, we projected a pulsing shade mimicking the participant's or another person's heartbeats over morphed photos. In experiment 1, participants performed a face recognition task before and after the cardio-visual stimulation to test for changes in self-face recognition; in experiment 2, participants' heartbeat evoked responses (HEP-electrophysiological index of cardiac cortical processing) were recorded during the cardio-visual stimulation. Results revealed that synchronous (vs. asynchronous) stimulation led to changes in the mental representations of self/other's face, as well as to HEP amplitude reduction associated with the sense of identification with the other's face. Interestingly, the magnitude of illusion-related effects increased linearly with the participants' trait ability to detect own interoceptive signals. These results provide novel evidence that the integration between interoceptive and exteroceptive information can modulate the mental representation of the self-face leading to changes in cortical processing of body-information.

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P114 - Here's a Happy Ending, Nothing Is Forever: Subjective, Physiological and Neurological Effects of Mindful Attention

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<sup>1</sup>Vrije Universiteit Brussel

*Abstract:*

Background: Mindfulness has beneficial effects on emotional experience. Mindfulness can be divided into two components, interoception (turning attention to bodily sensations) and mindful attention (observing experiences as transient mental events). Both components lead to improved emotional experience. However, no study has investigated whether the addition of mindful attention improves the beneficial effects of interoceptive awareness on emotional experience.

Methods: *Study 1.* In a within-participants design, participants are trained in 3 conditions: (a) immersion (control condition), (b) interoception and (c) interoception combined with mindful attention. Participants view negatively valenced pictures, while adopting one of the three strategies. After each picture, they rate felt valence and arousal. Skin conductance is measured during the experiment. Participants also filled in a measure of dispositional mindfulness. *Study 2.* We measured neurological activity by means of fMRI. The design was identical to study 1.

Results: Study 1 shows that mindful attention adds onto the effects of interoception by decreasing subjective arousal and increasing positive feelings. Dispositional mindfulness influences baseline felt arousal, and moderates the effect of interoception and mindful attention on the number of Skin Conductance Responses.

The results of study 2 will be discussed during the presentation.

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P115 - Higher Intuition Is Related to Worse Cardiovascular Recovery to Competition

Adrián Alacreu-Crespo<sup>1</sup>, Diana Abad-Tortosa<sup>1</sup>, Raquel Costa<sup>2</sup>, Alicia Salvador<sup>1</sup>, Miguel A. Serrano<sup>1</sup>

<sup>1</sup>University of Valencia

<sup>2</sup>University Miguel Hernández

*Abstract:*

Recently, different theories have highlighted the importance of cognitive variables as modulators of the coping response to competition. In this way, previous research showed that predominance of different thinking styles –rational vs experiential- could influence on cardiovascular (CV) disease risk. However, in spite of the importance of competition in our daily lives, there is no investigation about CV response depending on outcome and thinking styles. Thus, the main objective of this study was to analyze whether thinking styles could modulate the CV response to a laboratory competition. We recruited 116 healthy participants (44 women) with mean age of  $22.08 \pm 0.41$  (Mean $\pm$ SEM) that completed a cognitive task in a competitive (N= 86; 43 winners vs 43 losers), and a non-competitive condition (N= 30; control group), meanwhile heart rate variability frequency domain variables (HFn.u band = 0.15-0.40 Hz; LFn.u band = 0.04-0.15 Hz) were measured with a polar band. Trait thinking styles and situational emotional responses to competition (perceived effort, frustration, difficulty, performance and stress) were also assessed. Our results showed no effect of outcome on CV reactivity, neither recovery. However, losers had higher punctuations in experiential thinking style and frustration than winners. Finally, the higher scores in experiential style the higher sympathetic reactivity, but the worse recovery to basal levels, not mediated by situational variables. In conclusion, having a cognitive style focused on intuition and experience could lead to a worse recovery than a rational style with heightened CV levels after competition, which could increase the probability of CV disorders.

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P117 - How Accurately Do Listeners Recognize Emotions from Nonverbal Short Vocalizations?

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*Abstract:*

Emotions can be reliably judged from the voice with a high degree of consistency across cultures (Scherer, Banse, & Wallbott, 2001). Nevertheless, fear and happiness are commonly less well recognized than vocal expressions of anger and sadness (Juslin & Laukka, 2003). Regarding the voice acoustic proprieties that contribute to differences in categorical emotion recognition, duration was found to play an important role: anger, fear, sadness and neutral expressions seem to be accurately identified from short vocalizations (500-700 ms), while listeners might need more time to recognize happiness (1000 ms) and disgust (1500 ms) vocal expressions (Pell & Kotz, 2011).

The aim of this study was to determine how accurately emotions are decoded from nonverbal short affective vocalizations.

Thirty-eight European Portuguese college students (mean age = 21.68, SD = 3.74 years; 15 males) participated in this study. Nonverbal vocalizations (anger, fear, sadness, happiness and neutral) were selected from the Montreal Affective Voices (MAV, Belin, Fillion-Bilodeau, & Gosselin, 2008) set and its duration was shortened (700 ms). Participants completed a categorical assessment by rating stimuli intensity in four emotional categories (anger, fear, sadness and happiness).

Overall, accuracy ratings were quite high (mean of 68.07% for the chance level at 11.11%), with happiness yielding the highest ratings in the corresponding categorical scale (95%). These results corroborate a fast decoding of vocal emotions (Bostanov & Kotchoubey, 2004) and suggest that emotions can be differentiated even with short vocal samples.

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P118 - How Deep Is Implicit Perspective Taking? Evidence from fMRI Repetition Priming

Matthias Schurz<sup>1</sup>, Matthias G. Tholen<sup>1</sup>, Andrew Surtees<sup>2</sup>, Dana Samson<sup>3</sup>, Josef Perner<sup>1</sup>

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### *Abstract*

In a previous study (Schurz et al., 2015), we found that implicit visual perspective taking activates brain areas also found for explicit perspective taking. This is in line with other studies showing that implicit and explicit mentalizing recruit common areas of the brain (e.g. Schneider et al., 2014; Kovacs et al., 2014). Together, these studies aim at finding the functional similarities of implicit and explicit mentalizing. However, finding common brain activation for two different tasks has been criticized for having limited interpretational power due to the “reverse inference” fallacy (Poldrack, 2011). In the present fMRI study, we take a novel approach to studying the functional properties of implicit perspective taking: Repetition priming. We present a simple visual perspective taking task and systematically vary whether information linked to the content of the other's perspective is repeated over trials or not. First results show a repetition related effect in left and right temporo-parietal junction, providing initial clues on the question how deeply an implicitly adopted perspective is processed.

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### P119 - How Different Early Periods of Maternal Separation Affect Maternal Behaviour and Dams Anxiety?

Renata Lopes Alves<sup>1</sup>, Cecilia Juliana Alves<sup>2</sup>, Teresa Summavielle<sup>3</sup>, Liliana de Sousa<sup>4</sup>, Fernando Barbosa<sup>5</sup>, Ana Magalhães<sup>3</sup>

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### *Abstract:*

Studies focused on the maternal separation paradigm have shown that, in addition to the impact of this separation on infant's development, mothers also have neurobehavioral consequences. Here, the impact of different early periods of maternal separation (MS) on maternal behavior and dams anxiety was investigated. Female Wistar rats were subjected to daily/2h mother-litter separation (MS) from postnatal day (PND) 2-6 or from PND 10-14 (n=8). Maternal care was evaluated before and after separation on PND 2, 4, 6 or 10, 12, 14. After weaning, maternal anxiety was assessed in the elevated plus maze (EPM) and in the open field test (OF). Expression of typical stress markers in the amygdala and hypothalamus were also evaluated. Results show that affiliative behavior upon reunion increase in MS (10-14) dams and these females were also less anxious in EPM. Whereas MS (2-6) didn't change maternal behavior and dams were more exploratory in EPM. Dams respond to MS stressor, by increasing parental behaviour, only after the development of strong bonding between mother-infant (MS(10-14)). Therefore, the obtained results suggest that there is a key period for the caregiver strongly invests on parental care and the lack of significant increase of maternal care after MS (2-6) may be critical for mother-infant bonding quality.

FEDER funds through Programa Operacional Factores de Competitividade – COMPETE and Fundação para a Ciência e a Tecnologia, in the framework of the project PTDC/PSI-PCO/116612/2010. IF/01239/2014. FPCEUP-PD/00206/2013.

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### P120 - How Imitation Affects Empathy and Prosocial Behavior: The Role of Movement Congruency and Temporal Contingency

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**Abstract:**

Being imitated has been shown to increase empathy and prosocial behavior, suggesting that it induces a sense of social connection. It is still unresolved, though, how imitation produces these effects. According to one view the effects are grounded in embodied movement simulations, and therefore require the movements of the individuals to be bodily congruent. Yet, imitation could also have positive social effects because of the rewarding experience of perceiving temporal contingencies between one's own and the other's movements, implying that these effects would also occur if the imitator's movements are temporally contingent, but not bodily congruent.

We assessed whether bodily congruency is necessary for increasing empathy and prosocial behavior, or whether temporal contingency can also produce such effects. Participants made spontaneous joystick movements while engaging in a feigned webcam interaction with two confederates, one of whom made imitative movements, while the other made random movements. In two experimental groups, we varied whether the imitator made bodily congruent (1) or temporally contingent (2) movements. We then assessed participants' behavioral and electrophysiological responses in an empathy for pain task, and tested which confederate was favored in a prosocial decision making task.

Participants showed increased skin conductance responses when perceiving the congruent actor in pain, compared to the control actor. We did not find such an effect for the contingent actor. Besides, the congruent actor was favored over the control actor in prosocial behavior, but the contingent actor was not. Our findings suggest that movement congruency increases empathy for pain and induces a preference in prosocial behavior, but that temporal contingency does not have such effects. This supports the notion that the social effects of imitation are grounded in motor resonance processes.

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P121 - Sex Differences in Neuroendocrine Responses to Social Exclusion

Sina Radke<sup>1</sup>, Eva-Maria Seidel<sup>2</sup>, Roland Boubela<sup>3</sup>, Hanna Thaler<sup>2</sup>, Hannah Metzler<sup>2</sup>, Ilse Kryspin-Exner<sup>2</sup>, Ewald Moser<sup>3</sup>, Ute Habel<sup>1</sup>, Birgit Derntl<sup>4</sup>

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<sup>4</sup>University of Tübingen

**Abstract:**

Social exclusion is a stressful experience that might affect females and males differently. Building upon previous work showing sex-specific changes in hormone levels, the current study investigated behavioral, hormonal and neural responses to social exclusion. Forty men and 40 women performed a variant of the commonly-used Cyberball paradigm while undergoing fMRI. Females and males reacted similarly to being excluded in terms of subjective distress, cortisol and testosterone levels. Increases in progesterone, however, were only evident in women, and its release might be linked to affiliation motivation. Ongoing

analyses of the imaging data are targeted at revealing sex differences in brain activity. Further associations between neural and hormonal responses are expected to contribute to the discussion on sex differences and their underlying neurobiological mechanisms. This multi-level approach holds promise for new insights into the neuroendocrine basis of social motivation.

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P123 - Impact of the Duration of Epilepsy on Cognitive Evolution in Patients with Drug-Resistant Epilepsy

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<sup>1</sup>University of Valencia

<sup>2</sup>La Fe University Hospital

*Abstract:*

**Background:** Epilepsy is a neurological disease which could involve different patterns of cognitive deficits depending on factors such as the duration of the diagnosis, the age at epilepsy onset and the frequency of seizures. The interaction among these factors remains unknown. The aim of this study is to compare the impact of these factors on the different cognitive domains.

**Methods:** The sample is composed of 22 patients with drug-resistant epilepsy (mean age: 36.00, SEM= 2.59), 13 of them with lower epilepsy duration (20 years or less), and 9 with more than 20 years of evolution. Participants completed a neuropsychological battery assessing attention, verbal memory and visual memory.

**Results:** Participants with lower epilepsy duration had better performance in immediate verbal memory, short-term verbal memory, verbal learning slope, immediate visual memory, long-term visual memory, selective attention and tolerance to cognitive interference. These findings remained the same when frequency of seizures was controlled.

However, long-term verbal memory, long-term verbal recognition and verbal retrieval showed greater sensitivity to the age of epilepsy onset, with better performance in patients with later epilepsy onset (after the age of 5 years, n=11) in respect to patients with early epilepsy onset. Long-term visual memory was sensitive to both factors, the duration of the disease and the age of epilepsy onset.

**Conclusion:** These preliminary data suggest that cognitive domains show different sensitivities to the factors associated with epilepsy. These findings could have clinical implications in neuropsychological assessment and treatment decisions in these patients.

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P127 - Impulsivity and Automatic Change Detection

Kairi Kreegipuu<sup>1</sup>, Nele Pöldver<sup>1</sup>, Annika Kask<sup>1</sup>, Kertu Saar<sup>1</sup>, Jüri Allik<sup>1</sup>, Risto Näätänen<sup>1</sup>

<sup>1</sup>University of Tartu

*Abstract:*

Unexpected events in one's environment trigger specific automatic change detection processes in the brain. These processes can be studied via event-related potentials (ERPs). The visual mismatch negativity (vMMN) is such an automatic responses to a rarely presented unattended deviant visual stimulus as compared to a frequently presented but still unattended standard stimulus. In the talk the relationship between impulsivity, a multifactorial construct related to personality and behaviour, and vMMN will be analysed. Four subscales of impulsivity (Urgency, Premeditation, Perseverance, and Sensation Seeking, Whiteside and Lynam, 2001) were indexed from the responses to a short version of Big Five personality test (Möttus et al, 2006). Two opposite hypotheses will be tested: impulsivity is advantageous to the vMMN and that it disturbs the elicitation of vMMN. If the earlier is true, vMMN should probably be more related to greater bottom-up distractibility, as suggested by Franken et al., 2005 for auditory MMN) and weaker resistance to temptations. If the latter is true, vMMN should be more related to an ability to stay on main goals (i.e., task in the

experiment) and better cognitive control. The relationship may also depend on stimuli, especially on their emotional value. Results show that bigger vMMN amplitudes to a happy schematic face were related to lower scores on Urgency (i.e., lack of emotional self-control).

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## 129 - Implicit and Explicit Processing of Emotional Social Information in Healthy Adult Males and Females: High-density ERP Study

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<sup>1</sup>Institute of Higher Nervous Activity and Neurophysiology RAS

### *Abstract:*

We aimed at studying brain electrical activity underlying implicit and explicit social cognition in healthy adults. In the current study, gender differences in ERP components and behavioral measures were analyzed while our participants performed implicit and explicit recognition of social negative, positive, or neutral situations.

Our participants were healthy volunteers (26 females and 26 males), all performed two tasks with the same set of photographs. The stimuli were monochrome photographs showing pairs of humans or animals of the same species: they were neutral, positive or negative. The instruction for the Implicit Social Recognition (ISR) task was to press button 1 for a human and button 2 for an animal image. The instruction for the Explicit Social Recognition (ESR) task was to evaluate the kind of interaction between two subjects on the photograph – neutral, negative or positive. ESR task always followed ISR task and served as an indicator that the majority of the images were categorized «correctly», i.e., as they were in the experimental design.

128-channel EEG was recorded with sampling rate of 500 Hz and segmented -100 ms + 1000 ms from the picture onset. The evoked activity and behavioral parameters were analyzed for six categories: human negative, neutral, and positive), and animal negative, neutral, and positive.

The error rate in ISR task was 1-3%. The inter-category differences were close to significant in female group only. The error rate in ESR task was 3-17%, with higher rates for neutral images. The inter-category differences were significant in males for both human and animal images ( $p < 0.001$ ), but in females for human images only ( $p < 0.001$ ). Motor reaction times (RT) were longer for males compared to females in all categories in ISR ( $p < 0.05$ ) and ESR ( $p < 0.01$ ) tasks. The inter-category differences were not found in ISR task, but they were significant in ESR task for human ( $p < 0.001$ ) and animal images ( $p < 0.02$ ) in both groups.

The ERP differences between male and female groups were in the following windows: 1) early differences during the first 90 ms from picture onset; 2) 80-170 ms, including P120 component; 3) 170-400 ms, including N170/VPP and N250; 4) 400-1000 ms, corresponding LPP. The topography depended on task and the stimuli category. The differences in LPP were observed mostly in ESR task, and in ISR task they were seen for positive animal images.

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## P130 - Individual Variation of the CPCPD1 (EDI3) Gene Involved in Intracellular Choline Metabolism Modulates Selective Attention in the Elderly

Patrick D. Gajewski<sup>1</sup>, Christoph van Thriel<sup>1</sup>, Meinolf Blaszkewicz<sup>1</sup>, Jan G. Hengstler<sup>1</sup>, Klaus Golka<sup>1</sup>, Michael Falkenstein<sup>1</sup>

<sup>1</sup>Leibniz Research Centre for Working Environment and Human Factors at TU Dortmund (IfADo)

### *Abstract:*

Surface of visual cortex in humans varies considerably between individuals due to genetic variations. Recent genome-wide association studies identified a single nucleotide polymorphism (SNP; rs6116869) of a gene involved in choline metabolism (*GPCPD1* also called *EDI3*) that showed a strong association with the size of the visual cortex surface area. The homozygous TT allele carriers had larger visual cortices than GG or GT allele carriers. The present study aims at identifying functional differences between these genotypes using

event related potentials in a visual attention task. 125 elderly participants (mean 70 years) participated. In the visual search, task participants had to indicate presence of a predefined stimulus embedded in an array of similar stimuli. The behavioural results showed significantly higher rates of target detection in the heterozygous GT allele compared to homozygous GG allele. No difference was found between the GG and TT genotypes. Electrophysiological data revealed no genotype effects on the sensory P1 component. However, the amplitude of the occipital N1 associated with allocation of visual attention was strongly enhanced in the TT allele carriers compared to GG or GT allele. Moreover, the latency of the frontocentral P2 associated with recall of stored target information was significantly shorter in the TT than GG or GT genotype carriers.

In sum, the data show enhanced allocation of attentional resources and a faster stimulus evaluation in participants with the homozygote TT allele of the SNP rs6116869. This improved function might be related to the region-specific enlargement of the cortical surface area previously described in homozygote TT allele carriers.

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#### P131 - Infants' Neural Responses to Peer's Cry and Laughter: A Link to the Predisposition for Negative Emotionality

Maria Magdalena Crespo Llado<sup>1</sup>, Elena Geangu<sup>1</sup>

<sup>1</sup>Lancaster University

##### *Abstract:*

A growing body of evidence reveals that infants display a remarkable ability to share in adults' emotional expressions. By 10-12 weeks infants already show emotional resonance to adult facial and vocal displays of happiness, sadness, and anger (Haviland et al., 1987; Montague et al., 2001). A few hours after birth, infants express reactions of distress in response to another newborn crying (Simner, 1971) and by 5 months, infants resonate the facial and vocal affective displays of other infants (Vaillant-Molina et al., 2013). Less is known about infants' neural responses to their peers' emotions and whether such emotional responses are modulated by temperamental characteristics. We addressed this gap by investigating the neural correlates of infants' responses to peers' crying and laughter, while also examining differences in temperament.

Thirty 8-month-olds were presented audio recordings of other infants' laughter, crying, and coughing. ERPs time-locked to the onset of the sounds were analysed with respect to stimuli valence (positive/negative/neutral) and hemisphere (right/left). ERP data was further analysed in relation to temperament, particularly IBQ-R fearfulness and negative emotionality scores, as well as infants' emotion-regulatory behaviours (e.g. facial and vocal expressions, self-soothing, looking times) in response to video recordings of peers' laughing and crying.

Our results provide evidence for an early negativity bias: 8-month-old infants allocated more attention toward peers' crying (i.e., exhibited a higher frontal N1 peak) compared to laughter. Additionally, crying elicited a more frontal, positive slow wave (PSW) compared to laughter and coughing, which may reflect differences in sustained memory processing.

By contrast, laughter elicited a more differentiated P200 response than did crying, which might reflect higher-order perceptual processing of a socially salient event. Furthermore, IBQ-R fearfulness and negative emotionality scores correlated positively with the N1 mean amplitude for crying. ERP results will be further discussed in terms of their relationship to infants' emotion-regulatory behaviours.

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#### P132 - Influence of Disgust and Fear on Long-Term Memory – An fMRI Study with the Use of the Nencki Affective Word List (NAWL)

Monika Riegel<sup>1</sup>, Małgorzata Wierzbą<sup>1</sup>, Katarzyna Jednoróg<sup>2</sup>, Anna Grabowska<sup>2</sup>, Artur Marchewka<sup>1</sup>

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**Abstract:**

**Introduction:** Emotion-memory interactions are present at various stages of information processing, from encoding to long-term retrieval. There has been a debate concerning changes in the neural basis of memory unfolding over delay. Specifically, it has been shown on visual material that hippocampal activation decreases over time together with memory for contextual details. On the other hand, a study using verbal material with the instruction of mental integration pointed activation of the cuneus and negative correlation of left amygdala with frontal and hippocampal activity during encoding and retrieval. However, little is known about the influence of specific basic emotions on the storage of emotionally-charged verbal stimuli.

**Methods:** Verbal affective stimuli were selected from the Nencki Affective Word List (NAWL) [9]. During encoding session, 50 subjects (25 female; aged 20-35) were presented with 120 pairs of words (40 disgusting, 40 fearful and 40 neutral), instructed to imagine them as interacting in some way, and asked to rate how well they were able to imagine the pairings as single representations on a 6-point scale (1 = not well and 6 = very well).

After 2 weeks, the subjects were invited for retrieval session, presented with 120 words from the encoding list and 90 new words as lures, and asked to determine whether a word was old or new using a modified 6-point remember-know scale (*definitely new, probably new, not sure, probably old, definitely old, and remember*). Both sessions were conducted with the use of 3T Siemens MRI scanner.

**Results:** At the behavioral level, we found a significant main effect of memory performance - higher recognition of old stimuli than the rate of false recognition. There was also a main effect of emotion - disgusting and fearful stimuli had higher recognition rate than neutral. At the neuronal level, analyses of the retrieval session showed increased activation for correctly recognized old words vs. forgotten old words or correctly recognized new words in anterior and posterior cingulate cortex, bilateral inferior frontal gyri and thalami. The strength of neuronal response was higher for emotional than neutral stimuli.

**Conclusions:** Here we provided behavioral evidence that neural substrates of verbal long-term memory performance depend on the emotional content of the unitized words.

The study was supported by a National Science Centre grant no. 2012/07/B/HS6/02112.

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P133 - Influence of Lexical Context on MMN in Recognition Linguistic Stimuli: An ERP-Study

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<sup>1</sup>Saint Petersburg State University

**Abstract:**

The present investigation is designed to establish how words frequency influences the mismatch negativity brain potential (MMN) latency and amplitude. The MMN demonstrates an enhanced response to meaningful words over meaningless items. Increasing of amplitude in time period 100-200 ms supports to the above view on word memory traces as strongly connected assemblies of neurons. These results lend further support to the strength of internal connections in a memory circuit, which is in turn determined by lexical context. We hypothesize that different amounts of activation depend on the word's lexical representation strength.

**Method:** We compared the ERPs elicited by two different contexts: lexical and meaningless context. In our study we used a multistimuli passive oddball paradigm. Physical stimuli contrasts were kept identical. We tested two experiments with three conditions: one standard stimulus and two deviant stimuli and in the two other conditions, a reversed design. Thus the MMN responses were elicited by deviant items, but the critical variable determining



the MMN response - the standard-deviant acoustic-phonetic contrast was identical in all three conditions.

Results: No significant main effects could be found for the standard stimulus in either of the two experiments. Event-related potentials were successfully calculated for the standard and deviant stimuli in all experimental conditions, and mismatch negativity responses could be obtained for the all stimuli. We obtained the significant main effects for the mean amplitude and latency MMN only among stimuli witch was presented in lexical context. Conclusion: The results support our hypothesis: the stimuli in lexical context lead to a significantly more pronounced MMN response relative to the meaningless one.

Furthermore, the MMN latency is shorter by stimuli in lexical context relative to the meaningless one, suggesting more rapid access to familiar lexical entries. A lexical context in recognition leads to a more pronounced lexical MMN response than its meaningless counterpart. These results lend further support to the above view on word memory traces as strongly connected assemblies of neurons.

Acknowledgements: The work was supported by the Russian Foundation of Humanity (project # 15-06-10806)

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### P134 - Intertemporal Choices: A Comprehensive Review of Its Neurobiological Bases

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<sup>2</sup>Social and Behavioral Sciences Department, Maia University Institute

#### *Abstract:*

Intertemporal choices (IC) are choices that entail a trade-off between costs and benefits occurring at different points in time, and are known to have complex underlying neural mechanisms. Thus, we intend to present a descriptive review on the neurobiological bases of IC. Firstly, we describe the functional models of IC and present data from neuroimaging studies, particularly ALE analysis. Secondly, we demonstrate an immediate value preference beyond the predictions of a single-parameter exponential discounting model and how it can be mapped to a dual-systems model for brain functioning. In addition, several studies demonstrate that individuals display inconsistent preferences depending on the time until rewards are available. Although intertemporal evaluation involves neural mechanisms that differ from other forms of choice, there is also strong evidence that the associated value signals are represented in the context of a common reward system later on. As for the brain regions and circuits involved in IC, studies report the activation of a “nuclear network” and auxiliary areas that include the inferior prefrontal cortex, medial prefrontal cortex, temporo-parietal cortex, and peri-splenial posterior cingulate. Brain areas such as the ventral striatum, medial prefrontal cortex, orbitofrontal cortex, and anterior insula comprise a network sensitive to value. Lastly, evidence from neuroimaging and EEG studies suggest that choices are determined by a dual evaluation system.

This research was supported by a PhD Scholarship from the Portuguese Foundation for Science and Technology granted to the first author (SFRH/BD/108216/2015).

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### P135 - Intrinsic Networks Underlying Successful Emotion Regulation of Angry Faces

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<sup>5</sup>Centre for Cognitive Neuroscience, University of Salzburg, Austria

#### *Abstract:*

Most of our social interaction is naturally based on emotional information derived from the perception of faces of other people. Negative facial expressions e.g. anger of a counterpart might trigger negative emotions and initiate emotion regulatory efforts to reduce the impact of the received emotional message in a perceiver. Despite the high adaptive value of emotion regulation in social interaction, the neural underpinnings of it are largely unknown. To remedy this, the present study investigated individual differences in emotion regulation effectiveness during the reappraisal of angry faces on the underlying functional activity using functional magnetic resonance imaging (fMRI) as well as the underlying functional connectivity using resting-state fMRI in a large sample (n=60). Greater emotion regulation ability was associated with greater functional activity in the ventromedial prefrontal cortex, temporal regions and insula. Furthermore, we identified an intrinsic functional network underlying successful emotion regulation. Greater functional coupling between activity in the ventrolateral prefrontal cortex and the amygdala was associated with emotion regulation success. In addition, increased connectivity between medial frontal and temporal regions was also related to success in emotion regulation. Our findings provide a first link between prefrontal cognitive control and subcortical emotion processing systems during successful emotion regulation in an explicitly social context.

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P136 - Investigating the Neural Basis of the Autobiographical Self: An Event-Related Potential (ERP) Study

Helder F Araujo<sup>1</sup>, Yohan Boillat<sup>2</sup>, Jonas Kaplan<sup>1</sup>, Assal Habibi<sup>1</sup>, Hanna Damasio<sup>1</sup>, Antonio Damasio<sup>1</sup>

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<sup>2</sup>École Polytechnique Fédérale de Lausanne, Switzerland

*Abstract:*

Mental states elicited by retrieving memories concerning one's biography have been designated as "autobiographical self". The investigation of neural basis for those states has often compared evaluating one's personality traits ("self") with evaluating another person's traits ("other"). That investigation has been informative but the interpretation of the differences between self and other requires further scrutiny. Specifically, it has been hypothesized that those differences relate to memory-retrieval and decision-making processes. Here, we test that hypothesis using event-related potentials (ERPs).

Seventeen participants were asked to decide if a set of 102 traits described themselves or an acquaintance. The stimuli were three-word visual sentences. We analyzed ERP components associated with memory retrieval (frontal negativity [FN400], late positive component [LPC]) and decision-making (conflict-related negativity [CRN]). A microstate segmentation of the ERP data was also performed.

Both self and other elicited the ERP components of interest. Nonetheless, the mean LPC amplitude was greater for self than other; moreover, for self but not for other, FN400 and LPC showed greater amplitude in frontal than in parietal areas. No CRN amplitude differences between self and other were observed. We found differences in the duration of microstates during stimulus presentation and participants' responses between self and other.

Our results support the hypothesis that, both for self and for other, evaluating traits depends on memory and decision processes, and suggest that the differences between self and other relate particularly to memory. Moreover, some of those differences are in the hundreds-of-milliseconds range and may be difficult to detect with fMRI.

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P262 - Tracking Facial Trustworthiness and Reward during a Trust Game: An fMRI Study

Sara Dias dos Santos<sup>1</sup>, Inês Almeida<sup>1</sup>, Miguel Castelo-Branco<sup>1</sup>

<sup>1</sup>Institute for Biomedical Imaging and Life Sciences, Faculty of Medicine, University of Coimbra

*Abstract:*

Trust is a dimension of most importance during social interactions. Also, faces are a key source of information from which we perform rapid inferences about others. However, it is unclear how the perception of facial cues integrates the social cognition network to extract trustworthiness information. This is particularly relevant during decision-making and reward expectations processing. To clarify the relation between facial trustworthiness perception and reward processes, it is important to disentangle the underlying neural networks.

19 participants performed a Trust Game in an fMRI environment. The task consisted in a video presentation, a period where participants' evaluated their expectations regarding the returned amount, the investment period and, finally, the feedback period (when the returned amount was shown).

Contrast analyses between each factor (video, reward expectation, investment, feedback) levels were performed. The results show increased amygdala responses to social interactions during the video period (only for faces, not objects), anterior insula for the expectations period, thalamus during the investment period and superior and middle temporal gyrus for the feedback period. The putamen responded to a positive mismatch between expectations and feedback. Finally, the inferior frontal gyrus was found highly engaged both during perception of trustworthiness from facial cues as well as during feedback.

A better understanding of the role of these regions could help to unveil the processes underlying facial trustworthiness perception. Importantly, we demonstrate a partial overlap of the structures implicated in trustworthiness judgements of complex visual stimuli such as faces and the neural substrates of reward processing.

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## Poster Session 2 (25-06-2016) – Poster listing (P138 to P274)

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P138 - Is Social Feedback Special? Neuronal Correlates of Social and Non-Social Feedback Stimuli

Daniela M. Pfabigan<sup>1</sup>, Marianne Gittenberger<sup>1</sup>, Claus Lamm<sup>1</sup>

<sup>1</sup>University of Vienna

*Abstract:*

Although recent research emphasizes the importance of social factors during performance monitoring, so far the laboratory models mostly used non-social settings or non-social feedback. Consequently, the current study aimed to better understand the impact of social stimuli on performance monitoring. Thereby, we addressed a shortcoming of previous studies that failed to consider complexity of social stimuli as a potential influencing factor.

Twenty-four volunteers performed a time estimation task during electroencephalographic measurements. Either social complex, social non-complex, non-social complex, and non-social non-complex stimuli were used to provide performance feedback. Thumbs up/down acted as social feedback stimuli, plus/minus symbols were used as non-social ones – both being presented in either a complex or non-complex way. On the behavioural level, no effects of social dimension or complexity were found. In contrast, both Feedback-Related Negativity (FRN) and P300 amplitudes were sensitive to our manipulation with larger FRN and P300 amplitudes after social compared to non-social stimuli. Stimulus complexity was only reflected in FRN amplitudes – complex positive stimuli elicited larger FRN amplitudes than non-complex positive ones.

Our results showed that independently of each other, social dimension and visual complexity influence amplitude variation during performance monitoring. Both social and complex feedback stimuli could be considered as more salient and motivating feedback stimuli than non-social and non-complex ones. Since social dimension was reflected in both FRN and P300 amplitudes, we hypothesize that performance monitoring in the social domain relies on domain general processes recruiting the same neuronal networks as performance monitoring in the non-social domain.

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P139 - Is Stress Making Us Less Empathetic?

Sara Reis<sup>1</sup>, Francisco Magalhães Almeida<sup>1</sup>, Eugénia Fernandes<sup>1</sup>, Maria Manuel Pinhal<sup>1</sup>, Barbara Nobre<sup>1</sup>, Patrícia Oliveira-Silva<sup>1</sup>

<sup>1</sup>Human Neurobehavioral Laboratory, Universidade Católica Portuguesa

*Abstract:*

The ability of empathizing, or engaging in the other persons' internal states, is believed to be the foundation for all interpersonal relationships. However, too little attention has been given to a fundamental aspect of the empathic experience, the capacity for responding empathically. Although many evidences have been recently provided that there are several systems mediating empathy, it is well-established and strongly supported that the individual's level of arousal may be a critical factor in determining whether the response to a specific condition will be empathic or not. We suggest that the arousal level, as measured by the heart rate variability, may play a crucial role in the empathy-related behavior, potentially representing a neurobiological system that modulate the way people handle their empathic reactions to the others' needs. In this study, we used an empathy response paradigm encompassing 40 empathy-eliciting vignettes and we predict that different categories of empathy responses will be associated with the level of arousal. The focus of this communication is to discuss three main points: (1) the results obtained in this study; (2) what is known about this mechanism, by which the level of arousal can modulate the individual's tendency to respond empathically; and (3) the potential practical and conceptual implications of this research.

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P140 - Is the Processing of Face Familiarity and Emotional Expression Dependent on the Task?: Evidence from Event-Related Potentials

Marina Palazova<sup>1</sup>, Birgit Stürmer<sup>1</sup>

<sup>1</sup>International Psychoanalytic University Berlin

*Abstract:*

The original face recognition model by Bruce and Young (1986) postulates parallel and independent processing of face identity and emotional expression. This assumption is challenged by increasing evidence that both are functionally dependent. The current experiment aimed to specify boundary conditions of face familiarity and facial emotional expression interactions by applying event-related potentials. In a first task participants decided on the gender of face identities varying in familiarity (unfamiliar versus personally familiar) and emotional expression (happy, neutral and angry). The task did not emphasize any of the factors and thus was setting similar demands on their processing. In a second task participants passively viewed the same faces but were instructed to pay attention to the emotional expression. In both tasks main effects of face familiarity were observed only after main effects of emotional expression, indicating faster processing of emotion over identity. In the gender decision task an interaction of both factors was observed in the late positive complex (LPC), a component related to elaborate processing of emotion. In contrast, an interaction was missing for the LPC in the emotional passive viewing task. Interestingly, main effects of emotional expression and familiarity were observed in earlier time windows in the passive viewing task but not in the gender decision task, pointing to a task dependency. We, therefore, conclude that processing of face identity and emotional expression takes place mainly in parallel but is not completely independent.

## P141 - It's in Your Eyes: Novel Approaches to Study the Neural Mechanisms of Gaze-Based Social Interactions

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<sup>2</sup>Department of Psychiatry, University Hospital Cologne, Cologne, Germany

### *Abstract:*

The gaze of others fascinates us from birth onwards. Traditionally, experimental approaches to study the effects of gaze have focused on how human observers respond to gaze cues and how attention, perception and action control are each influenced by them. In recent years, the investigation of gaze behaviour has moved towards the inclusion of more ecologically valid conditions, in which gaze signals are exchanged as part of reciprocal social interactions. Such an 'interactive turn' is beginning to yield new insights into the neural mechanisms of gaze behaviour as they unfold in real life and has demonstrated the involvement of reward-related neurocircuitry during gaze-based social interactions. Furthermore, interactive gaze behaviour has also been shown to modulate subtle facial mimicry responses to seeing another's facial expression. Finally, it will be argued that taking steps towards a truly social neuroscience may also be informative for an understanding of the biobehavioural correlates of psychiatric disorders, which are often characterized by impairments of social interaction rather than social observation.

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## P142 - Knowing Where to Listen Reduces Age-Related Impairments of Attention Switching: ERP Evidence from a Dynamic Speech-Perception Task

Stephan Getzmann<sup>1</sup>, Edmund Wascher<sup>1</sup>

<sup>1</sup>IfADo Dortmund

### *Abstract:*

Speech perception in multi-talker environments usually decreases in aging. There is evidence that changes in target speaker due to conversational turn-takings result in declined speech perception especially in older adults. Here, we investigated whether visual cues indicating a subsequent change in target speaker reduce these costs of switching in older and younger adults. 22 younger (mean age 25.3 years) and 22 older (mean age 64.6 years) participants performed a speeded word discrimination task, in which sequences of short words were simultaneously presented by three speakers located at a left, central, or right horizontal position. In a two-alternative forced-choice procedure, the participants responded to target words ("an" and "ab"), while ignoring concurrent speech information. The speech stimuli were preceded by visual cues either indicating a subsequent change in the speaker of the target words (a switch from left to right or vice versa) or not. Older participants were more affected by uncued changes in target speaker than younger ones, as indicated by an increase in response times relative to non-change trials. However, no differences in performance occurred after cued changes. The analysis of event-related potential measures revealed – in addition to generally reduced inhibitory control (indicated by a reduced N2 component) – age-specific differences in cue processing. In sum, knowing where to listen has the potential to reduced age-related increases in switch cost in multi-talker speech perception that result – at least in part – from a delayed context updating and attention switching.

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## P144 - Learning Novel Action- and Object-Related Words – An fMRI Study

Max Garagnani<sup>1</sup>, Evgeniya Kirilina<sup>2</sup>, Friedemann Pulvermüller<sup>2</sup>

<sup>1</sup>Brain Language Lab, Freie Universität Berlin

*Abstract:*

According to embodied theories of language acquisition, word meaning is grounded in the action and perception systems of the brain through cortical associative processes that bind phonological representations in perisylvian areas with co-occurring semantic information in sensorimotor ones. Most previous studies investigating brain correlates of semantic processes used words from natural languages, which differ on a range of psycholinguistic variables. At present, no neuroimaging study on semantic grounding has shown that perception of newly learned category-specific items selectively reactivates the primary sensory or motor areas that were active during acquisition of the corresponding words.

We used functional Magnetic Resonance Imaging (fMRI) to investigate brain correlates of semantic grounding of novel action- and object-related words. 24 healthy volunteers underwent behavioural training sessions over 3 days, during which they heard 64 novel word forms paired with a semantic referent, consisting of either a familiar hand-action or object (animal) picture. The mapping of novel words to meaning was either consistent (same word always paired with same action or object) or inconsistent (same word paired with all items of one category). On day 4 participants were scanned and subsequently administered a lexical-decision test.

Behavioural results indicate that participants were able to successfully learn and recognize consistent word-meaning mappings but mostly failed at acquiring inconsistent ones; learning performance was also better for object-related than action-related novel words. A region-of-interest (ROI) analysis of the fMRI responses to learned consistent items revealed a wordType-by-ROI interaction in the data from the left-hemisphere's (i) primary visual cortex and fusiform gyrus (V1) and (ii) extra-striate body area (EBA), with object words activating V1 (and not EBA) more than action words, and the opposite trend emerging for action words. These results suggest that auditory perception of newly learned words selectively reactivated those areas that were more active during their acquisition, and enable us to identify, for the first time, brain correlates of referential semantic grounding in primary and higher perceptual areas.

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P145 - Atypical Approach of Threatening Facial Expressions in Young Adults with High Levels of Early Life Stress

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<sup>1</sup>University of Sheffield

*Abstract:*

Early life stress, such as childhood maltreatment, has serious consequences for children's emotional processing abilities, including their recognition of emotional facial expressions. Maltreated children show biased processing of angry facial expressions; they can identify the formation of an angry expression earlier than their non-maltreated counterparts (Pollak, 2008). However, it remains unclear whether this enhanced recognition of anger persists into adulthood, nor whether adults' social responses to emotional facial expressions are affected by their experiences of early life stress. Young adults aged 18-19 carried out an on-line questionnaire in which they viewed colour photographs of angry, happy and neutral facial expressions. Participants indicated the extent to which they perceived the expressions to be happy or angry, and the extent to which they would approach or avoid the person in the photograph. They also completed the Child Abuse and Trauma Scale (Sanders & Becker-Lausen, 1995), a measure of early life stress. Among male participants only, higher levels of early life stress were associated with reduced avoidance of angry facial expressions. This was partially explained by an association between higher levels of early life stress and reduced recognition of anger in angry facial expressions. Surprisingly, this finding with adults is in contrast to previous research with children: in adults, early life stress was associated with reduced recognition of anger, whereas in children, early life stress was associated with

increased recognition of anger (Pollak, 2008). Additionally, the present findings highlight the role of gender, as the associations were found only in male participants.

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P146 - Meaning Maintenance in the Brain: Evidence that Assimilation of Perceptual Anomalies Relies on Alpha-Mediated Gating in Frontoparietal Areas

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<sup>1</sup>University of Salzburg

<sup>2</sup>Tilburg University

*Abstract:*

Research in the context of the Meaning maintenance model has shown that perceptual anomalies are often assimilated to match existing meaning frameworks as part of a broader inconsistency compensation process. Here, we propose that the assimilation process relies on alpha oscillations in the frontoparietal attention network. These oscillations have been shown to be heavily involved in selective attention, active inhibition and perceptual gating. In an EEG experiment, participants had to rate the parity of regular and anomalous (reverse-colored; e.g., a black queen of hearts) playing cards. No participants became aware of the anomalous cards. We observed a phasic alpha band response to anomalous (vs. normal) playing cards over frontal and parietal sensors. This finding provides evidence that frontoparietal alpha oscillations are involved in assimilating perceptual anomalies. We argue that this alpha shift is due to a need for integration of both bottom-up (i.e., sensory information about the stimulus) and top-down (i.e., task-relevant selection) processes.

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P147 - Measuring Self-Other Sharing and Self-Other Distinction as Distinct Dimensions of Empathy

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<sup>1</sup>University of Vienna

*Abstract:*

Empathy refers to feeling another person's feeling. However, research focuses on situations where the empathizer is in a neutral or congruent emotional state. Thus, empathy measures tap on the affective sharing dimension of empathy but not on the more cognitive dimension, encompassing self-other awareness and self-other conflict handling. New tasks have recently been designed to capture both dimensions by introducing situations where our initial emotional state is incongruent with those of another person. In these situations, our egocentric feelings have to be dissociated and inhibited in order to be fully empathic. However, empathy is still measured with a single score despite being conceived as multidimensional. In this study, we decomposed this score into two scores tapping, respectively, on the self-other affective sharing dimension and the self-other distinction dimension. To test whether individuals significantly differ on both dimensions, we conducted cluster analyses on participants' scores in a recent visuo-tactile empathy task. Inter-individual differences were best reduced by forming 3 clusters, or profiles, of empathizers, reflecting a high heterogeneity along both dimensions. Overall, we provide a two-dimensional space to characterize empathic performance.

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P149 - Mirror Neuron System Activity Patterns in Chronic Stroke Patients during Action Observation, Execution, and Imitation

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*Abstract:*

The Mirror Neuron System (MNS) is comprised of motor regions (the inferior frontal gyrus, ventral premotor cortices, and posterior parietal cortices) that are active both when we make an action and when we see someone else make a similar action. Previous studies in non-disabled adults show that during imitation, regions of the brain show reliably larger BOLD signal intensity when compared to action observation or execution alone. Here, we ask: in patients with chronic left middle cerebral artery (MCA) infarcts suffering from mild to moderate upper extremity (UE) motor impairments, does BOLD activity patterns in the MNS follow that of non-disabled adults (imitation>execution>observation)? In this ongoing study, thirteen patients and 9 nondisabled subjects participated in this study. Both groups were asked to observe, execute, and imitate left and right hand actions while in the fMRI scanner. Our preliminary analyses confirm that in nondisabled subjects, the dominant (right) hand follows a pattern of highest percent signal change for conditions of imitation>execution>observation for all ROIs (IFGpo, PSL, PO, and PCG). In patients with stroke, the unaffected (left) hand follows the expected activity pattern (imitation>execution>observation) in all ROIs. For the affected (right) hand, execution engages the MNS to the highest degree, followed by imitation and observation. Engagement of these regions may suggest that recruitment of MNS is highest for the most used hand, such as the dominant/right hand in the nondisabled and the non-paretic/left hand in the stroke group. This information may be useful in understanding imitation post-stroke rehabilitation methods using imitative learning.

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P150 - Mirroring Multiple Agents: Motor Resonance during Action Observation Is Modulated by the Number of Agents

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<sup>2</sup>Université Catholique de Louvain

*Abstract:*

Research on the mirror neuron system has revealed a shared system for action execution and action observation. It has been argued that this system facilitates social interaction because it allows individuals to obtain direct knowledge on the actions of others. Although social situations regularly involve multiple agents acting together, most work so far has focused on situations involving a single agent. The goal of the current study was therefore to explore the role of the mirror system in situations that involve multiple agents. Specifically, we used motor TMS to investigate whether mirror activation is modulated by the number of observed agents. Based on social psychological work on group contagion, we hypothesized that multiple agents provide a stronger trigger to the motor system and hence produce a stronger mirror response than a single agent. In support of this idea, the results revealed an increase in motor resonance when participants observed two agents making an identical movement compared with when they observed a single agent making a movement. This suggests that input to the motor system increases as the number of agents grows. Relating back to group contagion, our study suggests that groups may be more contagious simply because their actions resonate louder. Given that the mirror mechanism has been linked to a variety of social skills, among which theory of mind and empathy, our findings additionally have important implications for the understanding of social interaction at the group level.

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P151 - Modality-Specific Processing of Natural and Artificial Entities

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<sup>1</sup>International School for Advanced Studies



*Abstract:*

The sensory-functional theory of semantic memory posits that categories such as living (i.e. natural) and nonliving (i.e. artificial) entities rely on different attribute types for their organization (Warrington & Shallice, 1984). According to said theory, natural entities are categorized more according to their sensory properties (e.g., color, shape) whereas artificial entities rely more on functional properties (e.g., use and manipulability). Indeed, some studies have demonstrated that correct color processing of natural objects (Tanaka & Presnell, 1999) and the graspable rotation of artificial objects are critical to their identification (Tucker & Ellis, 1998). However, to our knowledge, a direct comparison between the effects of these two principle features on automatic categorical processing of natural and artificial entities has yet to be studied. The current study investigates the categorization of natural and artificial entities via semantic (identity) priming in a lexical decision task.

Participants were presented with a picture prime of a natural (e.g., apple) or artificial (e.g., fork) entity modified in color, orientation, or presented normally, followed by a string of letters as target. Participants had to indicate by button press as quickly as possible if the string represented a word or nonword. Results indicated that color-modified primes yielded less priming than orientation-modified primes preceding a word target depicting a natural entity; the opposite pattern was found for words depicting an artificial entity. Taken together, these findings are in support of the sensory-functional theory, which purports that modality-specific processing guides categorization and that this processing varies as a function of semantic category (Martin, 2009).

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P152 - Modulation of the Neuronal Response to Depictions of Others in Pain through Stress-Related Chemosignals

Matthias Hoenen<sup>1</sup>, Katrin T. Lübke<sup>1</sup>, Bettina M. Pause<sup>1</sup>

<sup>1</sup>Heinrich Heine University Düsseldorf

*Abstract:*

From an evolutionary perspective it is beneficial to understand the distress of others and to allocate attention to the distressed other. Accordingly, studies showed empathy- and attention related brain activity in response to visual depictions of others in pain. However, chemosensory social information (body odors) may have a processing advantage compared to visual social information. Therefore, the current study tested whether the chemosensory information of stressed individuals modulates empathy- ( $\mu$ -activity) and attention ( $\alpha$ -activity) related EEG-activity in response to depictions of painful and non-painful actions.

Applying a within-subject design, participants ( $N = 22$ ) observed pictures of painful and non-painful actions, while chemosensory stimuli were presented via a constant flow olfactometer. Chemosensory stimuli were sampled on cotton pads while donors participated in a simulated job interview (stress condition) or cycled on a stationary bike (sport condition). Pure cotton was used as control. Activity within the 8-13 Hz band at electrodes C3, Cz, C4 ( $\mu$ -activity) and electrodes O1, Oz, O2 ( $\alpha$ -activity) were calculated using fast-fourier-transformation (resulting in a frequency resolution of 0.488 Hz).

As expected, stronger suppression of power in the 8-13 Hz band was observed in response to painful as compared to non-painful actions in the context of cotton control ( $p < .01$ ). However, suppression in response to non-painful pictures linearly increases from the no-odor context to the sport odor context to the stress odor context. These results indicate that stress-related chemosignals act as a warning signal, leading to stronger suppression in the 8-13 Hz band and thereby might prime attention and empathy in ambiguous situations.

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P153 - Modulatory Effects of Testosterone in Risk and Reward Processing

Lisa Wagels<sup>1</sup>, Mikhail Votinov<sup>1</sup>, Benjamin Clemens<sup>1</sup>, Frank Schneider<sup>1</sup>, Ute Habel<sup>1</sup>

*Abstract:*

Empirical evidence suggests a modulatory effect of testosterone on punishment-reward contingencies and on risky decision-making on behavioral and neural levels. Imaging studies emphasize the role of the anterior insula and the ventromedial prefrontal cortex.

The current study aimed for the investigation of experimentally induced testosterone increases on risky decision-making within a double-blind placebo-controlled study. For this purpose, the Balloon Analogue Risk Task (BART) was applied to 90 healthy, male subjects. Four hours prior to the measurement either a gel containing 50mg testosterone (T group) or a placebo gel (P group) was administered transdermally. During the task, participants could inflate a balloon in order to receive a certain amount of money which would be lost, if the balloon exploded. Participants could decide to 'pump' or to 'cash out' individually. In a control condition participants had to inflate the balloon without the possibility of receiving any monetary reward or risking an explosion.

The results showed that testosterone levels did not differ as baseline but were significantly higher before and after the task in the T group compared to the P group. A significant decrease of testosterone levels as effect of the task was found for the P, but not for the T group.

At behavioral level, a tendency towards higher risk-taking was found in the P group.

At neural level, higher risk for inflations compared to control pumps was associated with increased activation in the inferior frontal gyrus, anterior insula, and ventromedial prefrontal cortex. Increasing risk (and hence more money) for cash trials was associated with higher activation in the ventral anterior cingulate cortex and the striatum in the P group compared to the T group.

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P154 - Motivation before Emotion: EEG Correlates of Incentive and Hedonic Effects on Affective Action Tendencies

Andero Uusberg<sup>1</sup>

<sup>1</sup>Tartu University and Stanford University

*Abstract:*

People move faster towards rewarding or pleasant stimuli and away from threatening or unpleasant stimuli than vice versa, suggesting that affect involves automatic action tendencies. However, it is unclear if action tendencies relate differently to hedonic and incentive aspects of affect. In this study, we orthogonalized hedonic (pleasant vs unpleasant) and incentive (rewarding vs threatening) values of movement targets in order to directly compare their EEG-correlates and behavioral impact. 22 students (age 22+/-3.6 years) moved a schematic manikin towards or away from words based on a grammatical feature (noun vs adjective). Each word had hedonic value (pleasant vs unpleasant meaning) as well as incentive value (green vs red color predicting gain or loss of points towards receiving a bookstore gift card). Both types of value had significant and comparable effects on response latencies. In EEG, the earliest signatures of incentive as well as hedonic value encoding appeared in frontal N2 (70 - 130 ms). However, the response congruency ERP effects differed markedly between the two dimensions. Motivational incongruence enlarged fronto-central P1 (30 – 70 ms) and posterior late positivity (600 – 800 ms) amplitudes and slightly reduced the lateral readiness potential. By contrast, valence incongruence had weaker and distributed effects from 175 ms onwards. These findings suggest that incentive and hedonic value have partially independent pathways toward influencing action. In particular, motivational significance appears to bias action selection faster than emotional valence.

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P155 - Motor Cortex Involvement in offline Effector Recognition

Katherine R. Naish<sup>1</sup>, Sukhvinder S. Obhi<sup>1</sup>

<sup>1</sup>McMaster University

*Abstract:*

Observing an action performed by another person modulates activity in the observer's motor system. Most research to date has focused on how this modulation contributes to action perception in real time, and there has been little work on what happens *after* an action is observed. In previous work, we showed that interfering with motor activity during action observation impairs recognition of the *objects* involved in the action. In the current study, we examined whether motor interference impairs *effector* recognition in a similar way. In two experiments, single-pulse transcranial magnetic stimulation (TMS) was delivered over the primary motor cortex (M1) to briefly disrupt motor activity as participants watched an on-screen hand action. After a visual mask, a second video clip or a still image of a hand was presented, and participants judged whether the hand was the same or different to that viewed previously. Our results showed an impairment of effector recognition on trials where TMS had been delivered over M1 during action observation, compared to trials on which TMS was not applied or was delivered over the vertex. Importantly, stimulation over M1 did *not* influence recognition of hands that were presented as static images, or recognition of dot configurations or a moving shape. This work suggests a role for motor cortex in offline recognition of elements of action, with the motor system retaining a representation of the acting effector beyond the action observation period. Such lasting representations could play a role in observational learning and delayed action imitation.

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P156 - Motor Modulation during Action Observation: What Is It For, and Can We Control It?

Katherine R. Naish<sup>1</sup>, Sukhvinder S. Obhi<sup>1</sup>

<sup>1</sup>Social Brain, Body and Action Lab, McMaster University

*Abstract:*

Observing the movements of another agent modulates the observer's motor system. Two important questions stemming from this finding are: (1) What function(s) does this modulation serve, and (2) What factors influence the modulation itself? Addressing Q1, work from our lab has explored the potential role of this motor modulation during action observation (MMAO) in the off-line recognition of action. Single-pulse transcranial magnetic stimulation (spTMS) was delivered over M1 to briefly disrupt motor activity during observation of a hand action. Participants subsequently viewed a video or static image of the same action, and were asked to judge whether the hand was the same or different to that viewed previously. We found that TMS over M1 impaired hand recognition, compared to when TMS was not applied or was delivered over the vertex. This finding, together with our previous finding that M1 interference impairs object recognition, suggests an involvement of the motor system in off-line recognition of action components. For addressing Q2, we explored the effect of observer intention on MMAO. Participants viewed video-clips of a hand action, and the degree of MMAO was indicated by the size of motor-evoked potentials (MEPs) elicited using spTMS. In separate blocks, participants were instructed to either increase or decrease MMAO, after the concept of MMAO had been explained to them. Our data showed no difference in the size of MEPs elicited in each block, indicating that participants were not able to exert control of motor activation, at least in the absence of feedback or instructed strategies.

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P157 - Movies as Naturalistic Stimuli in fMRI Study Focused on Temperamental Differences

Maria Bierzynska<sup>1,2</sup>, Anna Kozak<sup>2</sup>, Pamela Sobczak<sup>2</sup>, Maksymilian Bielecki<sup>2</sup>, Keerthana Karunakaran<sup>3</sup>, Bharat Biswal<sup>3</sup>, Jan Strelau<sup>2</sup>, Malgorzata Kossut<sup>1,2</sup>

<sup>1</sup>Laboratory of Neuroplasticity, Department of Molecular and Cellular Neurobiology, Nencki Institute of Experimental Biology, Warsaw, Poland

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**Abstract:**

There is an increasing interest in the usage of movies as emotions eliciting stimuli in neuroimaging studies. Dynamic nature of films enables to expose participants to potential real-life scenarios in fMRI environment and study their emotional reactivity as well as emotional regulation (Saarimaki, 2015), which are the main aspects of temperament. In current study we adopted the procedure developed by Eryilmaz et al. (2011) in order to study differences in emotional processes (reactivity and regulation) in participants (n=62, females) with different scores in Emotional Reactivity scale of The Formal Characteristics of Behavior-Temperament Inventory. Instead of joyful and fearful movies used by Eryilmaz, films used in our study showed sports. Stimuli were chosen with respect to the level of arousal. Depending on the temperamental traits high arousing sports could be either appetitive or aversive stimuli. We compared the differential effects of movie content. We succeeded to evoke emotional response using movies showing sports. Both high arousing and low arousing sports evoked widespread activations in sensory and limbic brain regions, including amygdala, basal ganglia, fusiform gyrus and frontal regions clearly showing that movies engaged attention and produced emotional responses as expected. Preliminary analysis concerning group differences showed increased activation in inferior frontal gyrus (high arousing vs low arousing sports) in high emotionally reactive group. Further analysis will seek individual differences using ROI analysis and differences in emotional regulation during rest.

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P158 - Mu Rhythm Modulation as a Neuromarker for Socio-Emotional Interaction – An MEG Study

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<sup>1</sup>NatMEG - Karolinska Institut Department of Clinical Neuroscience

**Abstract:**

**Background.** Humans have evolved in a social environment where interactions with conspecifics constitute an important aspect of daily life. Such interaction is a keystone for successful social bonds and in forming collaborations. An important research question today in the field of social affective neuroscience is whether there is a distinct neuromarker for socio-emotional interaction. In a recent MEG experiment, we demonstrated that this seems to be the case.

**Methods.** In an MEG experiment, the brain activity of 24 healthy adults was recorded by means of MEG across different conditions of social and emotional interaction. During "social conditions" the subject was either instructed to produce the same emotion as the one depicted by the displayed face ("social emotional condition"), or to produce the same letter as the one depicted by the face ("social non-emotional condition"). During "non-social conditions", the subject responded to a letter presented on a screen, either associated with an emotion ("G" for happy or "A" for angry) and the subject had to produce the emotion ("non-social emotional condition"), or the letter was not associated with an emotion and the subject had to produce the letter ("non-social non-emotional condition").

**Results.** The results show that the Mu rhythm is uniquely modulated by the type of interaction, such that there is a suppression of Mu for *social* compared to *non-social* interactions. This suppression was furthermore stronger for *emotional* compared to *non-emotional* conditions. **Conclusions.** The results demonstrate that the Mu rhythm is a neuromarker candidate for social and emotional interaction.

## P160 - Need for Cognitive Closure and Processing of Emotionally Ambiguous Interpersonal Stimuli: An fMRI Pilot Study

Petra Zemánková<sup>1</sup>, Martin Gajdoš<sup>1</sup>, Jan Širůček<sup>1</sup>, Tomáš Kašpárek<sup>1</sup>, Martin Bareš<sup>1</sup>

<sup>1</sup>Massaryk University

### *Abstract:*

The ability to accurately decode, interpret, and respond to emotional facial expressions has been considered essential for effective social functioning. Abnormalities of affect recognition are a common feature in mental disorders, however in the present pilot study we investigated whether there are deviations in processing of emotionally charged interpersonal stimuli within healthy population, depending on a particular personality feature. Since most social stimuli are inherently ambiguous, we developed a novel paradigm using ambiguous pictures from the widely used projective method Thematic Apperception Test. Based on the scores in the Need for Cognitive Closure Scale (NFCC) participants were divided into two groups: ambiguity tolerant (low NFCC score; N=5), and ambiguity intolerant (high NFCC score; N=5). All participants underwent fMRI scanning while performing a modified Thematic Apperception Test, which requires inferring mental states of figures with ambiguous facial expressions and postures. The task activated superior temporal sulcus bilaterally, left temporo-parietal junction, and medial prefrontal cortex. These regions have been consistently identified in literature to be active in mentalizing about other people. Interestingly, group differences analysis revealed that ambiguity intolerant group, compared to the tolerant group, showed stronger activation in striatum, insula and inferior frontal gyrus. These regions correspond to brain structures associated with interpersonal emotion regulation processes and emotion reappraisal. We hypothesize that stronger involvement of such network in this group may reflect an experiencing of more negative emotions in an ambiguous context, in comparison to the group with lower scores in need for cognitive closure. Thus, the ability to regulate emotions may affect perception of others and the way of responding to others in ambiguous situation.

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## P161 - Neural and Behavioral Evaluation of a New Emotional and Non-Emotional Video Stimuli Database

Emily Kilroy<sup>1</sup>, Laura Harrison<sup>2</sup>, Sarah Gimbel<sup>2</sup>, Sharon Cermak<sup>1</sup>, Lisa Aziz-Zadeh<sup>1</sup>

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### *Abstract:*

To date, social and affective neuroscientific research largely relies on static images, yet people are rarely perceived in a static-state. A database that provides a spectrum of emotional and non-emotional videos is ideal for conducting a wide range of neuroscientific studies that control for processing of facial and non-facial movement. Here we present such a database: EmStim. EmStim consists of three distinct sets of video stimuli: emotional expressions (i.e., happy), non-emotional expressions (i.e., puffed-cheeks) and hand actions (i.e., cutting paper). Seven Caucasian actors (4 female; 29-39 years) were recorded making thirty-five expressions against a black background. The hands of one male and female actor were also recorded interacting with 100 everyday objects. To enable fMRI research, all videos were edited to 3.75 seconds and controlled for low-level visual properties. Psychometric evaluations of emotional face stimuli were collected. Additionally, functional Magnetic Resonance Imaging (fMRI) study was conducted to investigate neural differences in processing the three stimulus sets during three tasks. The three stimulus sets were displayed in a pseudo-random block design consisting of 15 (5 of each type) 15-second video blocks

(3 videos/block), with each block followed by 15-seconds of rest. Participants included neurotypical adults and children. They observed, imitated, and mentalized to each set of videos in separate fMRI scans. Standard preprocessing and whole-brain BOLD analyses were performed. Preliminary analyses indicate that the three tasks produced significant ( $p < .05$ ) overlapping and non-overlapping activation in the Action Observation Network (i.e., pars opercularis). Taken together, our results suggest that EmStim is a flexible and valuable resource for social, cognitive, and affective research. Ongoing work will continue to quantify relationships among individual differences in social and motor functioning and measurements of brain function associated with the three classes of EmStim stimuli.

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#### P162 - Neural Correlates of Reactive Aggression in Healthy Women and Female BPD Patients

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##### *Abstract:*

Aggression is a common social behavior. Although aggression may serve adaptive functions, increased anger and aggression as found in patients suffering from borderline personality disorder may cause severe personal and social costs. Neuroscientific studies have identified the amygdala and prefrontal regions, particularly the orbitofrontal cortex, as highly relevant for the generation and regulation of anger and aggressive impulses. However, only a few studies have investigated the neural correlates of affective aggression in women with and without high trait levels of aggression. In this talk, we will present the results of two studies using a modified Taylor Aggression Paradigm which mimics real-life social interactions to provoke and assess reactive aggression (1) in healthy women and (2) female patients with borderline personality disorder. In the first study, amygdala reactivity to threat was associated with aggressive behavior. Moreover, neural correlates of threat reactivity were modulated by trait testosterone and cortisol levels. We will also present first findings of an ongoing study with female borderline patients and matched healthy women. Based on the results of a pilot study, we expect increased activations in the amygdala, insula and medial orbitofrontal cortex as neural correlates of increased reactive aggression in patients compared to healthy women.

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#### P163 - Neural Indicators of Interpersonal Anger as Cause and Consequence of Combat-Training Stress Symptoms

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<sup>1</sup>Tel Aviv Center for Brain Function, Wohl Institute for Advanced Imaging, Tel Aviv Sourasky Medical Center School of Psychological Sciences, Tel-Aviv University

##### *Abstract:*

Patients with *Post-Traumatic Stress Disorder* (PTSD) exhibit maladaptive regulation of anger supposedly leading to their outbursts of aggression towards other people. Findings regarding interpersonal anger linked ventro-medial prefrontal cortex (vmPFC) to anger regulation and Locus Coeruleus (LC) to aggression. Both regions were previously associated with *Post-Traumatic Stress Symptoms* (PTSS), yet it is unclear if their functionality represents a consequence of, or possibly also a cause for PTSS. The current study investigated the relationship between the neural trajectory of these indicators of interpersonal anger and the development and manifestation of PTSS. Forty-six males (29 soldiers, 17 civilians) participated in a prospective fMRI experiment in which they played a modified anger-provoking Ultimatum Game (UG) at two-points. Soldiers were sampled at the beginning and end of combat-training, while civilians at the beginning and end of civil-service. We assumed combat-training would induce chronic-stress related PTSS. Soldiers showed an increase in

PTSS levels following combat-training while civilians showed no such change following civil-service. All participants were angered by the modified UG irrespective of time-point. Soldiers with high post combat-training PTSS levels had lower pre combat-training vmPFC activity and a higher increase in activity in the LC between pre and post combat-training. Results suggest that during anger-provoking social interactions, flawed vmPFC functionality may serve as a causal risk-factor for the development of PTSS, and heightened reactivity of the LC possibly reflects a consequence of combat-training PTSS. These findings provide neural targets for therapeutic intervention and inoculation for psychopathological manifestations of anger.

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P164 - Neural Mechanisms of Controlling Emotions: A Meta-Analysis of fMRI Studies on Emotion Regulation in Humans

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<sup>1</sup>Freie Universität Berlin

<sup>2</sup>The University of Melbourne

*Abstract:*

The ability to regulate our emotions is of high adaptive value in social situations, but also essential for our mental and physical health. Current studies in humans described a neural network implicated in emotion regulation (ER). Several important questions still remain unresolved: Are different ER strategies based on different neural networks? Which brain regions are involved in the up-regulation and in the down-regulation of emotions? Is ER implemented differently depending on the emotional stimulus material? In the most extensive meta-analysis on ER to date, we sought to quantitatively summarize the existing neuroimaging literature to answer these questions. We included 96 studies from peer-reviewed journals, reporting 170 experiments with a total of 4595 subjects and 1606 foci. The meta-analysis was conducted using the revised version of the activation likelihood estimation algorithm. We performed contrast and conjunction analyses: 1) Strategy-specific effects by contrasting the reappraisal strategy with other strategies (e.g., suppression); 2) goal-specific effects by contrasting up- versus down-regulation of emotion; and 3) stimulus-specific effects by contrasting pictures with other stimulus material (e.g. film clips). We show that reappraisal was associated with less activity in the left inferior frontal gyrus (IFG) compared to other strategies. Increasing emotional responses was associated with enhanced striatal activity, while decreasing emotional responses was linked to right prefrontal cortex activity. The right dorsolateral prefrontal cortex (DLPFC) that was more activated when pictures were presented compared to other stimuli. In summary, our results reveal specific roles within the ER network for IFG, DLPFC, and striatum.

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P165 - Neural Mechanisms of Emotional Conflict Processing during Cooperative Decisions

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*Abstract:*

Social interactions are highly complex phenomena, which can be studied at several levels of analysis and from multiple perspectives. When we make decisions that involve others, we take into account information coming from several sources, often including people's identity and their facial emotional expressions. When these lead to opposite predictions, conflict arises. Across several experiments, we have explored the neural mechanisms underlying the use of either of these two clues as relevant sources to guide cooperative decision-making. In these, participants played a modified Trust Game with cooperative and non-cooperative alleged partners, who displayed facial expressions of happiness or anger, and/or had different cooperative tendencies depending on their identity. Behavioral data showed that

even when emotions had no predictive power and were to be ignored, they influenced the speed of participant's decisions in a cooperative-dependent manner. fMRI data showed that congruent situations increased activation in the right the fusiform gyrus while incongruent interactions engaged the anterior cingulate and medial portions of the superior frontal gyrus, indicating an unavoidable influence of emotional information on identity-guided decision-making. EEG data, on the other hand, shows that emotional conflict influences face perception (as indexed on the N170 potential) and also later markers related to decision-making (P3b). Overall, these results advance our understanding of how emotional expressions that are ignored affect decisions and the neural mechanisms involved in processing conflictive social information.

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#### P167 - Neural Responses to Long-Lasting Slow Touch

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#### *Abstract:*

**Introduction.** Touch is important for individuals' subjective well-being and it is experienced as pleasant for a rather long time. The aim of this study was to investigate areas that code for the hedonic experience during long-lasting slow stroking touch.

**Methods.** 25 subjects were stroked for 40 minutes with a soft brush while they were scanned with functional Magnetic Resonance Imaging, and rated the perceived pleasantness of the stroking. Two resting baselines were included. Whole brain-based analyses investigated neural response to long-term stroking.

**Results.** Stroking was perceived as pleasant throughout the scanning. Activation in primary somatosensory cortex (S1) and S2, subdivision OP1, decreased over time, whereas activation in orbito-frontal gyrus (OFC) and putamen strongly increased until reaching a plateau after approximately 20 minutes. This was paralleled by increased functional connectivity of posterior insula with middle cingulate and striatal regions.

**Discussion.** The decreased activation in somatosensory cortices may represent stimulus habituation whereas the increased activation in OFC and putamen as well as the increased functional connectivity of posterior insula with middle cingulate and striatal regions may be related to continuous updating of reward values. The increased processing in reward related brain areas may reflect a mechanism for maintaining social touch interactions.

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#### P168 - Neurobiological Basis of Emotional Memory Retrieval in Violent Game Addiction

Can Soylu<sup>1</sup>, Dicle Capan<sup>1</sup>, Metehan Irak<sup>1</sup>

<sup>1</sup>Bahcesesehir University Brain and Cognition Research Lab

#### *Abstract:*

The goal of the study was to investigate the effects of violent game addiction on emotional memory retrieval using event-related brain potentials (ERPs). Forty-four participants (24 female, 20 male; 18 to 31 years) were separated into two groups, namely addicted (N= 23) and non-players (N = 21) based on the time they spend for violent game playing (per week), DSM based pathological game addiction symptoms, and their scores on the Game Addiction Scale. All the participants were right-handed, had a normal or corrected-to-normal vision, and had no history of neurological, psychological or memory diseases. A word list (consisted of violent and non violent adjectives) was used. In the encoding phase, all words were shown and the participants were asked to learn the



presented words, which they will be asked to retrieve later. In the retrieval phase, a stem completion test was used, and the participants were asked to complete the presented word. Stimulus presentation, recording, storage, and analysis were carried out using a 32 channel EEG/EP NeuroScan system. EEG activity was recorded with 30 electrodes placed according to the international 10-20 system. During correct and incorrect retrieval, P1, N1, P2, and P3 peaks were observed at the fronto-central regions and amplitudes of the peaks for correct retrieval were higher than for incorrect retrieval. On the other hand, amplitude and latency of the peaks of addicted and non-players were not different. Results indicated that game addiction may have no effect on these brain potentials obtained during emotional memory retrieval.

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P170 - Nonconscious Emotion Influences on Decision Making: Disentangling the Effects of Arousal and Valence

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<sup>1</sup>Faculty of Psychology, University of Lisbon

*Abstract:*

The results reported examine the non-conscious influence of emotional qualities (valence and arousal) on decision making in a choice preference for a neutral mask stimuli associated. It was supposed a bivariate definition of preferences responses registering the liking and the rejection subjective evaluations, respectively, for each mask presented in a subliminal masked priming paradigm (backward and forward masking). EEG –ERPs were recorded for each stimuli category. Selected pictures from IAPS were used as primes, presented during 17 ms, preceded and followed by neutral mask stimuli (167 ms). The masks consisted in four neutral abstract pictures. Each mask was specifically associated with a subliminal emotion category. First, valence effects were examined using four categories of subliminal stimuli: positive, negative, neutral and faint (a grey slide was subliminally presented). In a second experiment the effects of arousal were tested using two valences (positive and negative) with two arousal levels (high and low). In the first experiment preferences ratings were for positive and faint conditions. Rejection (or disliking) ratings were heist for negative and also for faint conditions. These results suggested an effect of valence. Faint ratings were interpreted as an arousal experimental effect due to rarity/low frequency. In the second experiment preferences ratings were higher for positive low arousal and rejection rates were more frequent for positive high arousal. Concerning electrophysiological signals, ERPs late positive potentials amplitude was higher for liked stimuli category in Fz EEG channel (IS 10/20; Averaging and regression to the 200 ms baseline separately for each subliminal category).

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P171 - On the Temporal Characteristics of Retro-Cue Induced Visuo-Spatial Working Memory Updating: Evidence by Event-Related Parameters of the EEG

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<sup>1</sup>Leibniz Research Centre for Working Environment and Human Factors

*Abstract:*

Working memory updating is required to adapt cognitive resources to changing environmental conditions and can be studied by means of retroactive cuing (retro-cuing) paradigms. We investigated the time course of this mechanism by focusing on the influence of non-cued working memory representations on further information processing. A retro-cue indicated if items on the left or right side of a previous memory array remained relevant. Subsequently, a central probe item was presented with a varying stimulus onset asynchrony (SOA: 300, 400, 600, 1000, 1800 ms). Participants had to state whether this stimulus was shown on the cued side of the memory array. The probe was either a cued, non-cued or new item.

Non-cued probes were associated with delayed response times and an increased frontal negativity from 400 to 600 ms indicating a higher processing conflict compared to new probes. These effects were strongest for the 300 and 400 ms SOAs and decreased in longer SOA conditions, pointing toward a benefit when there was sufficient time for working memory updating. Furthermore, contralateral negativities at posterior (PCN) and anterior sites (ADAN) reflected the attentional orienting toward cued information while selective retention was associated with a sustained suppression of posterior induced alpha power contralateral to retro-cue direction. Results suggest that retro-cue induced updating of visuo-spatial working memory requires about 500 ms. Afterwards, the non-cued contents remain in a more passive and fragile short-term memory state with less impact on ongoing information processing.

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P172 - Orienting Toward Fearful Eyes Involves the Fronto-Parietal Network of Attention

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<sup>2</sup>Université de Genève, Faculté de Psychologie et Sciences de l'Education, Genève, Suisse

*Abstract :*

Faces are key stimuli in social perception. Humans may be born with innate attention bias for faces, which could be pivotal in social motivation. Within faces, the eyes are looked at preferentially, particularly when the face displays an emotion such as fear. The neural underpinnings of orienting toward relevant face features such as fearful eyes are unknown. Amygdala may be involved, but its role is highly debated. Another hypothesis is that orienting toward fearful eyes involves the fronto-parietal network of attention orienting. Here, we used magnetoencephalography combined with eye tracking to disentangle these hypotheses. Nineteen subjects saw fearful, happy, and neutral faces presented for 150 ms with either the eyes or the mouth falling at fixation level, hence bringing about saccades toward the mouth or the eyes, respectively. They performed emotion categorization and intensity judgment. Emotion intensity ratings were higher for fearful and happy faces fixated at eye rather than at mouth level. Moreover, there were more 'rapid saccades' from mouth toward the eyes for fearful than happy faces. Event-related magnetic fields revealed an early (~100-130 ms) differentiated response to fearful versus happy faces seen at mouth level. This response preceded the saccades and involved superior frontal and inferior parietal cortical regions of the attention orienting network. In contrast, amygdala was only sensitive to fixation level, with greater responses to faces fixated at eye level around 165 ms. These findings demonstrate the involvement of the fronto-parietal cortical network of attention in rapid orienting toward relevant face features.

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P173 - Parents' Influence on the Sexual Processing

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<sup>1</sup>Universidade Católica Portuguesa

*Abstract:*

A common finding in psychophysiological sex research is that there are many factors influencing the sexual response. This has led researchers to speculate about the parents' role in the sexual processing. There is evidence that the presence of the parents have an inhibitory effect on the sexual processing based on automatic mechanisms. In this experimental study, we investigated whether being primed with parents' faces versus non-parents' faces influences the pattern of peripheral neurophysiological response, as measured by the continuous recording of the skin conductance. Participants (N=48)

performed a computerized priming task, which is well known as occurring despite conscious intentions. Additionally, we also tested if there was difference between mother's face versus father's faces. Finally, we investigated if priming with smiley mother's/father's faces would have a different effect in the skin conductance when compared with serious mother's/father's faces. Participants received instructions to observe pairs of pictures flashing briefly on the monitor, and to respond to the second picture if it was a sexual or a non-sexual context. This communication will underline the new ideas arising from the results, and future research directions in this area.

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P174 - Passionate Love and Differences in OXTR Polymorphism Influence the Ability to Discriminate between Self- and Other-Referenced Emotions

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*Abstract:*

There is evidence for substantial shifts in emotional and attentional processing when a person is in love and/or entering a romantic relationship. The present study compared people living in a relationship and singles in their judgment of emotional words concerning the self or another person to investigate how specifically complex social emotions (e.g. love) influence our ability to discriminate between own emotions and emotions unrelated to the self. Furthermore, oxytocin receptor polymorphisms (rs2268498, rs53576), considered to be highly relevant for the processing of self-related social information and coupling/bonding processes, were assessed. Relationship status and the intensity of love were assessed via questionnaire in combination with additional measures of empathy, depression, anxiety and facets of the self-concept. Self-related positive words (e.g., my happiness) were judged and responded to the quickest and the most accurate supporting previous findings of a self-positivity bias in the processing of self-related emotional stimuli in healthy subjects. Moreover, subjects in a relationship displayed the same enhanced reaction time advantage to other-related positive words. Moreover there were effects of gender and oxytocin expression, influencing reaction times (rs2268498) and accuracy measures (rs53576). Effects were not modulated by empathy. Our results are the first to show that being in a relationship and/or being in love extend the usually found self-positivity bias to the emotional other suggesting reduced self-other boundaries with regard to positive emotions. Gender and genetic status (oxytocin receptor polymorphisms) are important mediators supporting the idea of a genetic determination of processes involved in emotional self-processing.

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P175 - Patterns of Brain and Cardiac Activity during Solving Rule Discovery and Rule Application Tasks

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*Abstract:*

Our previous research revealed that mental tasks involving rule application (RA), e.g. performing arithmetic operations, cause greater tonic increase in cardiovascular activity than tasks requiring rule discovery (RD), e.g. logical completion of a series of digits. However, it was not well known what brain mechanism was responsible for this difference. The aim of the present study was to compare patterns of brain and cardiac activity while solving both kinds of tasks. Eighteen males, students of medical university, completed a series

of numeral RD and RA tasks, which did not differ in objective and subjective difficulty. Like in previous studies, tonic increase in heart rate was larger during the RA than the RD tasks. However, analysis of the fMRI data revealed larger brain activation during solving the RD than the RA tasks. Especially, the RD tasks caused larger increase in activity of superior, middle, inferior and medial frontal gyrus, middle temporal gyrus and cingulate cortex. Besides, performance of the RD tasks was positively correlated with the activation of middle and inferior frontal gyrus. These findings correspond with the brain activation pattern evoked by other RD tasks, like The Tower of London or Brixton Test. Furthermore, the RD tasks activated some areas specific for the numeral tasks solving, i.e. precuneus, supramarginal gyrus and angular gyrus. Our results indicate, that lower increase in cardiac activity during solving RD tasks as compared to RA tasks, is accompanied with higher increase in brain activity, especially – activity of prefrontal cortex.

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P176 - Perceived Quality of Life Is Modulated by Negative Affect, Depression and Anxiety, in Patients with a Diagnosis of Drug-Resistant Epilepsy

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<sup>1</sup>University of Valencia

<sup>2</sup>La Fe University Hospital

*Abstract:*

Background: Epilepsy is a prevalent condition which affects approximately 1% of the general population. This disease is related to affective deficits such as depression and anxiety which could have implications on the cognitive performance and the quality of life of these patients. The aim of this study is to know the relationship among these variables.

Methods: The sample is composed of 22 patients with drug-resistant epilepsy (mean age: 36.00, SEM= 2.59). By means of a cluster analyses and considering their scores in anxiety-trait and depression, participants were distributed in two groups: higher negative affect (n=7) and lower negative affect (n=15). There were no differences between groups in sex or epilepsy duration. Participants completed a neuropsychological battery, and questionnaires of psychological trait and quality of life.

Results: Participants with lower negative affect had better performance in immediate verbal memory, short-term verbal memory, long-term verbal memory, long-term verbal recognition, and verbal retention. There were no differences between groups in attentional processes. In addition, the group with lower negative affect had better perceived quality of life (lower seizure worry, better overall quality of life, higher emotional well-being, higher energy, and better perceived cognitive performance). The pattern of relationships among these variables will be discussed.

Conclusion: These preliminary results suggest that negative affect could have important implications on cognitive performance and perceived quality of life in patients with drug-resistant epilepsy. These findings could be useful in the clinical evaluation and therapeutic approaches of these patients.

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P178 - Person Memory Codes in Ventral MPFC: Knowledge Representations?

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<sup>1</sup>Vrije Universiteit Brussel

*Abstract:*

Neuroimaging studies on trait inference demonstrated that the ventral medial prefrontal cortex (mPFC) houses neural representations or codes for traits and persons that possess these traits (Heleven and Van Overwalle, 2015). An adequate method to localize these codes, is fMRI repetition suppression, a rapid suppression of fMRI responses upon repeated presentation of the same stimulus. Prior work showed repetition suppression in the mPFC

when traits or persons were repeated. This finding led us to conclude that there were trait and person codes in the mPFC. An alternative explanation however, is that repetition does not reflect the person itself but rather some degree of knowledge about the person. In the current study we try to explore this alternative hypothesis by manipulating the repetition not only of persons, but also of the knowledge about persons. We hypothesize that high levels of knowledge are part of a person code in mPFC. Consequently, repetition suppression in this area will be largest given repetition of high levels of knowledge compared to conditions with lower levels or no repetition at all. Crucially, a specific person code predicts an effect of high knowledge only for the same (repeated) person, whereas a general knowledge code predicts an effect of high knowledge irrespective of whether it involves the same person. In addition, it is possible that persons of whom we have a lower degree of knowledge are represented elsewhere in the brain and suppression effects for low levels of knowledge are thus found in other regions. The results will be presented at the conference.

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P179 - Personal and Irresistible: Preliminary Data on the Peripheral Physiological Correlates of Preferred Food Cues Processing in Healthy Women

Rafael Delgado<sup>1</sup>, Laura Miccoli<sup>1</sup>, Carmen Gervilla<sup>1</sup>, María Lozano<sup>1</sup>, Sandra Herrera<sup>1</sup>, Pedro Guerra<sup>1</sup>, Francesco Versace<sup>2</sup>, Vera Ferrari<sup>3</sup>, Laura Krutman<sup>4</sup>, Sonia Rodríguez-Ruiz<sup>1</sup>, Jaime Vila<sup>1</sup>, M.Carmen Fernández-Santaella<sup>1</sup>

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<sup>2</sup>University of Oklahoma Stephenson Cancer Center, OK

<sup>3</sup>University of Parma, Italy

<sup>4</sup>Universidade Federal Fluminense, Brasil

*Abstract:*

In the absence of food deprivation the motivational relevance of food is only moderate. Accordingly, peripheral physiological correlates of food cue processing are typically limited, at times non-different from those to neutral contents. In the present work, to develop a paradigm capable of increasing the motivational relevance of food cues, we presented healthy women with images displaying some of their own personal, irresistible, preferred foods. To include appropriate control stimuli, emotional stimuli that were motivationally pleasant (erotica) and unpleasant (human attacks) or neutral (objects) were similarly personally selected and presented to each participant. Personal stimuli, both food-related and affective, were displayed repeatedly within a pseudo-randomized passive picture-viewing paradigm while central and peripheral physiological measures were recorded. Here, we report data on the startle blink reflex and the facial EMG (corrugator and zygomatic muscles). In general, reactions to emotional control stimuli were in line with those observed when healthy women view images of erotica, neutrals, and attacks. In line with our hypotheses, the presentation of personally irresistible food cues prompted a cascade of reactions in the peripheral physiology consistent with the processing of highly appetitive stimuli: inhibition of the defensive startle reflex similar to erotic images and, for facial EMG, more activation of the zygomatic and more inhibition of the corrugator muscles compared to pleasant pictures. Therefore, in healthy controls, viewing preferred foods increases the motivational relevance of food cues and might prove especially informative when obese and eating-disordered women will look at images of the food they like/fear the most.

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P180 - Personal Relevance Increases Pupillary Responses and Emotion Effects in Event-Related Potentials

Mareike Bayer<sup>1</sup>, Katja Ruthmann<sup>1</sup>, Annkathrin Schacht<sup>1</sup>

<sup>1</sup>University of Göttingen, Germany

*Abstract:*

Emotional stimuli attract attention, leading to an increased activity in the visual cortex. Little

is known, however, about how the cortical processing of emotional input is influenced by the personal relevance of a given context. The present study investigated this question by presenting sentences containing positive, neutral or negative critical words that were presented in two different contexts, referring to a personally relevant or to an unknown agent. We recorded ERPs and pupil responses from 20 participants, and collected valence and arousal ratings from an independent sample of 120 participants.

In ERPs, high personal relevance increased cortical activity in response to critical words within 100ms after stimulus onset, indicating rapid processing of the context manipulation. Main effects of emotional content of the critical word were visible from 200ms as an increased posterior negativity for negative compared to neutral words. This ERP effect was modulated by personal relevance: Emotion effects were increased in amplitude and duration when presented in a relevant context. Pupil size was increased for critical words presented in relevant context irrespective of their emotional valence, suggesting a general increase in arousal for personally relevant information. In line with this finding, arousal ratings were higher for critical words in relevant contexts, while ratings of stimulus valence were not affected by modulations of personal relevance.

Taken together, our results suggest that personal relevance increases visual cortex activity and interacts with emotional content at the stage of perceptual processing, suggesting a common detection mechanism for stimulus relevance at this stage.

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#### P181 - Personality Determinants of Social Cognition: Introducing a Person-Centred Approach to Social Neuroscience Research

Kristína Czekóová<sup>1</sup>, Daniel J. Shaw<sup>2</sup>, Beáta Špiláková<sup>3</sup>

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#### *Abstract:*

*Introduction:* Despite researchers acknowledging the considerable variability in behavioural and neurophysiological measures of socio-cognitive processes, our current understanding of the influence of individual differences in this domain remains limited. This is true especially in terms of personality determinants related to components of social cognition, such as cognitive/affective empathy and emotion regulation. Since common analytical approaches tend to focus on differences between individuals, overlooking dynamic configurations of variables within individuals (a traditional variable-centred approach), we decided to employ an alternative person-centred approach that has the potential to identify important sources of individual differences related to social cognition.

*Methods:* We tested 221 healthy individuals on explicit (self-report) and implicit (performance-based) measures of personality, cognitive and affective empathy, and self-other distinction. Personality measures born out of Personality System Interaction theory (PSI) were used to focus on functional relationships between cognitive and affective systems within an individual. Three-step latent profile analysis was performed on these data to explore discrete personality profiles and their relationship with distal outcomes.

*Results:* We observed Intuitive, Analytical, and Unstable profiles that differentiate on measures of social cognition; for example, on implicit and explicit measures of cognitive and affective empathy.

*Conclusion:* Our results demonstrate the usefulness of a person-centred approach as an additional source of information regarding personality determinants of various aspects of social cognition. Future research will likely benefit from thorough investigations of social cognition within personality profiles emerging from our investigation.

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#### P182 - Physiological Synchrony in Electrodermal Activity during a Couple's Interaction Task

Joana Coutinho<sup>1</sup>, Patrícia Oliveira-Silva<sup>2</sup>, Diogo Correia<sup>1</sup>, Wolfgang Tschacher<sup>3</sup>

<sup>1</sup>Neuropsychophysiology Lab, CIPsi, School of Psychology, University of Minho, Braga, (Portugal)  
<sup>2</sup>Human Neurobehavioral Laboratory, [Faculty](#) of Education and Psychology, Universidade Católica do Porto, Porto (Portugal)  
<sup>3</sup>Wolfgang Tschacher, University Hospital of Psychiatry and Psychotherapy, University of Bern, Bern, Switzerland

*Abstract:*

Classical psychophysiological studies on the neural correlates of empathy and interactional processes, have shown that more than the level of autonomic arousal *per se*, the physiological linkage or synchrony between the empathizer and the target may be more indicative of higher empathy (e.g. Levenson & Gottman, 1983; DiMascio, Boyd & Greenblatt, 1957). Synchrony can be seen as a coordinated oscillation of the physiological responses between partners (e.g Butler & Randall, 2013). Romantic relationships become a relevant context to study physiological linkage because they are the central relationship for most adults (Robles & Kiecolt-Glaser, 2003), they constitutes a rich source of emotional interchange and empathic processes (Gottman & Levenson, 1988), depending on feelings of compassion, support and validation (Péloquin & Lafontaine, 2010). In this study we measured the electrodermal activity of both spouses during a dyadic couple's interaction task. Thirty couples ( $N=64$ ) in a committed monogamous relationship with a minimum duration of one year participated in this study. The interaction task consisted of a structured conversation in the laboratory about positive and negative aspects of their relationship, designed to mimic the couples' daily experiences. Electrodermal activity was recorded simultaneously using the Biopac MP-150 (Santa Barbara, USA) acquisition system. Using hierarchical linear modeling we found clear indications for EDA synchrony in our couples: the mean effect size for synchrony was 0.40 (with segment size=30s) and 1.54 (with segment size=60s). Our results extend previous report on marital linkage and have important clinical and conceptual implications which will be discussed in this presentation.

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P183 - Placebo Empathy Analgesia: An Indirect Effect of Trial Design?

Jessie Adriaense<sup>1</sup>

<sup>1</sup>University of Vienna

*Abstract:*

Empathy research often focusses on the shared representations mechanism. This mechanism postulates that processes underlying self-related experiences are used as proxy to understand the emotions of others. Several studies support this mechanism, including a recent placebo analgesia study, which indicates an association between reduced self-related pain and reduced empathy for pain, referred to as placebo empathy analgesia (Rütgen et al. 2015). However, the question arose whether placebo empathy analgesia is just due to placebo analgesia, or whether it might also be due to an indirect effect of the used mixed trial design. Such a design has a continuous alteration of self- and other-related pain trials, and therefore participants also continuously switch between judging these events. Consequently, judging other's pain may be anchored in the preceding self-related pain responses and thus could lead to a potential judgment bias. As an attempt to answer this anchoring question, the placebo empathy analgesia study is replicated including an empathy for pain paradigm and subjective and neural measures of pain and empathy for pain (i.e. self-report and EEG). However, to exclude a possible anchoring effect, a blocked trial design is introduced with each block either presenting other- or self-related pain trials. The hypothesis of this study is that trial design has no effect on empathy ratings, which would be confirmed if reductions in empathy between distinct other-related pain blocks are (statistically) indifferent from each other. Data acquisition is still ongoing at the moment of abstract submission, however data presentation will be included in a poster session.

P184 - Playing Violent Video Games and Its Relation with Working Memory: An Event-Related Brain Potential Study

Metehan Irak<sup>1</sup>, Can Soylu<sup>1</sup>, Dicle Capan<sup>1</sup>

<sup>1</sup>Bahcesehir University Brain and Cognition Research Lab

*Abstract:*

The amplitude of P300 component is often associated with working memory updating. Also it has been shown that P300 reflects the extent of evaluative categorization during processing of emotionally relevant stimuli. The goal of this study was to investigate the effects of violent game addiction on working memory (WM) performance using the event-related brain potentials (ERPs). Forty-four participants (24 female, 20 male; 18 to 31 years old) were separated into two groups, namely addicted (N= 23) and non-players (N = 21) based on the time they spend for playing violent video games (per week), DSM based pathological game addiction symptoms, and their scores on the Game Addiction Scale. All the participants were right-handed, had a normal or corrected-to-normal vision, and had no history of neurological, psychological or memory diseases. A delayed-matched-to-sample working memory task, which consisted of resolvable and misleading trials, was employed to measure WM performance. Stimulus presentation, recording, storage, and analysis were carried out using a 32 channel EEG/EP NeuroScan system. EEG activity was recorded with 30 electrodes placed according to the international 10-20 system. Results indicated that P2 and P3 peaks during resolvable trials produced higher amplitude than misleading trials at frontal regions. In addition, P2 and P3 amplitudes of the addicted group were lower than non-players'. The findings support the previous hypothesis, which suggested that reduction in amplitude of P300 reflects motivational processes, which is associated with desensitization to violence.

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P185 - Predictors of Infant Positive, Negative and Self-Direct Coping during Still-Face

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*Abstract:*

In the present study, we investigated whether infants' coping styles presented in Face-to-Face Still-Face paradigm (FFSF) are associated and predicted by: infants' physiological responses; maternal representations of their infant's temperament; maternal interactive behaviour in free play; and infant birth and medical status. The sample consisted of 46, 3-months old (corrected age), healthy, prematurely born infants and their mothers. Infant heart-rate was registered during FFSF episodes. Mothers described their infants' temperament using a validated Portuguese temperament scale. Maternal interactive behaviour was evaluated during a free play situation using CARE-Index. Our findings indicate that positive coping behaviours were correlated with gestational birth weight, heart rate (HR), gestational age, and maternal sensitivity in free play. Gestational age and maternal sensitivity predicted Positive Other-Direct coping. Self-directed behaviours were correlated with HR and with maternal controlling/intrusive behaviour, but only maternal behaviour predicted Self-direct coping. In sum, early emerging coping responses seem to be affected by infants' birth status and by maternal interactive behaviour. Internal and external factors may contribute to infant self-regulatory ability to cope and to re-engage after stressful social events.

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P186 - Processing of Internal and External Signals in Response Speed Evaluation



*Abstract:*

In everyday life errors are less common than accurate actions. Nevertheless, research on performance monitoring has mostly focused on errors, giving only superficial attention to correct responses. In the present experiment event-related potentials (ERPs) were recorded to assess how the brain evaluates response accuracy and speed based on internal and external signals. Participants performed a cognitive conflict task in which response quality was generally signalled by feedback but, in some trials, participants had to judge it. Four response categories were considered based on the factors accuracy and speed: incorrect, correct-average, and correct-slow.

Participants were very accurate in evaluating their response correctness, but were less precise in evaluating their response speed. Although the response-related negativity, an index of internal response monitoring, was significantly modulated by the correctness of the response, the negativity for correct responses (Nc) seemed to be insensitive to speed. A later component, instead, the positivity for correct responses (Pc), was clearly modulated by how fast correct responses were expressed. Processing of external signals was mostly evident as modulation of the feedback-related positivity (FRP): incorrect and correct-fast responses presented larger FRPs than correct-average and correct-slow responses. Interestingly, the latency of the FRP was shorter for correct-average responses.

These results suggest that the evaluation of response speed requires late monitoring processes, as indexed by the Pc. In addition, significant modulations of the FRP latency and amplitude might indicate the involvement of processes related to feedback expectation.

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P187 - Psychopathy and Non-Linear Processing of Facial Expressions of Emotion

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*Abstract:*

Psychopathy is described as a personality disorder associated with affective, interpersonal and behavioral deficits such as lack of empathy or remorse, manipulation and antisocial behavior. The study of facial expressions of emotions processing in psychopathy is a common theme, as an indicator and /or justification of the affective and relational deficits. However, this research did not analyze facial processing as a non-linear functioning. Thus, this paper seeks to explore the process of emotional and perceptual categorization reminiscence in the higher prevalence of psychopathic personality traits.

For this purpose, the participants ( $n = 29$ ) were asked to do an identification task of facial stimuli arranged in morphs, i.e. facial expressions organized in a continua (frames) that will progressively changing from one emotional category to another, or randomly presented. The categories used were emotional Happiness, Sadness, Fear and Anger. The hypotheses developed previewed this perceptual reminiscence: (1) psychopathy score is associated with a more salient hysteresis effect; (2) psychopathy score is related with a delay in the detection of Fear comparably to other emotional categories. The results lead to the presence of a relationship between total psychopathy scores and the need for more frames to detect Fear when preceded by Anger's visualization, which represents a reminiscence of the perceived Anger. Also analyzed, the effects of each subscale of psychopathy (Boldness, Meanness and Disinhibition), the Boldness score showed a positive correlation with retention of Anger and a delayed detection of Sadness, and a negative correlation with Happiness detection after seeing Anger.

Thus, the results suggest differences in emotional processing within the increase of some traits psychopathic, especially in the sense of rigidity in emotional detection under the effect of a previous perception and the use of superior and cognitive mechanisms in this process, culminating in a more salient hysteresis effect.

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P188 - Psychosocial Stress Effects on Hormonal Response and Cognitive Function in Subjects with Higher and Lower Psychopathy Scores: The Role of Sex

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*Abstract:*

Previous research has indicated that blunted cortisol secretion is associated with the existence of psychopathic personality traits in men but not women. The current study tested whether psychopathic personality traits are differentially related to inhibited cortisol production among men and women exposed to a standardized psychosocial stressor (Trier Social Stress Test, TSST). Fifty-eight subjects were selected through a general health questionnaire to become part of the study (ages between 18-35 years). Participants were recruited either from a sample of 1000 candidates with variable scores on Triarchic Psychopathy Measure (TriPM, Patrick, 2010), or among university students that filled the TriPM. Those 30 subjects that scored higher on TriPM (17 men, 13 women) were compared with those subjects showing lower psychopathy (13 men, 15 women) scores. Three salivary hormone samples were taken prior to task (t-40, t-30, t-10), and five samples (t0, t+15, t+20, t+30 and t+40) were taken with reference to the beginning of the stressor. In order to assess the cognitive function of the participants, we used an emotional memory task based in the recognition of pictures from the International Affective Pictures System (IAPS, Lang et al., 2005) and computed a d-prime index for the analysis of the participants' sensitivity in the memory task. Our results confirm, in part, previous studies and, by controlling sex related effects provide a more complete view of the possible neurobiological deficits associated with psychopathy integrating psychobiological correlates and memory measures. Data are discussed in relation to the obtained results.

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P189 - Pupil Mimicry-Trust Linkage Is Modulated by Oxytocin

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*Abstract:*

The eye-catching morphology of human eyes draws attention to the pupils and changes therein, enabling quick assessments of emotion signals and partner trustworthiness. Using incentivized trust games with partners from in-group and out-group whose pupils dilated, remained static, or constricted, Study 1 and 2 revealed that (i) participants withheld trust from partners with constricting pupils and extended trust to partners with dilating pupils; (ii) changes in participant's own pupils mimicked dilation or constriction in their partner's pupils; and (iii) dilation-conditioned trust in ingroup partners correlated with the dilation of participant's own pupils, whereas (iv) constriction-conditioned distrust in out-group partners did not correlate with constriction of participant's own pupils. Study 2 provided evidence that these tendencies are modulated by oxytocin, a neurohypothalamic peptide that on the one hand is implicated in pair-bond formation and in-group trust but on the other hand in intergroup conflict and competition with outgroups. Study 2 showed that oxytocin sensitized participants to negative cues by (v) lowering trust in partners with constricting

pupils, and (vi) facilitating pupil constriction mimicry. We suggest that pupil-contingent trust is in-group bounded and evolved in and because of group life.

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P190 - Pupillary and Electrophysiological Correlates of Inhibitory Control and Cognitive Effort in Anxiety

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*Abstract:*

Anxiety is associated with impaired inhibitory control, evidenced by increased inhibition-related ERPs at frontal sites. Anxiety-related deficits in inhibitory control are presumed to be more apparent when task demands are high and additional cognitive effort is required. Increased cognitive effort is linked to increased pupillary responses, however the effect of effort on inhibitory control and concurrent pupillary function and cortical activity has not been examined in anxious individuals. The aim of the study was to investigate pupillometry and electrophysiological indices of inhibitory control in anxiety during conditions of high and low cognitive effort. We used a Go/No-Go task and manipulated cognitive effort across two No-Go probabilities (High effort: 20% No-Go; Low effort: 50% No-Go). Pupil diameter and ERPs (N2 and P3: signals response inhibition) were measured in response to Go and No-Go cues. Results revealed faster reaction times on correct Go trials, but increased errors and larger pupillary responses on No-Go trials during increased effort (20% No-Go; 80% Go). Anxiety only affected pupillary and electrophysiological but not behavioural responses, characterised by greater (a) pupillary responses regardless of task and effort and (b) N2 at frontal sites during high effort. Results are consistent with neuropsychological models of prefrontal function in anxiety and suggest effects of high cognitive load and effort are apparent in electrophysiological measures. This suggests the use of convergent electrophysiological and pupillometry measures in future behavioural studies of executive inhibitory function in anxiety.

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P191 - Putting Action in Context: Facilitatory and Inhibitory (In)Congruency Effects on Motor Resonance

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*Abstract:*

Converging behavioral and neuroimaging evidence indicates that inferring the intentions and goals underlying other people's actions is a context-sensitive process. From a predictive coding perspective, context has been proposed to serve as a higher level prior which streamlines the processing of the incoming sensory signal. On this view, higher cortical structures built-up a predictive model that is communicated, through feedback connections, to lower sensory areas. The comparison between the predicted model and the actual sensory signal generates a prediction error that is used to update information across levels. While previous research has focused on how contexts modulates intention and goal level inference, much less is known about its role in modulating low-levels of action representation, including the movement kinematics and muscular patterns involved in the observed action. Furthermore, evidence regarding the time-course, the neural mechanisms and the brains areas subserving this modulation is still sparse. In this talk, I will present recent work from my laboratory using 'online' single-pulse TMS and 'offline' continuous theta burst stimulation (cTBS) protocols, showing that top-down contextual information indeed modulates lower-level aspects of motor resonance with a different engagement of M1 at early (facilitation ~250ms) and later phases (inhibition ~400ms) of action processing, depending on the (in)congruency of the information among hierarchical levels. In addition,

I will discuss the neural source of these effects, given special attention to the role of the middle temporal gyrus and the dorsolateral prefrontal cortex.

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P193 - Rapid and Highly Resolving Emotional Processing and Learning in the Absence of Contingency Awareness

Isabelle A. G. Klinkenberg<sup>1,2</sup>, Maimu A. Rehbein<sup>1,2</sup>, Christian Steinberg<sup>1</sup>, Markus Junghöfer<sup>1,2</sup>

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*Abstract:*

Magneto- and electroencephalographic correlates of rapid emotional tagging starting already around 50 ms in especially occipito-temporal and prefrontal cortex regions have recently been reported using a novel MultiCS face conditioning paradigm. Follow up studies revealed that these effects do not depend on specific UCS, but occur after pairing of neutral faces with aversive electric or auditory shocks as well as aversive odors. The high number of learned faces and additional contingency testing indicated, that these electrophysiological and convergent behavioral correlates of emotional learning most likely occurred in absence of contingency awareness. A recent study supported this view and extended it to appetitive conditioning: Neutral male faces which have previously been paired with a potential human pheromone  $\Delta 4,16$ -androstadien-3-one (AND) and faces paired with the pleasant odor vanillin also evoked enhanced rapid neural face processing compared to faces paired with a control odor. Importantly, AND paired faces evoked amplified neural processing and higher attractiveness ratings compared to faces paired with a control odor although AND and control odor were rated as equally neutral. We conclude that affective processing rapidly recruits highly elaborate and widely distributed networks with substantial capacity for fast learning and excellent resolving power. These results support current models of affective processing which assign the cortex a more important role in emotion processing and learning than traditionally assumed.

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P195 - Reading More Than One Mental State

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*Abstract:*

Neuroimaging research has demonstrated that the temporo-parietal junction (TPJ) and medial prefrontal cortex (mPFC) are activated during high-level thinking about the beliefs of other people, such as false beliefs that do not conform to reality. Recent approaches (Cabezza et al., 2012) see activation of the TPJ during false belief reasoning as caused by reorientation of attention from reality to internal memory. However, it is still unclear how reorientation is accomplished: by reducing attention to the self (what you observed) or by increasing attention to the other target's mind (what you remember the other knows)? To resolve this question, we asked participants to judge the false and true beliefs of one or two persons, instead of only one person as in past research. The results suggest comparing responses when maintaining two false beliefs as opposed to one false belief, results in longer response times. Moreover, the results revealed stronger activation in the ventral mPFC during the belief formation and question phase, and in the left TPJ during the question phase only. This suggests that increasing one's attention to distinct targets' mind is accomplished by increased recruitment of several brain areas responsible for false belief understanding.

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P196 - Reduced Delta and Theta Oscillations in Young Binge Drinkers during a Go/Nogo Task

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<sup>3</sup>Department of Clinical Psychology and Psychobiology, University of Santiago de Compostela, Galicia, Spain

**Abstract:**

**Introduction:** Binge drinking (BD) is a highly prevalent pattern of alcohol consumption between adolescents and young people in most Western countries. Recent neuropsychological and neurofunctional studies suggest anomalies in inhibitory control (IC) in young binge drinkers (BDs). Specific frequency bands within oscillatory brain activity (e.g., delta and theta) have been suggested to underlie IC. However, to our knowledge there are no studies evaluating the effects of BD on event-related brain oscillations during response inhibition.

**Aim:** To examine the total power of oscillatory brain EEG signals in young BDs while performing a Go/NoGo task.

**Method:** Seventy-two subjects (36 controls and 36 BDs) took part in the study. Time-frequency decomposition of the EEG signal was performed from 1 to 40 Hz. For the statistical analysis, a cluster-based permutation test across groups was used.

**Results:** BDs showed significantly lower total power in delta and theta range around 300-700 ms poststimulus interval compared to controls for both Go and NoGo condition. Moreover, higher level of blood alcohol concentration negatively correlated with the total power of delta and theta bands in the Frontal region for the NoGo condition and in the Central region for the Go condition.

**Conclusions:** Results support previous findings showing anomalies in the neural activity associated with IC in young BDs and are congruent with studies in alcoholics which report lower total power of delta and theta bands in these patients during Go/NoGo tasks.

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P197 - Reliability and Validity of the Composite Scale on Morningness - European Portuguese Version, in Adolescents and Young Adults

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**Abstract:**

**Introduction:** Morningness-eveningness, also known as chronotype, reflects demonstrable inter-individual differences in the peak timings (but not in the amount) of several circadian rhythms. The Composite Scale of Morningness (CSM) by Smith et al. (1989) is one of the most widely used tool to access it. It has been long used in research in Portugal, but very few detailed reports exist about its psychometric properties in younger ages and student samples in our country. The aim of the present work was to report reliability and validity data about the Portuguese version (Pt) of the CSM in high school and university students. **Methods:** 387 high school students (7th to 12th grades, 51.5% F, 12 to 21 yr-old) and 1654 undergraduates (1st to 3rd grades, 55.0% F, 18-25 yr-old) completed the CSM-Portuguese version (Silva et al., 1995), plus a set of self-report questions on sleep patterns in order to examine the questionnaire validity. **Results:** As to internal consistency, Cronbach alpha coefficients were

0.81 in each sample (high schoolers and undergraduates). Corrected item-total correlations ranged from .27 to .55 (high schoolers) and from .31 to .59 (undergraduates). As to validity, lower morningness scores were associated, as expected, with later sleep-wake schedules and mid-points of sleep. Correlations between morningness-eveningness scores and sleep patterns were generally larger for sleep schedules variables than for time in bed or sleep durations, suggesting convergent and discriminant validity, respectively. Scale structure is in accordance to previous findings reported in international literature. Conclusions: The European Portuguese version of the CSM is a reliable and valid tool to measure morningness-eveningness in adolescents and young adults' students with ages ranging from 12 to 25 years old.

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#### P198 - Reversed Laterality of Occipito-Temporal Event-Related Potentials to Faces Vs Hands

Miguel Granja Espirito Santo<sup>1</sup>, Octavian Maxim<sup>1</sup>, Martin Schürmann<sup>1</sup>

<sup>1</sup>University of Nottingham

##### *Abstract:*

Hands, much like faces, often convey social information, instructions and intentions. Compared to neural responses to faces [2,5] and whole bodies [4,8], however, there is little investigation of visual perception of hands [1,6,7]. Recent fMRI findings [3] have pointed toward a left hemispheric specialisation in the lateral occipital cortex for perception of hands. Still, no electrophysiological studies have attempted to: 1) find a hand related response which is discernable from body related ones; 2) find laterality differences between face and hand processing. 14 subjects were presented with images of right hands, left hands, faces, whole bodies, and objects, occurring in pseudo-random order with occasional stimulus repeats which subjects had to detect. Using electroencephalography (EEG), responses to each stimuli category were quantified as event-related potential (ERP). The most negative amplitudes within N170/90 latency range, from occipito-temporal electrode sites were entered into an ANOVA. A significant interaction between hemisphere and stimulus class was found. Follow-up ANOVAs indicated a reversed response laterality to hands vs. faces ( $p=0.020$ ); hands vs bodies were also different in response laterality (trend,  $p=0.078$ ). Given the well-known right-hemisphere dominance of face-specific brain activation [5], the reversed laterality for responses to hands – in line with fMRI-assessed laterality [3] - suggests a hand-related response mechanism in occipito-temporal networks supporting social perception.

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#### P200 - Reward and Loss Related Time Distortions in the Temporal Bisection Task

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<sup>3</sup>University of Tartu and Stanford University

##### *Abstract:*

It is well described that emotions alter the time perception but complex stimuli used in most experiments (faces, sounds, pictures) makes it difficult to draw a consistent picture of the mechanism underlying it. We used a game-like task (Monetary Incentive Delay Task) with chocolate rewards to elicit affective states in 39 subjects whose ages ranged from 19 to 35. Feedback to their still anticipated or reached chocolate gains/losses was given by perceptually similar (*Landolt* like) circles. Essentially, during the different task conditions participants had to bisect whether the duration of the presented feedback was more similar to a shorter (200 ms) or to a longer (800 ms) standard duration. In terms of results, time estimates were more variable (Weber's ratio) in the presence of less desired outcomes (ANOVA;  $F(5.2, 179.2) = 3.1, p < .01$ ), which may indicate that less attentional resources were

paid to a temporal task in those conditions. A significant lengthening effect was found for anticipatory (*may win/lose*) and more favorable (*won, didn't lose*) outcomes compared to the neutral stimuli in a given block (ANOVA;  $F(6.4, 243.1) = 10, p < .001$ ). We showed that it is possible, without using complex emotional stimuli, to induce a large number of affectively different states in the same task. The novel paradigm used in our experiment makes it possible to illustrate that similar mean temporal estimates in different conditions may differ greatly in terms of underlying mechanism and origin.

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## P201 - Reward Expectancy Modulates Primary Motor Cortex Excitability during Task Preparation

Carsten Bundt<sup>1</sup>, Elger Abrahamse<sup>1</sup>, Senne Braem<sup>1</sup>, Marcel Brass<sup>1</sup>, Wim Notebaert<sup>1</sup>

<sup>1</sup>Ghent University

### *Abstract:*

Humans are able to flexibly and rapidly prepare for environmental demands before the onset of an actual event. A major part of this event preparation is the setup of appropriate actions. Action preparation itself has been associated with transient primary motor cortex (M1) suppression before target onset (e.g., Duque & Ivry, 2009). In order to understand the functional characteristics of this suppression, recent attempts have been made to investigate motivational modulations of this effect. We devised a cue-target paradigm where a reward cue (+1) indicated that participants could receive reward on the coming trial or a neutral cue (+0) indicated they could not receive reward. We measured corticospinal excitability by means of motor TMS and EMG during the cue-target delay period. We therefore presented a TMS pulse 400, 600 or 800 ms after cue onset (600, 400 or 200 ms before target onset). Participants responded to the color of the stimulus in a Simon task (Experiment 1) or a Stroop task (Experiment 2) with the left or right index finger. Behaviourally, we observed that the reward cue resulted in faster reaction times compared to the neutral cue. In both experiments we observed a gradual increase of motor suppression towards stimulus presentation. Most important, this effect was only observed after reward cues. Results are discussed in the context of current theoretical frameworks explaining pre-target motor suppression as an indicator of impulse control.

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## P202 - Risk Perception in Food Choice

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### *Abstract:*

The intersection between risk perception and food is rather unexplored. Everyday we have to choose what to eat among food items. In order to achieve this goal we evaluate foods along several dimensions, including how safe they are. Contamination can occur and this produces a real risk for consumers. Here, we aimed to assess how the perception of a risk of contamination alters choice with foods of different caloric content. We had 19 healthy participants with normal body mass index (BMI) choose a food item among pairs of different caloric content using behavioral measures and fMRI. Analyses were performed using a linear mixed model with binary logistic regression and whole-brain fMRI. Given the same risk probability, high calorie content foods were chosen more frequently than low calorie ones. The activation of right insula (RI) mapped the behavior result, while activation in the anterior hippocampus varied parametrically with risk. Altogether, these results shed light on the behavioral and neural bases of risk perception in food choice. We found that the general

tendency to avoid risk was partially counterbalanced by an increased approach towards foods with high calories, suggesting that these foods might reduce people's concern toward contamination. The activation of RI is in line with other studies showing its role in risk aversion, while the anterior hippocampus activation has also been found in associative working memory, suggesting that higher risk might pose higher cognitive demands on the choice.

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P203 - Role of the Subgenual Anterior Cingulate and Anterior Insula Cortices in Social Exclusion in Relation to Depression

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**Abstract:**

**Background:** Major depressive disorder (MDD) is commonly associated with social impairments. The Cyberball task, an online ball-tossing game, allows studying the neural basis of social exclusion in humans. Social exclusion is encoded by the subgenual anterior cingulate cortex (sgACC) and anterior insula (AI), two regions involved in MDD. Although their implication in the regulation of social signal is established, the inter-relationship between the sgACC and AI during social exclusion is still unclear.

**Methods:** We developed a rodent task of social exclusion based on the Cyberball task and conditioned 21 Lister Hooded male rats as singles, dyads, and finally tested them in triads in a custom-made apparatus composed of three operant conditioning chambers.

**Results:** We found that rats shared food rewards with their peers ( $p < 0.001$ ), validating the social aspect of the task. Rats with a low basal resiliency, detected using the forced swim test, increased their immobility time after social exclusion whereas the others kept it constant, showing the inter-individual variability of the relationship between social exclusion and depressive resiliency.

**Conclusion:** The current task allows assessing inter-individual vulnerability to exclusion-related resiliency. Ongoing lesion experiments will give us a better understanding of the causal link existing between the sgACC and AI during social exclusion in relation to depression.

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P204 - Selective Attention to Emotional Words: Parallel and Interactive Effects in Visual Cortex

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**Abstract:**

Human brains spontaneously differentiate between emotional and neutral stimuli, including written words whose emotional quality is symbolic and acquired by learning. Electroencephalographically, emotional-neutral processing differences are typically reflected in the early posterior negativity (EPN, 200-300 ms) and the late positive potential (LPP, 400-600 ms). These components are also enlarged by explicit visual attention. Therefore, the Motivated Attention model posits that emotional content acts, as a natural driving force of attention, although the extent to which stimulus emotion and top-down attention utilize common neural mechanisms is not entirely clear. Here, we examine emotion-attention interactions in visual word processing. Participants attended to negative, neutral or positive nouns while high-density EEG was recorded. Emotional content and top-down attention acted in parallel to enlarge the EPN component. On the



LPP, by contrast, interactive effects were found: Explicit attention to emotional words led to a substantially larger increase of the LPP than did explicit attention to neutral words. Source analysis likewise revealed separate and interactive effects of emotion and attention in extended visual cortex. Distinct effects of emotional content were found in the inferior frontal gyrus, whereas distinct effects of attention resulted in enhanced activity over broad paracentral, superior occipital and frontal areas. Results demonstrate that emotion and attention act in parallel at early stages but interact during later processing. Both emotion and attention act upon visual cortex, with volitional attention further activating frontal, paracentral, and superior occipital areas, reflecting shared and separate mechanisms of emotion and attention at distinct word processing stages.

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P205 - Selective Attention within Visuo-Spatial Working Memory Suppresses Distractors by Enhancing Theta Band Power

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*Abstract:*

Working memory updating through selective attention is relevant for behavioral adaption to changing environmental conditions. Selective attention, induced by retro-active cues (retro-cues), protects relevant information from decay and interference. However, the neural mechanisms of counteracting distracting information are not fully understood. The present study investigated in a retro-cue based visuo-spatial working memory task how irrelevant distractor information is processed using EEG. Therefore, subjects had to memorize and reproduce the orientation of colored bars. A color retro-cue indicated either one (selective cue) or both bars (neutral cue) of a lateralized memory array as relevant for the subsequent task. In addition, as a compensatory distractor suppression mechanism was expected, a distractor array occurred between retro-cue and target presentation. To make the distractor predictable and thereby maximize the efficiency of compensatory suppression mechanisms, the distractor was presented in blocks. Both mean error and standard deviation of the error distribution were increased in distractor blocks, yet above all in trials with neutral retro-cues. In other words, the selective cue diminished the distractor effects. EEG data revealed an asymmetry in the P1/N1 time window at posterior electrodes evoked by distractor onset. Activation was reduced contralateral to the attended information, indicating suppressed sensory processing of distracting information on the attended side. Furthermore an asymmetry in theta band power occurred: theta power (4-6 Hz) increased contralateral to the attended stimulus before and during distractor presentation. This represents an increase in cognitive control processes specifically in the hemisphere containing the relevant information. In sum, the results show that suppression of predictable distracting information is a compensatory mechanism operating at different neural levels of processing. These neural suppression mechanisms go hand in hand with more adapted behavioral performance.

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P206 - Self-Other Distinction and Theory of Mind in Women with a History of Sexual/Physical Abuse

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<sup>1</sup>Ghent University

*Abstract:*

Experience of childhood abuse can disrupt development of a normal Theory of Mind (ToM), although surprisingly few studies have investigated ToM in adults with childhood trauma. In this study, we compared adult women with histories of childhood sexual and/or physical abuse to women with no history of trauma on two tasks and self-reported empathy. In the

first task, an implicit ToM task, we investigated how participants' quick detection of an object is facilitated by knowledge of another's false belief. In the second task, an imitation-inhibition task, participants performed finger movements in response to cues whilst observing a hand make the same movement (congruent), a different movement (incongruent), or no movement (baseline). As predicted, abuse group participants (ABs) were slower compared to controls to detect the object when they did not expect to see it but knew the agent did. Furthermore, they showed a smaller ToM index, as indicated by less facilitation by knowledge of another's false belief. Secondly, ABs were more facilitated in reaction time by seeing congruent movements and experienced less interference when observing incongruent movements compared to controls. Moreover, when depression was controlled for, differences in implicit ToM disappeared yet remained for inhibition of imitative behaviour. Lastly, ABs reported more empathic concern and less personal distress. Our findings suggest that women with a history of childhood abuse have poorer perspective-taking skills, potentially due to dysfunctional ToM development. Additionally, depression appears to play a role in only some aspects of ToM. Further studies are planned to investigate underlying neurobiological mechanisms.

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P207 - Self-Referential Dysfunction and Default Mode Hyperactivation in Insomnia Patients: A Case-Control fMRI Study

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*Abstract:*

Psychophysiological insomnia (PI) is a common sleep disorder. In this study we tested whether differences in terms of neural activation are present between a group PI patients group and a healthy-control group while they are exposed to idiosyncratic ruminations and worries evoked visually by words and to explore their hypothetical link with default-mode network (DMN) dysfunction in PI. Five PI patients diagnosed according to ICSD-2 of AASM and 5 age- and sex-matched healthy-controls were enrolled. Patients were recruited at the outpatient Sleep Medicine Centre of the Coimbra Hospital Centre. An fMRI block-design paradigm where the participants visualized lists of words related to past/present and future concerns and also emotionally neutral words was used. It was observed that PI patients showed DMN impairment in deactivation. Moreover, when these patients were exposed to words concerned to both past/present ruminations and future worries, there was a pronounced and significant over recruitment of brain areas related to DMN and self-referential processing when they were compared to healthy volunteers. The self-report measures showed also differences between the clinical and control groups. In sum, despite the relatively small sample size due to the stringent inclusion criteria, this study clearly suggests that in PI there is a dysfunction in brain regions pertaining to self-referential processing which is supported by an overall pattern of hyperarousal in brain regions comprising the DMN. These data may be useful in the improvement of pathophysiological models and therapeutic interventions for insomnia.

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P208 - Sensory Facilitation of Threat - Evidence from Different Aversive Conditioning Studies

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*Abstract:*

A plethora of studies suggests that the threat relevance of visual stimuli is associated with facilitated sensory processing, which is a useful mechanism for efficient detection of threat in the environment. In this presentation, I report studies employing steady state visual evoked potentials (ssVEPs) in which sensory gain in early visual cortex was investigated during aversive learning. Several experiments will be discussed in which electrocortical facilitation was found in response to faces and contexts, which acquired threat-value through differential fear conditioning. Finally, an experiment will be presented in which acquired and inherent threat was compared directly by presenting neutral faces (conditioned) together with angry faces at the same time. Across conditioning experiments, threat-cues or -contexts evoked larger cortical mass activity in early visual cortex indicating successful affective learning and concomitant short-term plasticity in visual cortex depending on the learning experience.

Interestingly, the generalization experiment showed the highest amplitude for the CS+ but the lowest for the generalization stimulus, which was most similar to the CS+ (lateral inhibition). The direct comparison of acquired vs. inherent threat showed that when angry faces compete with their neutral counterparts, acquired threat abolishes the dominance of the inherent threat face. Altogether, these results point at the preferential processing of both inherently and acquired threat in early visual cortex and at the significance of visuocortical facilitation in aversive learning. In addition, they demonstrate the feasibility of ssVEP methodology as a promising research avenue for investigating cortical dynamics and multiple stimuli processing at a time in aversive learning.

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#### P209 - Sequential Analysis of Event-Related Potentials and Theta Oscillations in a Two-Dimensional Simon Task

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##### *Abstract:*

The Simon effect is characterised by faster and more accurate responses when response site and task-irrelevant stimulus site are corresponding as if they are spatially non-corresponding. Trial-by-trial analysis further revealed that the Simon effect is more pronounced after spatially corresponding than after non-corresponding trials. These sequential modulations are widely accepted as a phenomenon of increased action control after non-corresponding trials. However, sequential effects can also be explained by task-feature repetition effects, i.e. faster responses when task features are repeated from trial to trial. We used a vertical and horizontal stimulus arrangement and vertically positioned response keys to study these sequential effects in the Simon task. Correspondence could occur with respect either to the hand (left/right) or to the response key (up/down). Behavioural data and the parietal P3 support the task-feature repetition account, as there was no correspondence-dependent sequential modulation of the Simon effect after an alternation of the spatial axis. However, sequential effects were evident within each spatial dimension, i.e. larger Simon effect after spatially corresponding compared to non-corresponding trials. Nevertheless, feature repetition cannot explain the data pattern completely. Some aspects of attentional processing (N2pc) indicate correspondence-dependent sequence effects that were independent from changes in the spatial dimension. Furthermore, the event-related frontal theta (4-8 Hz) activity, an electrophysiological correlate of cognitive control mechanisms, appears to be more sensitive to the current trial type than to the trial sequence. However, there is some evidence that executive control processes differ across the spatial dimensions, which would also allow to explain sequential effects in behavioural data in terms of action control.

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#### P210 - Sex Differences in Delay of Gratification in 40-Month-Old Children and the Relation to Prenatal Testosterone Levels

*Abstract:*

Over four decades ago, Walter Mischel (1970) introduced the “Marshmallow Test” which measures childrens' ability to delay gratification by either choosing an immediate smaller or a later larger reward. Looking at sex differences in delay of gratification, there is evidence for a female advantage. In this context, gonadal steroids influencing the neural structures essential for delay of gratification could be a possible explanation for sex differences. Recent studies connected the ability to delay gratification to free testosterone (from saliva samples) in adults as well as to the second-to-fourth-digit-ratio, often interpreted as a marker for prenatal testosterone exposure, in children. This study is part of a longitudinal study, in which we used prenatal testosterone levels from amniocentesis samples as a more direct measure and conducted a modified version of the Marshmallow Test with almost 150 children (age:  $M = 40.12$  month,  $SD = 0.50$ ). By recording every child's preferences for six different snacks, we were able to conduct the Marshmallow Test according to individual preferences. The children had to decide whether to wait for their preferred snack for a maximum of 8 minutes or to abandon the waiting period by ringing a bell signaling the choice of the less preferred snack. Girls waited significantly longer for their preferred snacks than boys providing further evidence for sex differences in delay of gratification. Importantly, in the male sample waiting time was negatively correlated with prenatal testosterone levels underlining the organizing effect of testosterone on the brain as an explanation for observed sex differences.

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P213 - Should I Cook or Should I Raw? Does the Brain Track the Level of Transformation in Food Images: An EEG Investigation

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*Abstract:*

Several imaging studies investigating how normal weight individuals process visual information regarding food unveiled a network subserving food perception. Using electrical neuroimaging (Murray et al., 2008) it has been found that at ~165 msec after visual stimulus onset, the brain implicitly discriminates between high fat and low fat foods (Toepel et al., 2009). However, how the brain deals with information regarding food transformation as an effect of cooking, aggregation or preservation procedures has received little attention to date. Whether the brain tracks the difference between unprocessed (or natural) and processed (or transformed) foods is the central question of the present study. Visual evoked potentials (VEPs) analysis allowed us to investigate spatio-temporal brain dynamics along with participants' behavioral responses. Results show how the brain responses to the two types of stimuli differed in the electric field strength early as ~200 ms after stimulus presentation while participants were performing a simple categorization task (food/non-food categorization). Furthermore, differences in response topography were found in 130-171ms and 187-232ms post stimulus presentation intervals. During these two time periods different estimated sources have been found using a distributed linear inverse solution. This study represents the first attempt to investigate if the brain differently categorizes natural and transformed foods using electrical neuroimaging and sheds light on a relatively unexplored domain of food perception.

## P215 - Social Anxiety Modulates Gaze Behavior and Mentalizing during Social Situations

Laura Müller-Pinzler<sup>1</sup>, Wolfgang Einhäuser<sup>2</sup>, Stefan Fraessle<sup>3</sup>, Jens Sommer<sup>3</sup>, Andreas Jansen<sup>3</sup>, Christian Keysers<sup>4</sup>, Valeria Gazzola<sup>4</sup>, Lena Rademacher<sup>1</sup>, Frieder M Paulus<sup>1</sup>, Sören Krach<sup>1</sup>

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<sup>4</sup>University of Amsterdam

### *Abstract:*

The fear of getting into an embarrassing situation and being negatively evaluated is a core experience of social anxiety. The mere presence of a perceived audience thus constitutes a threat for people with social anxiety disorder (SAD) [1], accordingly eliciting distress. Attention biases towards sources of information about potential social threats are thought to be an important mechanism eliciting this fear in SAD [1]. However, most studies on the neural correlates of SAD investigated it in social isolation [2]. The aim of this study therefore was to characterize the neural correlates of SAD related attention biases in response to evaluative feedback during real-life person-group interaction in the MRI [3,4]. By manipulating the presence of an audience we were able to characterize how social interaction anxiety (SIAS) modulates gaze behavior and mentalizing processes in 27 healthy participants during public failures and achievements. During public vs private feedback the participants' eye-gaze dwelled longer on the pictures of the audience ( $t(26)=4.245$ ,  $p<.001$ ) and activations of the fusiform face area (FFA), precuneus, and mPFC, areas of the mentalizing network, were increased. This might reflect a general increase of attention towards the audience and increased mentalizing about the evaluation of one's performance in-the-eyes-of-others. SIAS scores correlated positively with the respective differences in the gaze dwell-time on the audience's faces ( $r=.58$ ,  $p=.001$ ), activation of the FFA ( $r=.42$ ,  $p=.016$ ) and MPFC ( $r=.34$ ,  $p=.043$ ). In line with SAD related attention biases these correlations revealed a potentially maladaptive reaction towards the audience on the neural systems level.

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## P216 - Social Behavior in Psychopathy: Evidence from Neuropsychophysiology

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<sup>1</sup>Laboratory of Neuropsychophysiology, Faculty of Psychology and Educational Sciences, University of Porto

### *Abstract:*

Prefrontal deficits are well-established in antisocial behavior, but executive functioning in psychopathy is misunderstood. Controversial findings may be related to conceptualization issues. Growing empirical evidence suggests that the prevailing taxonomic model of psychopathy may mask specific relationships among psychopathic traits and executive functions, as it defines a unitary construct of psychopathy. Considering the heterogeneity of psychopathic personality structure, the Triarchic Model of Psychopathy was conceptualized to dissociate etiological pathways (low fear and externalizing vulnerability) that underlie phenotypic expressions of psychopathy (meanness, boldness, and disinhibition). Boldness is defined as an adaptive phenotype, while meanness and disinhibition are close correlates of antisocial behavior. The current study aims to assess the unique relationships between distinct psychopathic traits and inhibition executive function at neuropsychological and neurophysiological levels. We expect that boldness will underlie intact or enhanced inhibition, while meanness and disinhibition will predict impaired inhibition. Participants were recruited from the community, and completed the Stroop ( $n = 48$ ), and Simon tasks ( $n = 23$ ). Interference score was calculated to the Stroop Task, and measures of peak latency and mean amplitude were obtained to assess Error-Related Negativity (ERN). Psychopathy was assessed through the Triarchic Psychopathy Measure that allows the operationalization of

normal-range phenotypic expressions of psychopathy. Multiple linear regression models were calculated to examine the contribution of psychopathic phenotypes that were significant in predicting inhibition. Neuropsychological data revealed that boldness was positively related with inhibition. An opposite pattern was found to meanness. At the neurophysiological level, boldness predicted increased negativity of ERN, while disinhibition predicted decreased error detection. The main findings provide further support for the assumption that a dimensional probabilistic analysis of psychopathy is promising to understand its social behavior underpinnings. Boldness may predict prosocial behavior, as it reduces the probability of automatic-impulsive response patterns. In turn, disinhibition and meanness may relate to impaired inhibitory control that has been systematically found in impulsive-antisocial behavior.

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#### P217 - Social Decision-Making and Quality of Life in Bipolar Hypomania and Euthymia

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<sup>2</sup>Radboud University Nijmegen

<sup>3</sup>Leiden University

##### *Abstract:*

*Objectives:* Over the last decade, the study of social decision-making has increasingly gained ground, revealing altered functioning in major psychiatric disorders. However, social decision-making of bipolar patients pertaining to fairness, intentionality and facial emotions has remained unexplored.

*Methods:* After clinical and neurocognitive assessment, 14 hypomanic and 20 euthymic patients with bipolar-I or II disorder, and 19 control volunteers of similar age, gender and education, completed the social decision-making tasks Dictator Game and a modified version of the Ultimatum Game.

*Results:* Similar to the control group, bipolar groups rejected unfair offers most than hyperfair and fair offers in the UG ( $p < 0.0001$ ). Rejection was highest when an unfair offer was accompanied by a fair alternative ( $p < 0.0001$ ) and an angry facial emotion ( $p < 0.0001$ ). Hypomanic patients showed higher rejection rates towards hyperfair offers ( $p = .0423$ ) and offered less money themselves than did controls. For bipolar patients, larger rejection rates of intentional unfair offers were correlated with higher quality of life in terms of social relationships and overall quality of life.

*Conclusions:* Bipolar patients demonstrated adequate judgement of fairness and intentions of others when monetary gain is at stake. In addition, facial emotion recognition was adequately involved. Nonetheless, hypomanic patients showed more sensitivity to unfairness, since they also considered hyperfair offers as unfair. This finding gives rise to propose a more rigid social decision-making process during hypomania, and suggests that heightened unfairness sensitivity is state-related in bipolar disorder. Interestingly, we revealed a correlation between social decision-making and quality of life, hereby identifying social decision-making as a potentially important treatment target.

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#### P218 - Stimuli in Moral Judgment and Theory of Mind Tasks: A Validation Study for the Portuguese Population

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##### *Abstract:*

Moral judgment and theory of mind are main components of social cognition, being determinant to the success of the social interactions. The present study attempted to validate three sets of stimuli, widely used in social neuroscience, to assess moral judgment and theory of mind with the Portuguese population. Each set of stimuli was tested, through a behavioral task, with 44 community-dwelling individuals (24 women, 20 men), aged 19 to 58 years old ( $M_{\text{age}}=32$  years,  $SD=8$ ) who had educational backgrounds ranging from 9 to 22 years ( $M=16.2$  years,  $SD=3.4$ ), from several regions of mainland Portugal. In the moral judgment task, in which 40 moral dilemma translated to Portuguese were presented, the results revealed a lower percentage of utilitarian responses in 15 dilemmas compared to the American version (Greene et al., 2008). In a different task of moral judgment (Decety et al., 2012), in which 46 visual morally laden scenarios were presented, the overall mean accuracy response was high ( $M=80\%$ ,  $SD=18\%$ ). In the theory of mind task the participants had an overall mean accuracy response of 88% ( $SD=5.5$ ). The results found with the moral dilemmas may be related to cultural factors and should contribute to a cautious selection of the dilemmas to be used or with the interpretation of subsequent results. The high mean accuracy responses of the remaining tasks indicate that they are valid to assess moral judgment and theory of mind of the people in mainland Portugal. The present study revealed that the sets of stimuli tested are appropriate to study social neuroscience in the Portuguese population.

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P219 - Studying the Role of the Right Inferior Frontal Gyrus in Visual Perspective Taking Using Transcranial Direct Current Stimulation

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*Abstract:*

Visual perspective taking (VPT) has been defined as the ability to understand whether someone sees something or not (level-1 VPT) and how something looks to them (level-2 VPT). In everyday life, we often need to handle conflicts between one's own perspective and someone else's. This ability requires the contribution of different areas in the brain. Among the regions of interest, we are focusing in this study on the right inferior frontal gyrus (rIFG). So far it is unclear whether the rIFG is involved in the inhibition of the dominant but irrelevant perspective or whether it is specifically involved in self-perspective inhibition. To disentangle these explanations we used a level-2 VPT task requiring participants to judge either their own or an avatar's perspective, these perspectives being either the same (consistent perspective condition) or different (inconsistent perspective condition). Participants performed the task under anodal, cathodal or sham transcranial direct current stimulation (tDCS). If the rIFG is involved in inhibiting the dominant but irrelevant perspective, anodal and cathodal stimulation should affect the performance in the inconsistent perspective condition irrespective as to whether the irrelevant perspective is the participants' own perspective or that of the avatar. In contrast, if the rIFG is involved in inhibiting specifically the self-perspective, the anodal and cathodal stimulation should affect the performance only when the self-perspective is the irrelevant perspective. We will present and discuss the results.

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P220 - Temporal Dynamics of the Influence of "Being Imitated" on Empathy for Pain

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<sup>1</sup>University of Vienna

*Abstract:*

It has been shown recently that being imitated by another person enhances empathic responses to this other person's pain. However, the neural temporal dynamics of this effect have not been clarified yet. Consequently, the current study focuses on this issue by applying an experimental paradigm, which combines an imitation task with an empathy for pain task, while event-related brain potentials are measured.

Data collection is ongoing. So far, 21 volunteers (all male) engaged in the experimental paradigm in which they performed random finger lifting movements. Participants' finger movements were imitated in half of the trials, and were not imitated the other half of the trials by a hand presented, in first-order perspective, on the computer screen. After several finger movements, either imitative or not-imitative, participants watched the hand on screen receiving painful stimulation.

Preliminary analysis suggests that participants exhibit a larger N2 component over posterior electrode sites when seeing the hand receiving painful stimulation after imitative trials compared to not-imitative trials. These results might indicate that being imitated relative to not being imitated focuses participants' attention on the hand, since the posterior N2 component has been linked to attentional and stimulus evaluation processes. This observation might reflect enhanced self-other confusion, which is an assumed result of the influence of imitation on empathy for pain. Due to self-other confusion, the hand might be perceived more strongly as part of one's own body and painful stimulation of the hand might therefore attract enhanced attentional engagement after being imitated by the hand.

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#### P221 - Temporal Neural Dynamics of Automatic Imitation in an Ethnic Version of the Imitation-Inhibition Task

Birgit Rauchbauer<sup>1</sup>, Daniela Pfabigan<sup>1</sup>, Claus Lamm<sup>1</sup>

<sup>1</sup>University of Vienna

##### *Abstract:*

In automatic imitation paradigms the observation of action interferes with execution of instructed movements. This leads to *facilitation* in congruent (i.e. observed and instructed movement match) and *interference* in incongruent trials (i.e. observed and instructed movement do not match). Facilitation leads to faster, interference to slower response times. The mean difference response time between incongruent and congruent trials indexes the automatic imitation effect. Using event-related potentials (ERP), this study aimed to elucidate temporal neural dynamics of automatic imitation linked to stimulus (in) congruency perception and response execution. We modified the imitation-inhibition task (Brass et al., 2000) by presenting White and Black Hands wearing beige gloves to enhance ethnic equality. Behavioral results: No difference concerning the automatic imitation effect for White and Black Hands. EEG results: More pronounced positive amplitudes at parietal sites for congruent compared to incongruent trials 300 – 400 ms (P300), as well as 600 - 700 ms (Sustained Potential, SP) after (in)congruency-stimulus presentation. Moreover, more pronounced positive amplitudes for congruent trials 100 ms prior (Response Preceding Positivity, RPP) and up to 400 ms after response execution at parietal sites. RPP difference waves (incongruent-congruent) predicted the magnitude of the automatic imitation effect. Automatic imitation seems to be modulated at the response execution stage. Ethnicity of the presented hand stimuli did not alter the magnitude of the automatic imitation effect. This task may exemplify enhanced ethnic equality in experimental psychology. Overall this study presents insights into temporal neural dynamics of automatic imitation, which has thus far largely been neglected.

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#### P222 - Temporal Reliability of Resting-State fMRI Mapping at Ultra-High Resolution

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**Abstract:**

Resting-state functional imaging is a novel technique to study functional brain networks during rest that provides a good alternative to task-based fMRI. Previous evidence suggests that language, sensorimotor and visual networks can be reliably extracted with this technique, including in single-subject data. However, due to a largely unconstrained scanning environment —rest— it is essential to examine if mapping results are replicable across sessions. Our goal was to examine the temporal reliability of language, sensorimotor and visual networks in individual subjects. We did so by analyzing data collected with state-of-art, ultra-high resolution 7 Tesla MRI. Sixteen right-handed subjects performed resting-state protocols (15 min, TR 3 s, 1.5 mm<sup>3</sup> voxel size) in three time periods: twice in the same session (intrasession reliability) and again after seven days (intersession reliability). Language, sensorimotor and visual networks were extracted using Independent Component Analysis and classified using a template-matching procedure. Resting-state networks had high intrasession and intersession reliability, as well as high sensitivity and specificity. Language networks were less reliable than motor and vision networks. These results suggest that resting-state data obtained at 7 Tesla show little variability over time, and thus are temporally reliable for brain mapping in single-subjects. Even though ultra-high resolution scanners are still scarce, resting-state protocols at 7 Tesla may become an important tool for mapping functions in the brain.

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P223 - Term and Extremely Preterm Infants' Motor Learning at 3 Months of Age

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**Abstract:**

Extremely premature birth (<26weeks) is known to cause brain injury, including white matter (WM) damage, leading to later physical and cognitive disability. WM injury has been associated with reduced processing speeds and poorer cognitive outcomes in this population. This study used the conjugate reinforcement paradigm at 3 months of age to investigate the acquisition speed of a learnt motor response in a cohort of extremely preterm infants, compared to term-born controls. The standard conjugate mobile task was performed, with a baseline recording of 2 minutes and a training phase of 6 minutes. Using the widely accepted criteria for learning in this task (Rovee *et al.*, 1980), learning was defined when the infants displayed leg kicks 1.5 times greater than baseline for 2 consecutive minutes. Our findings suggest that 66% of the term infants (n=41) displayed a learnt response, in contrast to 33% of extremely preterm infants (n=22). The term infants also demonstrated a preference for the limb attached to the mobile, whereas the preterm group did not. These findings suggest a larger proportion of preterms are unable to translate incoming visual information to kinaesthetic learning in the time provided, potentially indicating reduced processing speeds within this group. This supports previous findings associating WM injury to the sensorimotor outcomes within preterm infants. Future follow up of this cohort will help clarify whether this task is detecting delays much earlier than other current clinical methods and if this could be a potential indicator of later cognitive function in children born extremely premature.

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P224 - The Anticipation of Emotional Events in Alexithymia

Francesca Starita<sup>1</sup>, Elisabetta Làdavas<sup>1</sup>, Giuseppe di Pellegrino<sup>1</sup>

*Abstract:*

Alexithymia is characterized by difficulties in emotion recognition, emotional response and response regulation, especially related to negative emotions. Nevertheless, its causal mechanisms remain elusive. Reduced anticipation of emotional events may be one such mechanism because it enables the individual to prepare to respond effectively to coming emotional events. To test this hypothesis differences in physiological response among individuals with high (HA), medium (MA) and low (LA) levels of alexithymia while learning to anticipate aversive and rewarding emotional events. Changes in skin conductance response (SCR) were recorded continuously in participants during a fear conditioning and a reward conditioning task. Two coloured squares represented the conditioned stimuli. One of them (CS+) was reinforced with a mild electrical stimulation or a monetary reward (UCS) while the other (CS) was never reinforced. During fear conditioning, SCR to CS+ was lower in HA compared to MA and LA. On the other hand, groups did not show differences in SCR during reward conditioning. Therefore, HA appear less responsive in anticipating the consequences of emotional events compared to LA and MA, which seems to be specific for negative emotional stimuli. Disruption of this process may lead to difficulties in recognition, response and response regulation to negative emotional events, which characterize HA and may represent a unifying causal mechanism underlying the difficulties in emotion processing of HA.

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P225 - The Assessment of Action Metaphor Comprehension (AAMC)

Eleonora Borelli<sup>1</sup>, Alexander Swenson<sup>2</sup>, Andrew Katirai<sup>2</sup>, Thomas Adams<sup>3</sup>, Lisa Schamber<sup>2</sup>, Sona Shah<sup>2</sup>, Lisa Aziz-Zadeh<sup>2</sup>

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<sup>3</sup>Rosalind Franklin University

*Abstract:*

The theory of embodied semantics for metaphor processing posits that conceptual representation involves sensorimotor cortical representations related to the meaning of the words. For example, a phrase like “kick the bucket” may be processed by motor regions involved in producing a kick. It is thought that the degree that embodied representations are activated may also depend on metaphor familiarity, with novel metaphors relying on embodied representations more than frozen or conventional metaphors. While some neuroimaging studies have tested these hypotheses, to our knowledge, no systematic attempt has been undertaken to build a tool to test these theories in neurological patients. Here we present data from the Assessment of Action Metaphor Comprehension (AAMC), a new test designed to examine motor metaphor comprehension in individuals with stroke to motor regions. Nineteen non-disabled individuals (age: 45-74) participated in the assessment. All subjects were right-handed and native English speakers. Tested metaphors (N=55) belonged to 3 categories (motor hand, motor foot, non-motor) and to 3 familiarity categories (frozen, conventional, novel). Instructions required that subjects choose one picture among four that matched a specific metaphor. Preliminary analyses indicate that accuracy was at 88%, with action and control metaphors showing no significant differences. Accuracy scores were significantly lower for less familiar metaphors, though this effect did not interact with type of metaphor (action, control). Thus, preliminary data indicate that the AACM seems to be appropriate to assess motor metaphor comprehension and may be appropriate for use in patients as well.

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P226 - The Cerebellar Involvement in Visuospatial Working Memory: Differences in Sequential and Simultaneous Components within Reaching and Navigational Space

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**Abstract:**

The cerebellar function in spatial navigation has not been clearly demonstrated in humans. This difficulty is linked to the different features that characterize this complex function such as the distinction between reaching or navigational space and between sequential or simultaneous presentation modality of information.

Aim of the study was to verify whether the cerebellum mediates the processing of information in both navigational and reaching space and to determine whether the eventual involvement is influenced by the modality in which the information is presented.

The performances of 14 patients affected by cerebellar damage were compared with those of 63 healthy control subjects. The experimental protocols were assessed in both reaching and navigational space. Sequential and simultaneous components of visuospatial working memory were investigated in reaching space by means of different paper tests. The same components were investigated in navigational space through the construction of an electronic platform named "Smartile", an innovative tool with an electronic component by which the software records the changing in body position of the subjects.

In spite of a high variability in the performances of cerebellar patients, the results demonstrated a greater impairment when simultaneous modality of information processing is required. A prevalent impairment in simultaneous tasks is present in both reaching and navigational space.

The present findings support the hypothesis that visuospatial memory consists of different components and that these components can be selectively damaged. Further clinical evidences are necessary for a better definition of the cerebellar role in visuospatial domain.

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P227 - The Cognitive Control of Empathy

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**Abstract:**

Affective empathy is subject to modulation by different contextual factors (Hein & Singer, 2008). We complimented these findings by showing that psychopaths were able to self-modulate their empathy at the neural level when they were instructed to 'feel' for the victims of emotional videos (Meffert et al., 2014). These findings suggest that our ability to empathize with others is subject to voluntary cognitive reappraisal of the stimuli. Thus, the aim of our study was to find the neural correlates of the cognitive control of empathy in healthy individuals.

We recruited 19 young male subjects that underwent 3-fMRI scans while they watched emotional clips. Sessions differed in the cognitive appraisal of the participants, subjects were explicitly required to: a) focus on their own emotions, b) to be empathic, or c) to be detached from the characters' emotions.

We used the intersubject correlation analysis (ISC) to model temporally dynamic changes in the BOLD response across conditions (Ames et al., 2015).

A conjunction analysis of the modulation conditions showed a significant recruitment of the middle frontal gyrus, the pars orbitalis, and the medial frontal gyrus. Additionally, subjects recruited the insula, the bilateral temporal gyrus, and superior parietal regions bilaterally

(height threshold  $T = 2.99$ ,  $p < 0.05$  fdr). We conclude that we can self-modulate our affective empathy, and this modulation is related to the prefrontal cortex, a brain region associated to higher cognitive capacities. Empathy seems to be a top-down regulated process and could sub serve to other higher executive processes.

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P228 - The Development of Emotion Cognition Interactions: An fMRI Study of An Emotional N-Back Task in Adolescents vs. Adults

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*Abstract:*

In adults, emotional distraction influences top-down cognitive control indicated by interactions in several brain regions including the amygdala and the dorsolateral prefrontal cortex (dlPFC). Dual process theories of adolescent brain development hypothesize faster maturation of "affective" structures (amygdala and striatum) but slower maturation of the dlPFC involved in cognitive control in adolescents relative to adults thus exacerbating this effect. Data from two separate experiments will be presented, a behavioural and an fMRI version that probed dual process theories. Specifically, we examined how relevance of the emotional stimulus affected working memory ability. Participants either had to pay attention to the emotion (task relevant condition) or judge the gender (task irrelevant condition) of happy, angry or neutral faces. In the behavioural study, adolescents (ages 12-14) and adults (ages 18-29) showed a benefit in cognitive control during positive information when affective information was task relevant, which was more pronounced in adolescents. In the fMRI version adults but not adolescents showed a modulation of the PFC during angry faces depending on working memory load. Similarly, in the amygdala adults but not adolescents responded to the presence of angry faces when the task was relevant but not irrelevant. By contrast, happy faces elicited a stronger effect in ventral striatum in adolescents relative to adults. Depending on the context, such increased sensitivity to positive information could either serve as risk or resilience factors for psychopathology. The findings are highly consistent with, and will be discussed in relation to neurobiological models of adolescent development.

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P229 - The Development of the Decision Making in Youths: Gender and Heavy Alcohol Drinking

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*Abstract:*

**Objective:** The goal of this longitudinal study was to investigate the development of the decision making as indexed by performance in Iowa Gambling Task (IGT) in male and female university students. A second objective was to determine the association between the IGT performance and heavy drinking (HD) trajectories.

**Method:** Subjects were 155 first-year students, 76 males and 79 females, followed prospectively over a four-year period. They were classified as stable non-HD, stable HD and Ex-HD according to their scores in the AUDIT. Decision making was assessed by the IGT three times during the follow-up. Contingencies of gain and loss were taken into account. Generalized linear mixed models were applied.

**Results:** There was a significant improvement in performance in both genders over the years. Females showed a greater sensitivity to loss (RR= 1.12, 95 % CI: 1.03-1.20) in comparison to

males. No gender-related differences were found in contingencies of gain. A stable HD pattern was not associated either with sensitivity to gain (RR= .96, 95%CI .89-1.05) or with loss (RR= 1.02, 95% CI.94-1.11) in the IGT in comparison with a stable non-HD pattern.

Conclusions: Performance in decision making is still improving in late adolescence, suggesting neuromaturational development in both genders. Females and males perform differently in decision making. In particular, females have a greater sensitivity to frequency of loss. Finally, heavy drinking during the college years is not associated with deficits in decision making.

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#### P230 - The Effect of Acute Aerobic and Resistance Exercise on Executive Function and Attention of Adults

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##### *Abstract:*

**Introduction:** The effects of chronic physical activity on cognition in older adults have been extensively investigated. Different interventions of acute physical activity have resulted in improvements in cognitive functions, however it is not clear which intervention has the highest effect.

**Purpose:** To assess the influence of acute bouts of aerobic versus resistance exercise on executive function and attention of adults.

**Methods:** Forty physically active adults (age = 51.88±8.46 yr) served as participants. Each subject visited the laboratory four times: on the first visit participants performed computerized cognitive test. An aerobic fitness assessment was then conducted and after a 30 minutes rest an assessment of maximal strength on six exercises was performed. During visits 2-4, participants completed the cognitive test before and after the experimental condition, which consisted of either 25 min of aerobic exercise, resistance exercise, or watching a recorded interview show in a seated position (control condition).

**Results:** Findings indicated significantly higher scores on attention after aerobic exercise relative to the pre-exercise scores, but not after resistance exercise or the control activity. Executive function scores showed a trend of improvement following both aerobic and resistance exercise, but not after the control activity.

**Conclusion:** The results suggest that adults should consider augmenting both modalities into their training routines as they improve their cognition, in addition to other physical benefits.

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#### P232 - The Effects of Pain-Related Words on Aversive Response

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##### *Abstract:*

A few recent studies suggest that processing pain-related words may enhance activation of part of the neural pattern underlying pain and modulate its perception (Richter et al., 2010, 2014). Would mere reading of pain-related words elicit avoidance responses similar to the ones elicited by noxious stimuli? The aim of this experiment was to address this question. We expected pain-related words will elicit faster avoidance responses than pain-unrelated words, and such responses will be modulated by the degree of painfulness associated with each word. Participants judged whether a visually presented word was positive or negative. Stimuli consisted of 60 positive words and 60 negative words, of which 20 pain-unrelated, 20

physical pain-related and 20 psychological pain-related words. Pain-related stimuli were selected from a database of 512 Italian pain-related words, rated for psycholinguistic, emotional and pain-related variables (Borelli et al., submitted). To induce a stimulus-centred perspective in approach/avoidance responses (Phaf et al., 2014), participants were instructed to press a central key as a starting point and to judge the word valence by pressing a button closer to the screen for positive words (approach) and farther from the screen for negative words (avoidance). In the avoidance condition, release times were faster for pain-related than pain-unrelated words. Partial correlations revealed that pain-related variables modulate the avoidance response to pain-related words by speeding reaction times. Hierarchical regressions showed that pain-relatedness and valence affect response times independently of one another, even after the contribution of psycholinguistic variables had been taken into account. These results suggest that words conveying pain trigger behavioural responses at least in part similar to the ones elicited by real, nociceptive stimuli.

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### P235 - The Face of Lie: The Use of CIT Methodology for Lie Detection in Face Recognition by Eyewitness Testimony

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#### *Abstract:*

Eyewitness testimony is one of the main and most widely used forensic evidence in the judicial system, although their accuracy rate in lineup identification is not above 25%. However, besides the involuntary mistakes due to false memories and/or inaccurate perception, deliberate perjury can also occur. However, detecting it is very difficult, mainly due to the difficulty of verifying the veracity of the eyewitnesses' testimonies. False memories or unintentional mistakes are not the same as lies and this difference is decisive during performance on a Concealed Information Test (CIT). The CIT aims to detect guilty knowledge and is based on the premise that, under certain conditions, critical information might originate specific physiological responses. This test is based on the oriented reflex theory which states that orienting reflexes occur when people are confronted with personally significant stimuli. Orienting reflexes origin physiological responses that can be registered by various psychophysiological techniques. In a CIT study, a guilty examinee will respond differently to the critical item (e.g., the recognized murder weapon), comparing to the non-critical items (e.g., other weapons). However, an innocent person will have identical physiological responses when answering to all the items. Various studies of lie detection using the CIT have been conducted, however, the performance of the eyewitness on a CIT paradigm using faces has not been consistently explored. Forty-eight participants viewed 4 movie segments exhibiting a crime scene, and completed a 20 photos CIT after each movie segment (5 critical items – photo of culprit, and 15 irrelevant items - other men). Half of the participants were instructed to lie when they saw the culprit in the photo lineup, whereas the other half of the participants were instructed to tell the truth. The ECG was recorded during performance on the CIT and analysed 15 seconds after each stimulus. The results showed a statistically significant difference in the heart rate of liars between critical and irrelevant items in the sixth second after the stimulus and a statistical trend in seconds 5, 14 and 15. In the group of truth tellers, no statistically significant differences in heart rate were observed between the two types of items. These results are consistent with the literature, and suggest that the CIT using faces is a valid methodology for lie detection and may therefore be used in eyewitness situations.

## P236 - The Feedback-Related Negativity during Performance on the Halstead Category Test

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### *Abstract:*

The aim of this work was to study the electrophysiological correlates of performance on the Halstead Category Test (HCT), a neuropsychological test that measures a person's ability to formulate abstract principles. Performance must be adjusted based on feedback after each trial and errors are common until the underlying rules are discovered. Event-related potential (ERP) studies associated with the HCT are lacking. This work demonstrates the use of a methodology inspired on Singular Spectrum Analysis (SSA) applied to EEG signals, to remove high amplitude artifacts resultant from ocular movements during performance on the test. This filtering technique introduces no phase or latency distortions, with minimum loss of relevant EEG information. After signal treatment, we were able to successfully identify a frontocentral ERP wave related to error-processing: the feedback-related negativity (FRN), peaking around 250 ms, after feedback. As expected, errors elicited more negative amplitudes on that potential than correct responses. Results are discussed in terms of the functional significance of the FRN potential as an electrophysiological correlate of performance on the HCT. The FRN identified during this test can then be used as an electrophysiological marker of feedback processing, which allows it to be used with different pathologies that might show impairments at this level.

Funding: This research was supported by Bial Foundation with Grant Ref 136/08 to Isabel M. Santos and by funding from Foundation for Science and Technology (FCT) and the POPH/FSE Program (grant reference SFRH/BPD/101112/2014) to Ana R. Teixeira.

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## P238 - The Influence of Pro-Social Motives on Lying Behavior and Underlying Neural Mechanism

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### *Abstract:*

Objectives: Contrary to classic economic theory which assumes lying does not carry any cost, accumulating evidence suggests that people encounter utility loss due to deception (Gneezy U., 2005, Shalvi S. et al., 2011). This utility loss might be reduced if the deception was justified by a pro-social motive, e.g. when gains favor a charity organization (Lewis A. et al., 2012). However, the neural mechanism underlying such modulation is not well understood. The current study aimed to investigate the associated neural signature by combining computational modelling with fMRI in an incentivized game set-up.

Methods: Forty-seven healthy participants (29 females) attended the fMRI experiment. We adopted a modified sender-receiver paradigm where participants as the senders would earn different monetary amounts by lying or telling the truth. To further explore the

modulation of pro-social motives on lying behavior, the beneficiaries of participants' decisions were either charities or themselves. SPM 8 was used to analyze the fMRI data. Results: Behaviorally, participants lied more to benefit the charity than themselves. At the neural level, the anterior insula (AI) showed higher activation when participants chose to lie and benefit themselves (vs. charity). As hypothesized, we found a significant positive correlation between the prosocial effect on the lying disutility and the prosocial effect on the activity in the AI.

Conclusion: Our results show that prosocial motives decrease the utility loss caused by lying. This effect is related to activity in the anterior insula.

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#### P239 - The Melody of Voice across Cultures: An ERP Study of Emotional Vocal Change Detection

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#### *Abstract:*

The way in which humans express and recognize emotions is largely universal. Studies on visual processing, for example, have shown increasing evidence of a universal emotional bias towards negative stimuli. But the extent to which the same effect is observed in other sensory modalities (e.g., auditory) and whether it is the result of cultural/universal human characteristics remain issues that need further investigation. To understand how the interplay between these factors modulates on-line neural responses to auditory emotional information, we compared how two different cultural groups, English-speaking Americans and Portuguese, process non-verbal vocalizations with neutral and emotional (happy and angry) content. Auditory Event-Related Potentials (ERPs) were recorded from 15 American and 20 Portuguese individuals during performance of a modified version of the auditory oddball paradigm. The paradigm comprised four blocks in which vocalizations selected from the Montreal Affective Voices database played both the role of standard and deviant sounds. Participants' task was to attentively listen to deviant sounds and count the number of times they were presented. The P300 component was analyzed. Overall, a more positive P300 for angry vocalizations in the American group was found, as opposed to a more positive P300 for happy vocalizations in the Portuguese group. These findings challenge the view of negative information having a privileged access to attentional brain resources and suggest that culture modulates the neurocognitive processing of auditory emotional expressions.

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#### P240 - The Neural Background of Language Specific Prosodic Information Processing

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#### *Abstract:*

The aim of the present study was to investigate the language specific aspects of word stress processing. Previous studies investigating the neural background of word stress processing demonstrated that the change of stress pattern is processed in an automatic way in disyllabic words as shown by the emergence of the Mismatch Negativity (MMN) ERP component. In the case of trisyllabic words, the situation is more complicated, because there are two possible stress pattern violations, and languages might differ in how listeners process these violations.



In the present study, speakers of a fixed-stress language (Hungarian) heard trisyllabic pseudowords in a passive oddball paradigm, while we recorded the brain's electrical activity with a 128-channel EEG system. Pseudowords were stressed on one of the three syllables and were presented both as standards and deviants in different conditions. Results showed that pseudowords stressed on the first syllable (legal stress pattern in Hungarian) did not elicit the MMN component, while pseudowords stressed on the second and third syllables (illegal stress patterns in Hungarian) elicited MMNs related to the appropriate syllables. Thus, the MMN appeared only when the standard had a legal stress pattern, but there was no MMN when the standard had an illegal stress pattern.

Our results demonstrate the inability of illegally stressed pseudowords to form a reliable memory trace for comparison, and suggest that the legal stress pattern of a particular language has a specific long-term neural representation.

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#### P241 - The Neural Bases of Sustained and Transient Event Monitoring: An ERP-fMRI Study

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#### *Abstract:*

The ability to monitor environment over time in order to detect the occurrence of specific targets entails sustained as well as transient control processes. Previous research has shown that frontal as well as parietal areas subtend such processes. However, it is not clear yet which areas specifically contribute to each of the two components. In this study, functional magnetic resonance imaging (fMRI) and electroencephalography (EEG) were simultaneously recorded and jointly analyzed in order to disambiguate the role of these areas. Unlike similar research, a block-design experiment was conducted. Participants were presented with faces. In half of the blocks, they were asked to perform a female/male discrimination task (non-monitoring blocks). In the other half, they were additionally asked to monitor the occurrence of specific stimulus categories (monitoring blocks). The fMRI data resulting from the contrast between monitoring and non-monitoring blocks showed the co-activation of a set of bilateral fronto-parietal areas. These areas were associated with the sustained component of monitoring. The analysis of event-related potentials revealed a larger slow negative deflection over frontal electrodes in monitoring blocks. The block-by-block variability of this ERP component was convolved with the block-wise blood oxygenation level-dependent (BOLD) activity. This analysis evidenced the involvement of right-lateralized areas, including the angular gyrus and the superior frontal gyrus, which therefore are suggested to mediate the transient component of monitoring. Overall, the findings extend previous studies by clarifying the specific spatio-temporal characteristics and functional role of fronto-parietal areas in monitoring processes.

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#### P242 - The Neural Bases of the Black-Sheep Effect

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#### *Abstract:*

Inter-group relations and attitudes towards group membership have been extensively studied in the social neuroscience field (Amodio, 2008). The Black Sheep Effect refers to a group membership evaluation bias accounted by the Subjective Group Dynamics Theory (framed in the Social Identification Approach), where the normative and deviant members

of the in-group are judged more extremely when compared to members of the out-group (Marques, Yzerbyt & Leyens, 1988). Although extensively studied in the social psychology field, there is no existing approach to the neural mechanisms underlying the Black Sheep Effect. In the present study we explored the ERP correlates of this effect.

The experimental procedure consisted in the presentation of pictures of four targets both representing two within-participants factors: members were presented as either in-group (same University) or out-group (competing University) of the participants (university students). Moreover, members were either normative (according to the standards of the society) or deviant (violating the standards of the society) regarding their supposed opinions to the target about several relevant social issues. ERPs were extracted considering the presentation of the target's face and opinion, in order to analyse the N170 and the P300 components, respectively, and members' evaluations.

The preliminary results suggest that the brain correlates of the Black Sheep Effect are consonant with the Subjective Group Dynamics assumptions with extreme peak amplitudes (for both N170 and P300 components) being associated with the processing of the ingroup member, and respective opinion.

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#### P244 - The Neural Oscillations of the Sentence Superiority Effect

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##### *Abstract:*

Sentences are recalled easier than random word sequences, a phenomenon called the sentence superiority effect (Brenner, 1940). Previous research suggests that sentence structure is used to efficiently chunk words into working memory during encoding, resulting in decreased working memory demands during the retention of sentences compared to other verbal information (Bonhage, Fiebach, Bahlmann, & Mueller, 2014, Jefferies, Lambon Ralph, & Baddeley, 2004). The current time-frequency EEG study independently manipulated task type (working memory vs. lexical decision task) and material type (sentences vs. word lists) to assess the neural oscillations underlying the sentence superiority effect. Our results show specific oscillatory counterparts of sentence encoding and retention: During sentence encoding, increased delta power was observed, while the pause between encoding and response yielded a decrease in both theta and gamma power. General task effects were seen as theta suppression for working memory encoding and a sustained alpha increase during retention. The data suggest orthogonal neural dynamics for linguistic and working memory processes, jointly leading to an overall behavioral benefit for retaining sentence structure in working memory. We argue that syntactic structure enables automatic chunking and storage, benefitting behavior without direct neural interaction with the working memory system.

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#### P248 - The Psychological Refractory Period Paradigm: Age-Related Differences in Performance and Event-Related EEG Potentials

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##### *Abstract:*

In many everyday-life situations, multiple and conflicting tasks require a high level of cognitive resources. However, cognitive performance in these tasks decreases with increasing age. Moreover, elderly people show large inter-individual variability in

performance but little is known about the underlying neural processes. Thus, we analyzed the performance in a large sample of healthy elderly participants ( $n = 138$ , age:  $> 65$  years) in a dual task situation (psychological refractory period paradigm) in comparison to a group of young participants ( $n = 36$ , mean age 25 years). Reaction times and error rates of elderly participants were strongly increased in trials when both tasks appeared simultaneously (SOA = 0 ms, vs. 750 ms). Based on their overall performance (mean inverse efficiency), we clustered three groups of well, medium and poorly performing elderly. Differences in task performance were significant between all groups. The groups also differed in respect to event-related potentials during task preparation: the frontal CNV amplitude prior to the target presentations was significantly increased in well-performing elderly as compared to both other groups of elderly. Moreover, reduced amplitudes of fronto-central P2 in response to the second target stimulus indicate less efficient recall of stimulus response (S-R)-mappings in poorly performing elderly. In general, shorter reaction times in young participants as compared to elderly were reflected in shorter P2 latencies. These results show that superior performance in dual-task situations in elderly is due to more efficient allocation of cognitive resources prior task execution and well preserved retrieval of S-R mappings.

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#### P249 - The Role of Action-Feedback Contingency in Optimizing Tone-Eliciting Actions

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##### *Abstract:*

Numerous studies have shown that the processing of sensory events caused by our own actions requires less processing resources than those originating from external sources. Influences in the opposite direction are, however, usually disregarded: in most studies, it is generally assumed that actions (e.g. key-presses) are invariable regardless of their sensory consequences. In the present study, we investigated how action-parameters (force applied to a response device) changed as the function of action-effect contingency.

Participants were instructed to briefly pinch a force-sensitive resistor repeatedly every 3 seconds. In one condition, no effects were triggered. In another condition, when pinch force exceeded a certain threshold, a tone was presented. In a third condition, a pinch elicited a tone and flashed a light-emitting diode (LED). To manipulate the level of action-effect contingency, in two further conditions, externally initiated sounds identical to the self-produced ones were also intermixed with the self-produced sounds.

Pinch force was strongest when neither sound nor LED flash was elicited. The addition of the LED flash as an effect lead to reduced pinch force. When the level of action-effect contingency was reduced by intermixing externally initiated sounds, participants applied more force.

These results suggest that participants relied on the action-effects to minimize effort. The presence of more feedback sources lead to the adoption of an action parameter which was closer to the optimum. Importantly, however, the results indicate that it was not solely the presence of feedback, rather the level of action-effect contingency which allowed this optimization.

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#### P250 - The Role of Anterior Insula in Empathy and Sympathy

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##### *Abstract:*

It is generally agreed that in order to understand the neurocognitive basis of empathy it is necessary to distinguish the empathic process from other socio-cognitive processes that also

involve the representation of another's affective state. For example, empathy and sympathy can be differentiated on the basis of the congruence between the affective states of the other and of the self, while empathy refers to affective changes that are induced in the observer and are isomorphic with the affective state of another person, sympathy refers to affective changes that are induced in the observer but are not necessarily isomorphic with those experienced by the other. Previous neuroimaging studies have shown that the experience and the observation of others' experience of pain and disgust commonly activate the anterior insula. This shared activation has been interpreted as an indication that empathy is represented in this region. However, we do not yet know whether the response overlap observed is indeed a reflection of a representation of specific emotions (as in empathy) or otherwise a reflection of a general representation of negative affect (as in sympathy). Elucidating the role of anterior insula in these distinct socio-cognitive processes is particularly important as measures of anterior insula activation in response to others' affective states are frequently used as an index of empathic response and empathic ability, for example when assessing clinical populations, inspecting sex or cultural differences, or even inspecting individual differences in empathic processing.

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#### P251 - The Role of Attention in Emotional Modulation of Time Perception

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#### Abstract:

Emotions change time perception by speeding up or slowing down the internal clock and these effects have been generally attributed to changes in arousal. Previous research suggests that emotional events are perceived to last longer than they actually do, indicating subjective lengthening of time. The purpose of the present study is to investigate the contribution of attention processes in the emotional modulation of time perception. Participants produced short temporal intervals (0.9, 1.5, 2.7, and 3.3 seconds) while viewing images of highly arousing pleasant and unpleasant content in comparison to neutral images from the International Affective Picture System (IAPS). Behavioural measures indicated overproduction of 0.9 s intervals whereas 2.7 and 3.3 s intervals were produced significantly shorter. In addition, the effect of valence occurred for the shorter intervals and disappeared as the target intervals became longer. Specifically, unpleasant images were produced shorter for the 0.9 s interval whereas images with pleasant content significantly lengthened produced durations for 1.5 s and shortened them for 2.7 s intervals. The general tendency for the affective stimuli was to increase the rate of subjective time. Event-related potential (ERP) correlates of different processing stages of affective stimuli were employed to differentiate possible role of arousal and attention in time perception. Early Posterior Negativity (EPN, 150-320 ms) was significantly larger for pleasant than for unpleasant images, suggesting valence-specific effect on early attention mechanisms. Regarding the early P1 (60-150 ms) and the Late Positive Potential (LPP, 320-500 ms) components, both pleasant and unpleasant stimuli demonstrated equal affective modulation. These results indicate that images with pleasant and unpleasant content both influence attention and subsequent arousal processes, but the early attentional capture is more evident for the pleasant stimuli. Additional frequency analysis of EEG investigated alpha and gamma activity in relation to timing and affective information processing.

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#### P252 - The Role of Mindful Exposure to Emotions in Affective Adaptation

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Abstract:

Mindfulness – the nonjudgmental awareness of the present experience – has been shown to promote emotional functioning. The proposed mechanisms underlying this outcome, however, require further empirical testing. This study investigated the immediate effects of open monitoring mindfulness exercise on affective responding. The Late Positive Potentials (LPP, 260-1500 ms, centro-parietal electrodes) induced by negative and neutral IAPS images were analyzed across repetitive stimulus presentations for 37 meditation-naïve participants performing open monitoring exercise, and during subsequent re-exposure. Affective LPP amplification was used as a measure of emotional salience of negative images, and the latency of this amplification as an indication of the automaticity of emotional reactions. Compared to two active control conditions where attention was either diverted to a distracting task or the stimuli were attended in a non-mindful way, open monitoring enhanced the initial LPP response to negative stimuli, indicating increased exposure. Across stimulus repetitions, mindfulness reduced and ultimately removed the affective LPP amplification, suggesting extinction of emotional reactions. For images previously viewed mindfully, the affective LPP amplification remained absent during re-exposure, pointing to reconsolidation of emotional information. These dynamics were further enhanced by trait and state mindfulness. The processes of exposure and extinction were largely absent in control conditions. Mindfulness was also the only task that interfered with relatively automatic emotional salience detection as indicated by lack of affective amplifications in the early LPP window (< 500 ms). Taken together, these findings indicate that mindfulness fosters affective adaptation by enhancing exposure to emotional experiences and facilitating extinction of habitual emotional responses.

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P253 - The Role of Post-Decisional Anticipated Emotion in the Resolution of Moral Dilemmas  
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Abstract:

Drawing from the dual process theory of moral judgment, we tested if post-decisional anticipated emotions of regret, guilt, shame, anger, and disgust can account for individuals' choices in sacrificial moral dilemmas. These dilemmas depict the choice of letting some people die (non-utilitarian option) or sacrificing one person to save them (utilitarian option). We collected participants' choices and post-decisional emotional ratings for each option using Footbridge-type dilemmas, in which the sacrifice of one person is the means to save more people, and Trolley-type dilemmas, in which the sacrifice is only a side effect. Moreover, we computed the Readiness Potential to test if the neural activity related to the last phase of decision-making was related to the emotional conflict between options. We hypothesized post-decisional emotions to be stronger for utilitarian as compared to non-utilitarian options, especially for Footbridge-type dilemmas. Crucially, we expected participants to choose the option associated with the least intense emotions. The results showed that participants chose the option that minimized the intensity of negative emotions, irrespective of dilemma type. However, while the emotions were generally stronger for the utilitarian as compared to the non-utilitarian options, in Trolley-type dilemmas, anger and regret were stronger for the non-utilitarian option. Finally, no relationship between emotions and the amplitude of the Readiness Potential emerged, suggesting that post-decisional anticipated emotions might play a role in earlier stages of decision-making.

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P254 - The Significance of the Right Dorsolateral Prefrontal Cortex for Pitch Memory

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<sup>3</sup>Amsterdam Center for Language and Communication, University of Amsterdam, The Netherlands

**Abstract:**

Pitch memory is a key factor for music and language processing. Neuroimaging studies have highlighted a complex neural network comprising temporal, parietal and frontal brain areas including the right dorsolateral prefrontal cortex (DLPFC) for the pitch memory process. In a previous study, we showed that the application of transcranial alternating current stimulation over the right DLPFC at a low gamma frequency improved pitch memory in congenital amusics, who dispose music processing deficits. Here, we explored the effects of cathodal transcranial direct current stimulation (tDCS) over the right DLPFC on pitch memory in healthy non-musicians in order to determine whether pitch memory can be disturbed by cathodal tDCS. In three sessions, 27 participants completed a pitch and visual memory recognition task at baseline and after receiving cathodal or sham tDCS over the DLPFC. The overall analysis showed no significant effects of the factor session on pitch or visual memory performance. However, when dividing the sample at the median of the pitch memory baseline performance and including this factor into the analysis, the results showed that pitch memory differed at baseline and in the sham condition but this difference did not persist after cathodal tDCS. This effect was due to a decline of pitch memory only in superior performers following cathodal stimulation. Visual memory was not affected. Taken together, the study shows a differential and selective effect of cathodal tDCS on pitch memory depending on baseline performance and provides additional support for the significance of the right DLPFC for pitch memory.

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P255 - The Smell of Masculinity: Attractiveness Preferences towards Body Odours of Men Varying in Skin Colour Masculinity

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**Abstract:**

Body odours may possess an inherent higher level of relevance to the perceiver by assuming an evolutionary function of promoting one's genes. It has been demonstrated that olfactory signals with high ecological importance, similarly to visual signals, are processed in a privileged way by the brain. Body odours of more masculine men might trigger higher attractiveness responses in women's perception, a mechanism that would affect mate-selection. In this study, masculinity was accessed through skin colour, based on a previous study that proved skin colour to be sexually dimorphic and possibly a sign of genetic quality. To do so, facial skin colour measurements and body odour samples were taken from 18 male participants. The body odours collected were then presented to 42 heterosexual females who rated them in attractiveness. The goal was to investigate whether the body odours of donors with more masculine skin colour would be rated as more attractive since masculinity is believed to represent genetic fitness. As expected, higher attractiveness ratings were given to odours belonging to men with more masculine skin colour. This result supports the idea that skin colour can be an indicator of fitness, influencing mechanisms of sexual attraction and selection. Also, body odours seem to be important informational cues that determine several behavioural mechanisms including attractiveness responses.

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P256 - The Things You Do. Observers Implicitly Predict Behaviour Based on Past Actions in a Person and Object Specific Manner

Abstract:

Predictive coding models of action observation predict that expectations of others' actions affects identification of those actions. Here, we dissociated the effects of expectations provided by the statistical distribution of action likelihoods and explicit action expectations. Participants reported whether actors interacted or turned from objects. Trials were manipulated so that one actor typically interacted with one object and turned from the other object. In a first test we found observers implicitly 'learned' person- and object-specific behavioural tendencies. Response times were faster when the actor performed their 'typical' action (e.g., John kicked) than their atypical action (e.g., John typed). Actors were also perceived to have increased liking for objects they typically interacted with than those they typically turned from. Thus we access situation-specific internal models about others' behaviour during action observation which facilitates our predictions of their most likely actions in the current situation. In a second test participants assessed an explicit hypothesis over a number of blocks (e.g., John tends to kick the ball but turn away from the computer). Blocks either conformed to or contradicted this hypothesis. As before, response times were faster for the actual statistical regularities seen, but error rates conformed to the explicit hypotheses (more errors were made when the hypothesis and patterns in the stimuli mismatched). Therefore, action observations integrate multiple sources such as (low level) statistical regularities and (high level) explicit information from others. We implicitly 'learn' behavioural tendencies about others and overtly 'test' them in future encounters.

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P257 - The Understanding of Gestural Hesitation in Infants

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<sup>2</sup>University Medical Centre Groningen

Abstract:

The ability to attribute reliability to a person is an important social skill. It is acquired during early infancy. However it remains unclear at what age infants are able to link a gestural hesitation to the reliability of a person. One important factor that may aid the understanding of a hesitation is to be aware of its cause. Using a preferential looking paradigm in twenty-five 24-month-old infants, we investigated if infants preferentially used the pointing of a confident over a hesitated hand as a cue to a hidden object.

All infants watched two sets of videos containing four unique videos each. The first set contained videos including gestural hesitation. At the beginning of each videos, two closed boxes were presented. Afterwards, two actors took turns at pointing at one of the two boxes. One actor pointed confidently and the other hesitantly. At each moment in time, only the hand and arm of one actor was visible. The two actors differed in color and pattern of their sleeves. After a delay of two seconds, an interesting object, for example a ball, was revealed in the box the confident actor pointed at. The second set followed the same storyline, however the access to the left box was occluded by an obstacle in form of book shelves mounted to the background. Preferential looking was defined as the differences in percentage of looking time spend on the box pointed at confidently and the box pointed at hesitantly during the 2-second delay phase.

We found that hesitation is recognized as a cue for unreliable information, but only when access to the target is restricted by an obstacle. It has been described earlier that the presence of a situational constraint evokes longer looking times in 15-month-old infants. However, this cannot explain the findings in the current study, as looking times during the entire videos were not different for the two conditions. We interpret this finding as the necessity of a reasonable explanation for the hesitation to influence the looking preference.

The obstacle makes it reasonable for the actor to stop and consider whether to take the extra effort to reach the target through the book shelves.

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### 133 P258 - The Use of Endogenous Levels of Steroid Hormones and Gray Matter Volumes in Predicting Aggressive and Impulsive Behaviours

Mikhail Votinov<sup>1</sup>; Lisa Wagels<sup>2</sup>; Despina Panagiotidis<sup>2</sup>; Benjamin Clemens<sup>2</sup>; Ute Habel<sup>2</sup>

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#### Abstract:

Findings from various studies demonstrated that steroid hormones testosterone (T) and cortisol (CRT) play a crucial role in regulating aggressive and impulsive behaviors. However, it is still unclear how baseline concentrations of these hormones are linked to aggression and impulsivity traits and gray matter volumes in brain regions implicated in aggressive and impulsive behaviors.

We investigated this question by means of voxel-based morphometry (VBM). The basal level of T and CRT was measured from 83 healthy subjects, all of whom underwent MRI scanning. To assess aggression and impulsivity traits, we used the aggression questionnaire (AQ) and the Barratt Impulsiveness Scale (BIS-11). Gray matter volumes (GMV) were extracted from anatomical regions of interest from the aggression network. Multiple regression analyses were conducted to examine whether GMV and levels of T and CRT predict aggressive and impulsive traits. The significance threshold was  $p < 0.05$ .

Endogenous T (after correction for age and CRT level) was positively correlated with total aggression scores, but not with impulsivity. In contrast, the same analysis for cortisol showed significant correlations only with the subscales physical aggression, attention impulsivity, and motor impulsivity. Moreover, total AQ scores were positively correlated with total BIS-11 scores. CRT, T levels and ROI GMV explained a significant amount of variance in aggression levels ( $R^2$  adjusted = 0.2,  $p = 0.005$ ), but not impulsivity levels. These findings confirm that there is an association between aggression and impulsivity, but ROI GMV and basal levels of T and CRT predicted only levels of aggression, not impulsivity.

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### P259 - Therapeutic Collaboration and Psychophysiological Arousal: A Comparative Study of a Dropout and a Terminated Therapy Cases

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<sup>2</sup>Unidade de Investigação Aplicada em Psicoterapia e Psicopatologia do CIPsi - Escola de Psicologia da UMinho

#### Abstract:

The collaborative involvement between therapist and client is an important predictor of the therapy gains and critical in the client's decisions to complete the therapy. There is also some evidence that higher psychophysiological arousal is linked to poor conflict management and decreased relationship quality between partners in a romantic relationship, but few studies have tried assess psychophysiological factors in relation to therapeutic collaboration. In this study, we aim to characterize the collaboration process and the underlying psychophysiological arousal, occurring in a dropout and a completer case of cognitive-behavioral therapy. Skin conductance level (SCL) and heart rate (HR) of both, client and therapist, were recorded, during the psychotherapy processes. Independent coders, using the Therapeutic Collaboration Coding System, coded the therapeutic collaboration. This system allows the identification of collaborative and non-collaborative therapeutic exchanges, based on the articulation of the therapist's supporting or challenging



interventions and the following client's response of Validation, Invalidation or Ambivalence. Preliminary results show that non-collaborative episodes were more prevalent in dropout than on the completer cases. It was an increasing tendency of therapist to use more Challenging interventions across the time, leading to considerably more invalidation responses by client. We hypothesize that psychophysiological arousal will follow this collaborative pattern: more psychophysiological reactivity will be correlate with Challenging interventions and Invalidation responses, namely on the last sessions of the dropout case when compared with the completer case. Results will be discussed in terms of their implications for research and clinical practice.

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#### P260 - Threat and Relevance Are Differentially Processed during Cognitive Extinction of Conditioned Fear

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<sup>1</sup>University of Reading, UK

##### *Abstract:*

Specific regions of lateral prefrontal cortex are thought to play a role in the reappraisal of emotional stimuli, though a lack of control in previous neuroimaging studies makes it hard to determine their specificity. We examined prefrontal engagement during a tightly controlled task involving reappraisal of stimuli previously conditioned with electric shock, compared to a more conventional emotion regulation task.

20 participants underwent fear conditioning of letters (CS+) to electric shocks (US), before completing a reappraisal phase during fMRI in which the letters were embedded in words belonging to two categories, one safe (not associated with an electric shock) and one dangerous. Skin conductance and pupil dilation were also collected.

Skin conductance responses and insula activation were significantly higher during dangerous CS+ trials than during safe CS+ and CS- trials. In contrast, pupil dilation was significantly higher during CS+ trials than CS- trials, regardless of whether they were safe or dangerous. Left ventrolateral PFC activation was greater during safe CS+ compared to dangerous CS+ trials, and showed specificity to the task, with the conventional emotion regulation task activating a distinct region of lateral PFC, and a significant task by PFC-region interaction.

These results suggest that distinct regions of lateral PFC are involved in the reappraisal of potentially threatening stimuli, which is effective in reducing shock-related insula activation and autonomic arousal as indicated by skin conductance responses. In contrast, pupil dilation reflects processing related to stimulus saliency, rather than emotionally-specific autonomic responses.

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#### P263 - Unbalanced Resting-State Networks Activity in Psychophysiological Insomnia

Daniel Ruivo Marques<sup>1</sup>, Ana Allen Gomes<sup>2</sup>, Vanda Clemente<sup>3</sup>, José Moutinho dos Santos<sup>3</sup>, Isabel Catarina Duarte<sup>4</sup>, Gina Caetano<sup>4</sup>, Miguel Castelo-Branco<sup>4</sup>

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##### *Abstract:*

Psychophysiological Insomnia (PI) is a disorder characterized by sleep-related disturbing cognitive activity and biased self-related information processing. This putative cognitive arousal seems to be correlated with overactivation within different brain areas and networks, especially when individuals are at rest, e.g., in the absence of any attention-demanding task. In the current study, we performed a resting-state fMRI experiment aimed at

investigating activity of the different resting-state networks in PI. Our pool of participants comprised 5 PI patients and 5 sex- and age-matched healthy controls recruited from the community. Participants from both groups also completed a set of self-report measures, including the Sleep Diary, Insomnia Severity Index (ISI), Dysfunctional Beliefs and Attitudes About Sleep (DBAS-30), and the World Health Organization Quality of Life Measure (WHOQOL-Bref). The results showed that insomnia patients presented altered activation in the default mode network (DMN), visual and auditory networks, and bilateral fronto-parietal networks. In the DMN, the patients presented a pattern of both decreased (right superior frontal gyrus, left medial frontal gyrus, and right middle temporal gyrus) and increased activation (left superior frontal gyrus, left anterior and posterior cingulate, right precuneus, left cingulate gyrus, and left middle temporal gyrus). These findings on unbalanced resting-state networks in PI, with special emphasis on the DMN, may lay grounds to better understanding of the cognitive arousal experienced by PI patients and might help to further improve the treatment of insomnia.

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#### P265 - Using Films to the Recognitions of Basic Emotions

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<sup>5</sup>Instituto de Investigación en Informática, I3A, Albacete and Escuela Superior de Industriales, Albacete

#### *Abstract:*

The recognition of emotions is very important for the relationship between people and the psychological health of ourselves. From the research is essential to be effective detecting basic emotions. These can be evaluated subjectively with test or questionnaires, and objectively through different physiological techniques. "Improvement of the Elderly Quality of Life and Care through Smart Emotion Regulation" is a European project which goal is to create a system of devices with the power to recognize and interpret the basic emotions, making easier the modulation of emotions and thus, improve psychological well-being of older people. To get this, it is necessary to know how are the physiological and subjective responses of basic emotional states and this study selected film clips to induce emotions for its ecological validity, standardization and ability to induce discrete emotions. In the first phase of study, 23 volunteer university students were induced to feel a set of emotions discriminately: sadness, anger, amusement, affection, disgust, fear and neutral state. Film clips were rated valence, arousal, dominance and discreteness. Subjective response was evaluated through questionnaires and objective responses through the electrodermal activity by a wearable acquisition device, a wristband.

The initial results suggest that it is possible to extract discrete values about neutral, positive and negative emotional states and use them as keys to get emotion regulation.

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#### P266 - Validation of the Light-Dark Test as a Model for Study Anxiety in Rats

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*Abstract:*

The elevated plus maze (EPM) and the light-dark (LD) models are widely used for the study of anxiolytic drugs and neurobiological mechanisms of anxiety, however only the EPM is a validated model for the evaluation of anxiety in both rats and mice. In order to find evidence of behavioural and pharmacological validation of the LD test as a model for study anxiety in rats, we compared the behavioural responses under different anxiety conditions (EPM and LD) and analyse the effects (behavioural, neurochemical and hormonal) of an anxiolytic drug (diazepam) in rats exposed to EPM or LD condition. Results showed that the EPM and LD tests induce similar behavioural responses. Furthermore, diazepam-induced changes, consistent with anxiolytic effects, were observed in the amygdalar dopaminergic system of animals exposed to EPM while in animals exposed to the LD test, such changes were observed in the hippocampal serotonergic system. This differential neurochemical response suggests that anxiety is mediated via different brain areas or receptors in the two paradigms. The adrenal response was also different to the EPM and LD paradigms when diazepam was administrated.

In conclusion, the comparative analysis of the behaviour recorded in EPM and LD suggests that it reflect the same psychological state - anxiety, whereas neurochemical and hormonal evaluations showed different responses to EPM and LD tests in diazepam-treated rats. These differences may be explained by the different nature of the aversive stimuli elicited by EPM and LD paradigms and are further discussed.

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P267 - Value-Based Virality: A Neurocognitive Model of News Retransmission

Christin Scholz<sup>1</sup>, Elisa C. Baek<sup>1</sup>, Matthew B. O'Donnell<sup>1</sup>, Hyun Suk Kim<sup>1</sup>, Joseph N. Cappella<sup>1</sup>

<sup>1</sup>Annenberg School for Communication, University of Pennsylvania

*Abstract:*

Modern forms of social content sharing like Facebook posts critically affect reach and impact of ideas and information. Building on current knowledge of brain function, we propose and test a parsimonious, neurocognitive account of virality centered around the value of sharing. Specifically, value-based virality assumes that two types of inputs - a message's self-relevance and its perceived social impact - inform an overall computation of the value in sharing an idea, and that this domain general value signal is directly related to content virality.

We provide empirical evidence for this framework using fMRI data (N = 41) collected during initial exposure to 80 New York Times (NYTimes) articles, and API-derived population-level data on the retransmission counts of these news items (N = 117,611 retransmission instances). As predicted, activity in a priori hypothesized regions of interest associated with self-related, social, and value-related cognitions were significantly associated with population-level retransmission of NYTimes articles. Further, structural equation modeling suggests that the effects of neural activity related to self-related and social cognition on retransmission were fully mediated by valuation-related activity. This model explained 15% of the variance in article retransmission.

Value-based virality unifies prior approaches centered around the involvement of self-related or social cognitions in virality by demonstrating their integration into an overall content value signal which directly affects virality. The generalizability of this model to population-level news virality further demonstrates its value as content design guideline for practitioners, and as vehicle for parsimonious theorizing about one of today's most prominent social phenomena.

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P268 - Viewpoint and Identity-Invariant Categorisation of the Six Basic Expressions

*Abstract:*

Humans are particularly adept at detecting changes of facial expressions under different conditions of lightening or viewpoint, independently of the individuals displaying these expressions. To characterize this fundamental brain process, we recorded EEG during fast periodic visual stimulation (FPVS). Neutral faces were presented at a rate of 6 Hz (F) for 1 min changing viewpoint (0, 45° to the left and right, experiment 1) or identity (experiment 2) at every stimulation cycle. Every five stimuli, faces briefly changed expression into one of the six basic emotions (in different stimulation sequences). Thus the 1.2 Hz (F/5) response and its harmonics (e.g., 2F/5 = 2.4 Hz) in the EEG spectrum objectively indexed 1) the detection of a facial expression change and 2) the generalisation of this expression across viewpoints (expt. 1) or across different identities (expt. 2). This high signal-to-noise ratio (SNR) response focused on occipito-temporal sites, but its magnitude varied among the facial expressions, with more subtle expressions like sadness and fear leading to weaker responses. A complementary time domain analysis showed that the automatic facial expression change categorisation occurs very quickly (shortly after 100ms) but is prolonged (several hundred ms after the presentation of the expressive face). Taken together these results show that difficult expression categorisation can be objectively studied with remarkably short testing sessions (only several minutes), opening venue for future research addressing deficit in social stimuli processing in special populations.

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P269 - Visual Stimulus Persistence in Young and Older Adults – a Visual Mismatch Negativity Study

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*Abstract:*

It is well established that compromised inhibitory processes significantly contribute to age-related cognitive changes. A consequence of low-level inhibitory differences is the longer stimulus persistence in older age. While in many domains performance in older groups decreases, longer persistence may lead improvement in perceptual integration (formation a unit from temporarily distinct parts, Kline and Orme-Rogers, 1978). We conducted a behavioral and an event-related potential (ERP) experiment in this field. In the behavioral study the task was to decide whether a two parts of a stimulus pair was a letter or a non-letter. The main variable was the stimulus onset asynchrony (SOA). In this task the older group outperformed the younger participants. In the ERP study a passive oddball paradigm was introduced. The task was the detection of the thickness of one of the sides of a frame. Within the frame there were standard (80 %) and deviant (20%) task-irrelevant stimuli. These stimuli were either letters or non-letters (both types in standard and different roles). In various sequences the stimuli were presented either as a simultaneously appearing unit, or as stimulus pairs with 0, 20 or 40 ms SOA. As difference between the ERPs to the deviant and standard stimuli, visual mismatch negativity (vMMN) emerged at the simultaneous and 0 SOA sequences (also in this case the amplitude was smaller). As the results show, (1) considerable age-related increase appeared in the attentional level, (2) in this study we did not registered age-related vMMN difference.

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P270 - What Are We Looking At? Intra-Cerebral EEG Reveals Important Differences between Stimuli Used to Elicit Automatic Imitation

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**Abstract:**

*Introduction:* Humans imitate the actions of others involuntarily, a tendency referred to as automatic imitation (AI). This is believed to reflect the functioning of brain mechanisms that map observed actions onto our own neural motor circuits. For this reason, studies utilise AI to investigate this brain system behaviourally, by manipulating the imitative compatibility between observed and executed finger actions, they examine the influence of the former over the latter under different experimental conditions. This study evaluated the importance of anatomical compatibility between stimulus and response hand for stimuli used in this AI paradigm by comparing behavioural and neural responses elicited by left and right stimulus hands. *Methods:* Neural signals were measured at the level of local-field potentials collected with intracerebral electroencephalography (iEEG) from four epileptic patients undergoing pre-surgical evaluation. In addition to event-related potentials (ERPs) within discrete structures, we also assessed differences in connectivity profiles in response to these stimulus hands using analyses of cross-correlation and power coherence. *Results:* Consistent with behavioural responses, our iEEG data reveal that late ERP components recorded from several cortical and sub-cortical structures were greater for the left compared with the right stimulus hand. Such differentiation was present also in the connectivity profiles of these structures, differential increases of cross-correlation and coherence within specific frequency bands were observed in response to the two stimulus hands. *Conclusions:* These findings indicate that AI elicited by different stimulus hands may index different neural mechanisms. We suggest that this reflects the differential influence of confounding spatial-/orthogonal-compatibility on imitative processes, which has strong implications for studies utilising the finger-tapping AI paradigm to investigate neural action observation-execution matching mechanisms.

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P271 - When Villains Smile: on the Interplay between Affective Identity and Emotional Expression in Face Perception

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**Abstract:**

Models of face perception propose that constant aspects of human faces, such as facial identity, are processed independently from changeable aspects, such as emotional expression. Some electrophysiological studies supported such independence of identity and emotion by revealing main effects of face familiarity and emotional expression, but no interaction. Yet, other investigations showed significant interactions between for example face attractiveness and emotional expression. Here, an affective identity was assigned to 16 faces with neutral expressions using MultiCS conditioning with an aversive electric stimulus as unconditioned stimulus. High-density ERPs revealed typical effects of conditioning, such as amplified Early Posterior Negativities (EPNs) and Late Positive Potentials (LPP) for previously conditioned (CS+) compared to non-shocked (CS-) faces. After this learning phase, participants viewed angry and happy expressions of the CS+ and CS- faces. Strong main effects of emotional expression and affective identity (conditioning) emerged in the EPN and LPP time interval. Importantly, there was a strong interaction of both factors with amplified EPNs for congruent pairs (angry CS+, happy CS-) compared to incongruent pairs (angry CS-, happy CS+). Our results support the interplay of emotional expression and

affective identity in perceiving others. This interplay and the immediate availability of information about a person's identity including biographical facts and the acute emotional state are important factors to deal effectively with social interactions.

This work was supported by the German Research Association (DFG, SFB-TRR58-C1) and the University of Castellon.

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## P272 - White Matter Integrity in Anxiety-Relevant Brain Networks

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### *Abstract:*

Anxiety not only exerts a critical influence on localized brain regions involved in affective processing but also affects the communication within global brain networks and broad cognitive function. This broad impact is hypothesized to be mirrored by influences on four critical brain networks involved in cognitive function including top-down control of attention (FPN, fronto-parietal network), salience detection and error monitoring (CON, cingulo-opercular network), bottom-up stimulus-driven attention (VAN, ventral attention network), and emotion regulation and default-mode (DMN, default mode network). Although functional connectivity studies support the effect of anxiety on network communication, structural evidence on the white matter (WM) connections between these networks and the amygdala and within these networks is lacking. This study used probabilistic tractography to investigate the effect of anxiety on these WM connections in a large healthy sample (n = 483) of the human connectome project (HCP). Results showed that higher anxiety symptoms predicted lower WM integrity in the connections between amygdala and specific regions of the FPN, CON, VAN, and DMN. Within-network connectivity was not predicted by anxiety. The findings suggest that anxiety has an influence on structural integrity of amygdala – network connections. However, future studies are needed to determine the consequences of these deficits for cognitive-affective functioning and psychopathology.

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## P273 - You Make Me Lose It! Diffusion of Responsibility & Sense of Agency

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### *Abstract:*

Sense of agency, that is, how much we feel in control of external events, is thought to play an important role in social interactions, where responsibility and controllability can be ambiguous. In turn, it is little understood how social situations affect our sense of agency. The presence of other people can result in diffusion of responsibility, with people feeling less responsible for the outcomes of their own actions. Previous ERP studies showed reduced amplitude of the feedback related negativity when participants perceived less control over action outcomes, or shared control with other participants.

In this ERP study on diffusion of responsibility, we investigated how the presence of others changes the way we perceive our own action outcomes, and how much control we feel we have over them. Here, we used a task in which the objective responsibility for the action outcome was unambiguous, such that participants knew they cause a given outcome. We then manipulated the supposed presence of another player, who could act instead of the participant.

Compared to trials in which participants believed they were playing alone, the alleged presence of another agent who could have acted, but did not, led to a reduction in perceived control over action outcomes. Furthermore, N200 amplitude in response to the outcome was reduced. These results show that the diffusion of responsibility is not just a post-

hoc justification. The mere presence of a potential alternative agent is sufficient to reduce the sense of agency and attenuate the early processing of action outcomes.

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P274 - You Use the Right for “Nothing” in Number Transcoding

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*Abstract:*

Transcoding numerals containing zero is more problematic than transcoding numbers formed by non-zero digits. However, it is currently unknown whether this is due to zeros requiring brain areas other than those traditionally associated with number representation. We hypothesized that transcoding zeros entails visuo-spatial and integrative processes typically associated with the right hemisphere, which are not necessarily required for processing other numbers. The investigation involved 22 right-brain-damaged patients and 20 healthy controls who completed tests of reading and writing Arabic numbers. As expected, the most significant deficit among patients involved a failure to cope with zeros. Moreover, a voxel-based lesion–symptom mapping analysis showed that the most common zero-errors were maximally associated to the right insula which was previously related to sensorimotor integration, attention, and response selection, yet for the first time linked to transcoding processes. Error categories involving other digits corresponded to the so-called Neglect errors, which however, constituted only about 10% of the total reading and 3% of the writing mistakes made by the patients. We argue that damage to the right hemisphere impairs the mechanism of parsing, and the ability to set-up empty-slot structures required for processing zeros in complex numbers, moreover, we suggest that the brain areas located in proximity to the right insula play a role in the integration of the information resulting from the temporary application of transcoding procedures.

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