Proceedings

of the

1^{st} Conference

of the

European Society for Cognitive and Affective Neuroscience

9^{th} - 12^{th} May 2012
Marseille, France

Organizing comittee

Boris Burle (chair)
Franck Vidal (co-chair)
F.-Xavier Alario
Thomas Brochier
Laurence Casini
Thierry Hasbroucq
Pascal Huguet
Laure Spieser

Scientific Advisory Board

Torsten Baldeweg
Koen Böcker
Michael Falkenstein
Maurits van der Molen
Marc Molnár
Paul Pauli
Gilles Pourtois

Welcome

ESCAN: the society

The *European Society for Cognitive and Affective Neuroscience* (ESCAN) aims to promote scientific enquiry within the field of human cognitive and affective neuroscience and related areas. ESCAN provides a platform for collaboration and exchange of information between investigators across Europe through scientific meetings, workshops, summer schools, and such other activities. ESCAN was founded during a kick-off meeting of 70 participants from different European countries (Amsterdam, 10-12 December, 2009). The 2012 meeting in Marseille is the first official ESCAN conference. In addition to the exchange of scientific information, the meeting offers the opportunity to ESCAN members to shape the ESCAN future in a bottom-up fashion. Since the 2009 kick-off meeting, an initiative group ensured the legal status of ESCAN in 2010, and a preliminary board organized the first, official conference with the assistance of the local organizing committee. The old and new boards (elected by the ESCAN membership) will convene with members during the general assembly to discuss matters of importance regarding the future of ESCAN. Thus, all members are cordially invited to attend the general assembly and to provide valuable input. I look forward meeting you at the conference which, according to the program, will be a stimulating event. On behalf of the ESCAN board, I would like to thank you for contributing to the meeting and supporting ESCAN.

Maurits van der Molen
ESCAN president

Welcome to ESCAN 2012, the 1^{st} ESCAN conference

Organizing the first conference of a new scientific society is a great challenge and a great responsibility. In accordance with the goals of the society, we were asked to organize a **high quality, low threshold** conference. With the organizing committee, we did our best to meet those criteria, and we hope we have succeeded. Keeping the threshold as low as possible, especially for our young colleagues, implied considerable involvement of the organizing committee, and we would like to more specifically thank Laure Spieser, Laurence Casini and F.-Xavier Alario, for their great help.

The quality of a conference essentially depends on the contributors. Both symposia propositions and regular submissions were generally of very high level, and the scientific committee had the difficult task of choosing among them. We ended up with 22 symposia, 5 thematic sessions and about 140 posters, and we did our best to propose a high quality, but also coherent, program, and hope you will enjoy it.

In the name of the organizing and the scientific committees, we welcome you to this first conference of the *European Society for Cognitive and Affective Neuroscience*. We hope that it will be an exciting and important moment for our scientific community, and that in a few years, you will be proud to say:

ESCAN 2012 ! I was there !

B. Burle, chair & F. Vidal, co-chair

Thanks

Academic support

The conference is hosted by the Cognitive Neurosciences department (Aix-Marseille University and CNRS – UMR 7291) who has provided invaluable help, especially Luciana De Stephanis and Catherine Marra, for the organization of the conference.

We also received financial support from the Research Federation "Brain, Behaviour and Cognition" (FR 3512) that we warmly thank and from the French Psychophysiology and Cognitive Neurosciences Society (SPNC).

Aix-Marseille University put Saint Charles campus at our disposal for free, allowing the conference to be held in a very pleasant but affordable place. They are gratefully thanked for this help.

Funding contributors

In order to keep the registration fees as low as possible for young scientists, we asked for the generosity of senior researchers:
Gold funding members (50 €): F-X. Alario, T. Baldeweg, B. Burle, L. Casini, N. Suchitra, K.R. Ridderinkhof, M. van der Molen, F. van Overwalle.
Silver funding members (25 €): N. Bruneau.

Reviewers

All submissions have been reviewed by two independent reviewers: One from the conference board (local scientific committee + ESCAN board), and one external reviewer. In addition to the local scientific committee and the ESCAN board, the following people have served as reviewers: C. Assaiante, E. Barbeau, C. Baunez, F. Bonini, L. Carbonnell, M. Conrad, J. Coull, O. Coulon, K. Davranche, N. George, M. Gomot, A. Guillaume, S. Khalfa, M. Laganaro, M. Lorist, J. Magnuson, P. Maurage, L. Mouchnino, S. Mueller, K.R. Ridderinkhof, D. Rigoni, C. Roger, F. Sargolini, G. Thierry, W.P.M. van den Wildenberg, L. Waldorp, B. Wicker, M. Wutte, J. Ziegler. We warmly thank them for their precious help.

Web support

Organizing such a conference would not have been possible without the use of a dedicated service for handling submissions and reviews. The "Sciencesconf.org" (http://www.sciencesconf.org/?lang=en) platform has provided all the necessary tools and support. More specifically, we wish to warmly thank Yannick Barborini for his ongoing rapid and efficient responses.

Edition

The edition of these proceedings has been made entirely with open source software, mainly python and LaTeX. Thanks to the open source community for providing such useful tools.

Contents

General information

About Marseille

Marseille has a long tradition in Neuroscience Research and is currently the second largest French Neuroscience community with almost 1000 people. Multiple scientific interactions and joint technical platforms create a dynamic environment whose interests range from earliest developmental events in simple model organisms to the understanding of highest cognitive functions in humans. Marseille Neuroscience Network comprises three major sites, each with its own scientific identity: Neural development, physiology and movement sciences in Luminy (south campus), cognitive, affective and integrative neuroscience in Saint Charles and La Timone Hospital (center campus) and molecular neuroscience with a strong biomedical interface at Jean Roche Institute (north campus).

ESCAN 2012 is hosted by the Cognitive Neurosciences department (UMR 7291) of the Aix-Marseille University and CNRS in Saint Charles (center campus), that belongs to a "Research Federation" (FR 3512) including two other departments: Cognitive Psychology and Integrative Neuroscience.

Committees

Organizing committee

- Boris Burle, conference chair
- Franck Vidal, conference co-chair
- F.-Xavier Alario
- Thomas Brochier
- Laurence Casini
- Thierry Hasbroucq
- Pascal Huguet
- Laure Spieser

Scientific Advisory Board

- Torsten Baldeweg
- Koen Böcker
- Michael Falkenstein
- Maurits van der Molen
- Mark Molnar
- Paul Pauli
- Gilles Pourtois

The conference

Location

The conference will be held on Saint Charles Campus of Aix-Marseille University, close to the Saint Charles train station. Geographical address:
Université de Provence
3 place Victor Hugo
13003 Marseille
Metro : The two metro lines (Metro number 1 – blue – and number 2 – red) reach the Saint Charles Central station, from which you can easily reach the University ($\simeq$ 100 m).

Registration

Participant check in will start on Wednesday, May 9 from 10:00 to 19:00. The reception desk will be located in the main courtyard (weather permitting) or in room 4 (in case of rainy or windy weather). Onsite registration is possible throughout the Congress, with the onsite registration fee.

Special events

Date	Time	Event
Wednesday	15:00	Keynote Lecture 1: F. Lopes da Silva
Wednesday	18:00	Welcome Buffet
Thursday	15:30	Keynote Lecture 2 : P. Belin
Thursday	18:30	General assembly
Thursday	evening	Young researcher party
Friday	15:30	Keynote Lecture 3: K. Rubia
Friday	19:30	Conference dinner
Saturday	12:45	Farewell Buffet

Oral presentations

All oral presentations are meant to last 15 minutes + 5 minutes for discussion, except if specif-

ically instructed otherwise (*e.g.* for symposia). Chairs and speakers are asked to respect the time schedule. All rooms are equipped with microphones and PCs. It is possible to give the presentation making use of your own laptop computer. Presentations must be uploaded at least 20 minutes before the session. Our staff will assist you with the computer configuration, if needed.

Poster Sessions

Poster sessions will be held on Thursday and Friday afternoons from 13:40 to 15:30 in the main courtyard (weather permitting) or in room 4 (in case of rainy or windy weather). Authors are requested to stand by their poster during the poster session. Posters will be installed before lunch the day of the presentation. Attach your poster as a function of its number (see program) on the associated grid. Do not forget to remove your poster at the end of the session so that it does not get lost. Dimension of the grids: 2m (high) × 1m (wide).

Eating and drinking during the conference

Conference registration includes buffets, lunches and coffee breaks. Should you crave for more, you may find a few dining places within the train station, in the concourse opposite the university.

Coffee breaks

Coffee will be served in the main courtyard from 10:40 to 11:00 and from 16:30 to 16:50.

Lunch

Lunch will be served in the Lunch area on Thursday and Friday, from 12:40 to 13:40, and a lunch buffet will be offered in the main courtyard on Saturday, from 12:30.

Welcome buffet

The Welcome Buffet will take place in the main courtyard on Wednesday, May 9 from 18:00 onwards.

Conference Dinner

The Gala Dinner will take place at the Cercle Mixte de Garnison on Friday, May 11, starting at 19:00. Geographical address:
Cercle Mixte de Garnison
2, boulevard Charles Livon
13007 Marseille
The Gala Dinner location can be reached from the "Vieux-Port" metro station (from Saint Charles Central station, Metro number 1 – blue, in the direction of "La Fourragère") and then by foot (about 10 minutes), a nice walk along the Vieux-Port (left side, facing the sea – quai rive neuve), or by bus (N° 83, stop: "Théâtre").
Please note that the Metro closes at 00:30.

Young Researchers Party!

On Thursday 10, from 8:00 PM until 2:00 AM, a party is organized by and for young researchers (with no age limit...). It will be located at the "Havana Café" (11 Quai Rive Neuve, 13001 Marseille). Happy hour for ESCAN participants!!

More information during the conference!

Participants

ESCAN 2012 will welcome about 300 participants, from more than 20 different countries (see figure 1). Students/Post-docs (see the conference website for definition...) represent about 25% of the participants.

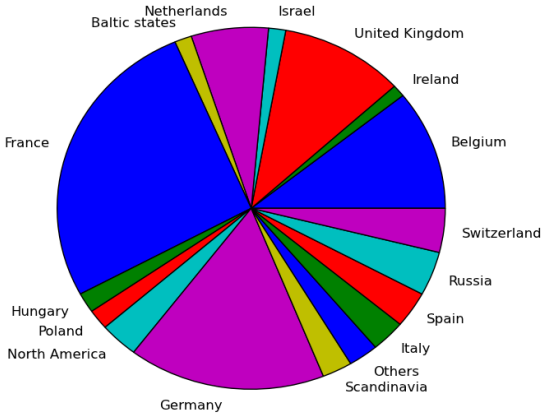


Figure 1: Ratio of participants per country. "Others" include countries with less than 3 participants: India, Georgia, Czech Republic, Portugal, Austria

Boat trip

On Thursday, May 10 during the lunch break and the poster session, on the stand "Marseille Croisières Calanques", information will be provided about boat trips to the Calanques of Marseille and you will have the possibility to book boat trips for Saturday afternoon.

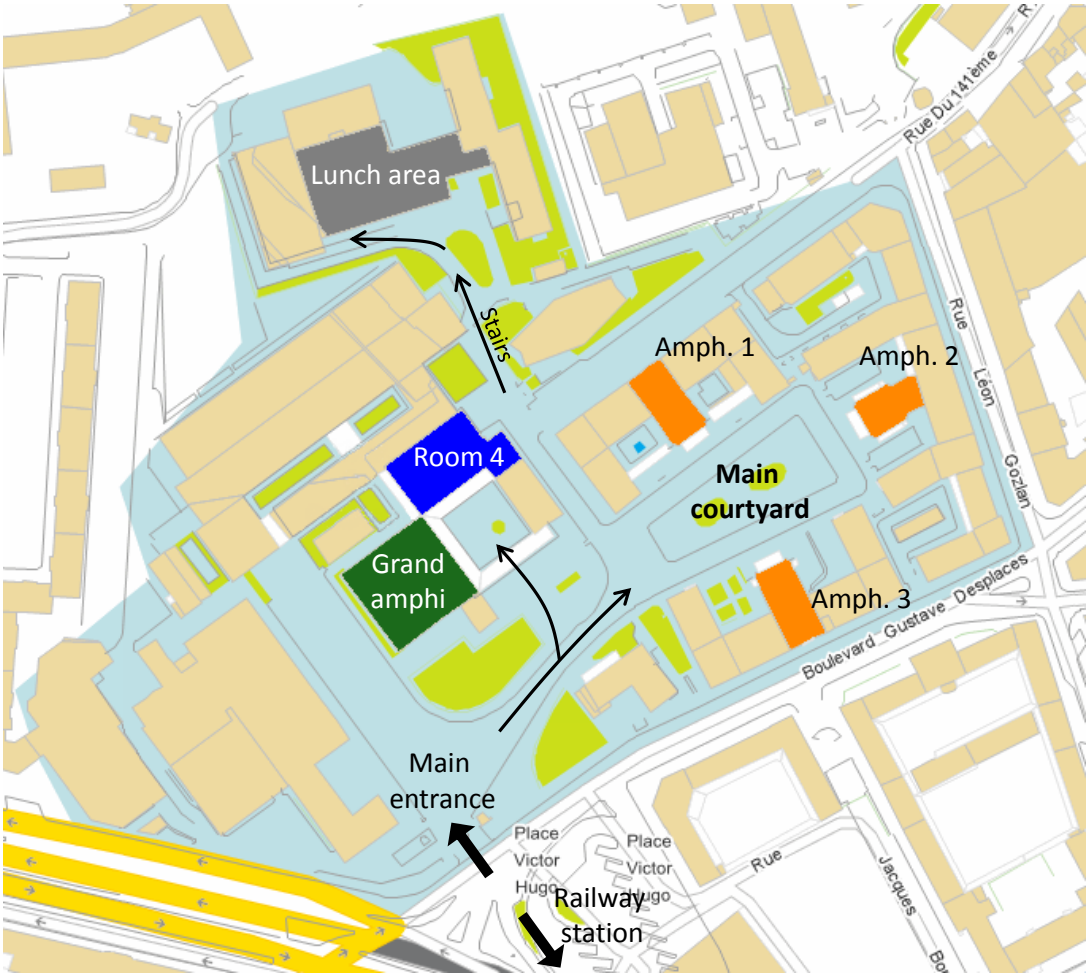
Certificate of attendance

A certificate of attendance will be given upon request with your congress bag.

Wifi access

Wireless Internet connection will be available in the University. Access codes will be included in the congress bag.

Finding your way on campus



- Keynote Lectures and welcoming remarks will take place in the "Grand Amphi"
- Parallel sessions will take place in Amphi 1 to 3
- Poster sessions, coffee breaks, and welcome and farewell buffets will be on the main courtyard (weather permitting) or in room 4.
- Lunch will be served in the University Restaurant, upstairs from the conference location (Lunch area)

Program

Wednesday

10.00 – 14.30 — Registration

14.30 — Welcoming Remarks
Grand amphi

15.00 — Keynote lecture 1
Fernando Lopes da Silva
Grand amphi

16.00 – 17.40

SY	Alexithymia and its Link with Social and Cognitive Neuroscience	*Amph. 1*
SY	Face perception: insights into the visual, emotional and social brain	*Amph. 2*
SY	How does the brain process time ?	*Amph. 3*

18.00 — Welcome buffet

Thursday

9.00

SY	Social cognition across development and pathology	*Amph. 1*
OR	Emotions 1	*Amph. 2*
SY	A question of time: subcortico-cortical interactions in speech processing	*Amph. 3*

10.40 — Coffee break

11.00

SY	Advances in Developmental Cognitive Neuroscience	*Amph. 1*
SY	On the perception of the body from within and from the outside	*Amph. 2*
SY	Medio-frontal cortex: performance monitoring and beyond	*Amph. 3*

12.40 — Lunch

13.40 – 14.30 — Poster session 1

15.30 — Keynote lecture 2
Pascal Belin
Grand amphi

16.30 — Coffee break

16.50 – 18.30

OR	Social factors	*Amph. 1*
SY	Emotion dysregulation in psychopathology	*Amph. 2*
OR	Executive functions	*Amph. 3*

19.30 — ESCAN society General Assembly

Young Researchers Party !

at a glance

	Friday	Saturday
9.00	SY Cognitive and affective neuroscience of aging — *Amph. 1* SY The Neuroscience of Social Conflict and Action Monitoring — *Amph. 2* SY Electro-physiology of language production — *Amph. 3*	SY Affective neuroscience: Fear and pain — *Amph. 1* OR Cognitive and Affective Disorders — *Amph. 2* SY Stopping action and cognition — *Amph. 3*
10.40	Coffee break	Coffee break
11.00	OR Emotions 2 — *Amph. 1* SY Communicating brains — *Amph. 2* SY Basal ganglia and cognition — *Amph. 3*	SY déjà vu, déjà vécu and other mnesic experiential phenomona — *Amph. 1* SY The asymetry of attention in visual processing — *Amph. 2* SY Emotions: Towards an integrated approach — *Amph. 3*
12.40	Lunch	Farewell Buffet
13.40 – 14.30	Poster session 2	
15.30	Keynote lecture 3 Katya Rubia *Grand amphi*	
16.30	Coffee break	
16.50 – 18.30	SY Developmental Affective Neuroscience — *Amph. 1* SY Perceiving and acting in a world with others — *Amph. 2* SY Emotion word processing — *Amph. 3*	

Conference dinner

Wednesday, May 09, 2012

10:00 - 14:30	**Registration**		
14:30 - 15:00	**Welcoming remarks**		
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16:00 - 17:40	**SY: Alexithymia and its Link with Social and Cognitive Neuroscience** – B. Herbert	Amph. 1	p. 1
16:00 - 17:40	**SY: Face perception: insights into the visual, emotional and social brain** – N. George	Amph. 2	p. 3
16:00 - 17:40	**SY: How does the brain process time?** – J. Coull & L. Casini	Amph. 3	p. 4
18:00 - ...	**Welcome buffet**		

Thursday, May 10, 2012

09:00 - 10:40	**SY: Social cognition across development and pathology** – B. Wicker	Amph. 1	p. 7
09:00 - 10:40	**OR: Emotions 1** – M. Molnár	Amph. 2	p. 8
09:00 - 10:40	**SY: A question of time: subcortico-cortical interactions in speech processing** – S. Kotz & M. Schwartze	Amph. 3	p. 9
10:40 - 11:00	**Coffee break**		
11:00 - 12:40	**SY: Advances in Developmental Cognitive Neuroscience** – T. Baldeweg	Amph. 1	p. 10
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	PO: Language		p. 63
15:30 - 16:30	**Keynote Lecture - P. Belin**	Grand Amphi	p. 15
16:30 - 16:50	**Coffee break**		
16:50 - 18:30	**OR: Social Factors** – F. van Overwalle	Amph. 1	p. 15
16:50 - 18:30	**SY: Emotion dysregulation in psychopathology** – C. Lombardo	Amph. 2	p. 17
16:50 - 18:30	**OR: Executive functions** – F. Vidal	Amph. 3	p. 18
18:30 - 19:30	**ESCAN General Assembly**		
20:00 - 2:00	**Young Researchers Party !**		

Friday, May 11, 2012

09:00 - 10:40	**SY: Cognitive and affective neuroscience of aging** – M. Falkenstein	Amph. 1	p. 21
09:00 - 10:40	**SY: The Neuroscience of Social Conflict and Action Monitoring** – L. Koban & E. Núñez-Castellar	Amph. 2	p. 22
09:00 - 10:40	**SY: Electro-physiology of language production** – M. Laganaro & F.-X. Alario	Amph. 3	p. 24
10:40 - 11:00	**Coffee break**		
11:00 - 12:40	**OR: Emotions 2** – G. Pourtois	Amph. 1	p. 24
11:00 - 12:40	**SY: Communicating brains** – S. Anders & T. Ethofer	Amph. 2	p. 26
11:00 - 12:40	**SY: Basal ganglia and cognition** – W.P.M. van den Wildenberg & S. A. Wylie	Amph. 3	p. 28
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16:50 - 18:30	**SY: Developmental Affective Neuroscience** – S. Mueller	Amph. 1	p. 31
16:50 - 18:30	**SY: Perceiving and acting in a world with others** – C. Lopez & P. Romaiguère	Amph. 2	p. 32
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Saturday, May 12, 2012

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10:40 - 11:00	**Coffee break**		
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Wednesday, May 09, 2012

10:00 - 14:30	**Registration**		
14:30 - 15:00	**Welcoming remarks**		
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16:00 - 17:40	**SY: Alexithymia and its Link with Social and Cognitive Neuroscience** – B. Herbert	Amph. 1	p. 1
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	Relations between Alexithymia and Mentalizing, *Subic-Wrana C.*		
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	Can't say what I feel: Cognitive and neural basis of alexithymia and relevance for schizophrenia, *Aleman A.*		
	Alexithymia is associated with Altered Top Down Control of Behavior, *Herbert B.*		
16:00 - 17:40	**SY: Face perception: insights into the visual, emotional and social brain** – N. George	Amph. 2	p. 3
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	The neuronal dynamics of face processing: from detection to recognition, *Barragan-Jason G.*		
	Early emotional modulations beyond human faces, *Dubal S.*		
	The effect of cultural background on face and gaze scanning: An eye-tracking study, *Senju A.*		
	Investigating online joint attention during face-to-face interaction: an hyperscanning EEG study, *George N.*		
16:00 - 17:40	**SY: How does the brain process time?** – J. Coull & L. Casini	Amph. 3	p. 4
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	Post-interval evoked N1-P2 amplitude reflects continuation of timing following CNV resolution, *Van Rijn H.*		
	Automatic and controlled mechanisms in temporal preparation, *Correa A.*		
	Spatial-temporal interactions in the human brain: neurophysiological and neuropsychological studies, *Oliveri M.*		
18:00 - ...	**Welcome buffet**		

Thursday, May 10, 2012

09:00 - 10:40	**SY: Social cognition across development and pathology** – B. Wicker	Amph. 1	p. 7
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	Interactions between motor and emotional resonance investigated with a humanoid robot, *Chaminade T.*		

	When cartoon differ from real faces: Facial emotion processing in Autism Spectrum Disorders, *Bastard-Rosset D.*		
	Early Modulation of Perceptual Neural Activity Induced by Top-Down Social Information, *Mermillod M.*		
09:00 - 10:40	**OR: Emotions 1** – M. Molnár	Amph. 2	p. 8
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	Individual differences in emotion regulation: Why so negative?, *Johnstone T.*		
	Top down control of emotion: a specific example of a general mechanism?, *Clarke R.*		
	Toward an automatic and valence non-specific mechanism of relevance detection, *Mazzietti A.*		
	Age-related time-locked synchronization likelihood changes accompanying ERP components observed in an emotional GO-NOGO task, *Molnár M.*		
09:00 - 10:40	**SY: A question of time: subcortico-cortical interactions in speech processing** – S. Kotz & M. Schwartze	Amph. 3	p. 9
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	Easy guessing, hard listening – Neural mechanisms of speech comprehension, *Obleser J.*		
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11:00 - 12:40	**SY: On the perception of the body from within and from the outside** – M.R. Longo & M. Tsakiris	Amph. 2	p. 12
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	Just a heartbeat away from one's body: interoceptive sensitivity and malleability of body-representations, *Tsakiris M.*		
	Multisensory Mechanisms of Owning an Entire Artificial Body, *Ehrsson H. H.*		
	A Hierarchy of Body Representations, *Longo M.*		
	The Perception of Spatial Layout as a Biologically Functional Adaptation, *Linkenauger S.*		

11:00 - 12:40	**SY: Medio-frontal cortex: performance monitoring and beyond** – B. Burle Rapid evaluation of error significance during performance monitoring, *Steinhauser M.* The role of supplementary motor area in action monitoring: evidences from intracerebral ERP recordings in Humans, *Bonini F.* The engagement of adaptive control is reflected in oscillatory neural dynamics in mediofrontal cortex, *Ridderinkhof K. R.* Neural correlates of cognitive control and its modulation during learning in monkeys, *Procyk E.*	Amph. 3	p. 13
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16:30 - 16:50	**Coffee break**		
16:50 - 18:30	**OR: Social Factors** – F. van Overwalle Neural Systems Underlying the Fundamental Attribution Error and its Consequences for Person Perception, *Brosch T.* Spontaneous and Intentional Social Inferences: A Common Process, *Van Overwalle F.* The temporal dynamics of the processing of social rejection feedback: Insights from the FRN-P3 complex, *Dekkers L.* The left temporal pole is not necessary for mentalizing, *Michel C.* Ongoing neural development of affective theory of mind throughout adolescence, *Vetter N.*	Amph. 1	p. 15
16:50 - 18:30	**SY: Emotion dysregulation in psychopathology** – C. Lombardo Ethnic Variation in Emotion Regulation: Do Cultural Differences End Where Psychopathology Begins?, *Arens E.* Is the enhancement of attentional allocation in social anxiety specific to emotional stimuli? Evidences for a generalized disruption of perceptual processes, *Rossignol M.* Emotion dysregulation in eating disorders, *Lombardo C.* Emotional dysregulation in insomnia: a possible mediating factor in the relationship between insomnia and depression, *Baglioni C.*	Amph. 2	p. 17
16:50 - 18:30	**OR: Executive functions** – F. Vidal Suppressing invalid response activation: RT distribution and electrophysiological arguments for common processes in Inhibition of Return and Simon tasks, *Spieser L.* Dissociation of facilitatory and inhibitory mechanisms of auditory attention after damage of the lateral prefrontal cortex, *Bidet-Caulet A.* Evidence for the automatic evaluation of self-generated actions, *Aarts K.* Reward increases early attentional control in the Stroop task and modulates interference-related ERP components, *Krebs R.* Updating episodic bindings: A role for the ventral striatum, *Hommel B.*	Amph. 3	p. 18
18:30 - 19:30	**ESCAN General Assembly**		
20:00 - 2:00	**Young Researchers Party !**		

Friday, May 11, 2012

09:00 - 10:40	**SY: Cognitive and affective neuroscience of aging** – M. Falkenstein Dynamics in cognitive ageing, *Lorist M.* Two hemispheres for better memory in old age: role of executive functioning, *Angel L.* The brighter side of brain aging: about the relationship between cognitive decline, emotional reactivity, and physical fitness, *Godde B.* Vascular disease—is it a substrate for the changes with aging in thought and affect?, *Jennings J. R.* To buy, or not buy: Aging and understanding of spoken language in a naturalistic 'stock price monitoring' task, *Falkenstein M.*	Amph. 1	p. 21
09:00 - 10:40	**SY: The Neuroscience of Social Conflict and Action Monitoring** – L. Koban & E. Núñez-Castellar How monitoring other's actions influences one's own performance during social interactions, *Núñez-Castellar E.* Social modulations of action control and adaptive behaviour, *De Bruijn E.* Do I care for others' money as much as for my own? Disentangling self- and fairness- related neural mechanisms involved in the Ultimatum Game, *Corradi-Dell'Acqua C.* Neurobiological mechanisms of social influence, *Klucharev V.* Monitoring performance and action conflicts – effects of interpersonal relationship and social consequences, *Koban L.*	Amph. 2	p. 22
09:00 - 10:40	**SY: Electro-physiology of language production** – M. Laganaro & F.-X. Alario The use of electroencephalography in language production research: a review, *Christoffels I.* Tracking the Time-course of Spoken Word Production with Event-Related Potentials, *Holcomb P.* Towards a component-free, correlative approach to event-related potentials acquired during overt speech tasks: A more natural context to test language production, *Thierry G.* Comprehensive spatio-temporal analysis of event-related potentials, *Michel C.*	Amph. 3	p. 24
10:40 - 11:00	**Coffee break**		
11:00 - 12:40	**OR: Emotions 2** – G. Pourtois The role of the ventromedial prefrontal cortex in negative emotion: Implications for well-being, *Van Reekum C.* Behavioral, Neural and Cardiovascular Responses to Emotional Stimuli: Simultaneous Recording of fMRI and Continuous Blood Pressure Reactions, *Okon-Singer H.* Comparison of physiological characteristics during unconscious and conscious perception of emotional audio stimuli, *Vaisertreiger A.* Disentangling the effects of affective dimensions and emotional categories in the perception of facial expressions of emotion: Affective ratings and event-related potential (ERP) findings, *Ferreira-Santos F.* A distributed cortico-limbic network decodes the emotional tone of a voice, *Frühholz S.*	Amph. 1	p. 24

11:00 - 12:40	**SY: Communicating brains** – S. Anders & T. Ethofer	Amph. 2	p. 26
	Encoding and integration of social information from human faces and voices, *Ethofer T.*		
	Coordination of EEG between speakers and listeners, *Kuhlen A.*		
	Mapping the flow of affective information between communicating brains, *Anders S.*		
	Dual-EEG of joint tapping: what can two interacting brains teach us about social interaction?, *Konvalinka I.*		
	Using fMRI-hyperscanning to study social interaction, *Bilek E.*		
11:00 - 12:40	**SY: Basal ganglia and cognition** – W.P.M. van den Wildenberg & S. A. Wylie	Amph. 3	p. 28
	Cognitive functions of the rat subthalamic nucleus, *Baunez C.*		
	Deep brain stimulation impairs on-line executive control in Parkinson's disease patients, *Hasbroucq T.*		
	The Role of the Subthalamic Nucleus in Multiple Alternative Perceptual Decision Making revealed by 7T Structural and Functional MRI, *Keuken M.*		
	Dopamine Agonists and the Suppression of Impulsive Actions in Parkinson's Disease, *Wylie S.*		
	Deep-Brain Stimulation Improves Overriding but not Re-engagement of Actions in Parkinson's Disease, *Van Den Wildenberg W.P.M.*		
12:40 - 13:40	**Lunch**		
13:40 - 15:30	**- Poster Session N°2 -**		p. 69
15:30 - 16:30	**Keynote Lecture - K. Rubia**	Grand Amphi	p. 31
	Neuro-functional development of "cool" and "hot" executive functions and its abnormalities in ADHD		
16:30 - 16:50	**Coffee break**		
16:50 - 18:30	**SY: Developmental Affective Neuroscience** – S. Mueller	Amph. 1	p. 31
	The relationship between puberty and social brain development, *Goddings A-L.*		
	Reward-related neural responses are dependent on the beneficiary, *Braams B.*		
	Incidental contextual threat in adults and adolescents: an fMRI study, *Mueller S.*		
	The development of attentional systems and modulation of emotion across adolescence, *Ernst M.*		
16:50 - 18:30	**SY: Perceiving and acting in a world with others** – C. Lopez & P. Romaiguère	Amph. 2	p. 32
	Lateral occipital cortex and self-other processing, *Romaiguère P.*		
	Putting affordances in social context, *Costantini M.*		
	Being moved by the self and others: empathy traits influence vestibular mechanisms of self-motion perception, *Lopez C.*		
	Body ownership as manipulated by a simple social interaction is reflected in hand-specific subregions of primary somatosensory area: an ultra-high 7T fMRI study, *Martuzzi R.*		
16:50 - 18:30	**SY: Emotion word processing** – L. Kuchinke	Amph. 3	p. 33

Contributions of Arousal and Valence to Word Recognition, *Estes Z.*

Effects of Word Frequency during the Processing of Emotional Words, *Méndez-Bértolo C.*

Effects of mood and emotional content on visual word processing – an fMRI study, *Kissler J.*

Emotion processing and its regulation: What words can tell us about it, *Herbert C.*

Processing emotional words and nonwords: an evaluative conditioning ERP study, *Kuchinke L.*

Do words stink? Investigating the effects of disgust on word processing, *Ziegler J.*

20:00 - ... **Conference Dinner**

Saturday, May 12, 2012

09:00 - 10:40	**SY: Affective neuroscience: Fear and pain** – P. Pauli	Amph. 1	p. 37
	Startle potentiation in humans – an indicator of fear and anxiety, *Pauli P.*		
	Neural Basis of Biased Information Processing in Phobics and its Modulation by Exposure Therapy, *Miltner W.*		
	Gender differences in pain responses under emotional stimulation: an ERP study, *Angrilli A.*		
	Brain responses to others' expressions of pain in chronic pain patients, *Montoya P.*		
	Emotional effects of the putative pheromone androstadienone on human participants, *Esteves F.*		
09:00 - 10:40	**OR: Cognitive and Affective Disorders** – P. Maurage	Amph. 2	p. 38
	Disrupted regulation of social exclusion in alcohol-dependence: an fMRI study, *Maurage P.*		
	Predicting treatment outcome in depression: combining EEG and personality, *Böcker K.*		
	Modifications of attentional bias and emotion processing in PTSD after EMDR treatment, *Khalfa S.*		
	Novelty-processing in infants with acyanotic congenital heart defects: a behavioural and ERP study, *Cormack F.*		
	Reduced interhemispheric temporal lobe connectivity predicts language impairment in adolescents born preterm, *Northam G.*		
09:00 - 10:40	**SY: Stopping action and cognition** – R. J. Huster	Amph. 3	p. 40
	Electroencephalographic indicators of response inhibition: Where to look?, *Huster R.*		
	Meta-analytic evidence for impaired cognitive inhibition in schizophrenia, *Westerhausen R.*		
	Discerning proactive and reactive mechanisms of inhibitory cognitive control: a combined EEG-fMRI study, *Lavallée C.*		
	Dissociating action cancellation and action restraint – Evidence from prefrontal and basal ganglia lesion patients, *Krämer U.*		
10:40 - 11:00	**Coffee break**		

11:00 - 12:40	**SY: déjà vu, déjà vecu and other mnesic experiential phenomena** – E. Barbeau Déjà vu in unilateral temporal-lobe epilepsy is associated with selective impairments in familiarity assessment, *Köhler S.* Forced-choice recognition in patients with chronic deja vecu, *O'Connor A.* Déjà vu induced by direct intracerebral stimulations studies, *Bartolomei F.* Recollection of vivid memories following intracerebral stimulations in epileptic patients, *Barbeau E.* Unveiling the mystery of déjà vu, *Brázdil M.*	Amph. 1	p. 41
11:00 - 12:40	**SY: The asymmetry of attention in visual processing** – R. Verleger Laterally presented targets in rapid visual series: Why left is better than right, *Verleger R.* Dependence of hemispheric asymmetry on alertness in healthy subjects and in visual hemineglect patients, *Finke K.* Attentional Load Asymmetrically Affects Early Electrophysiological Indices of Visual Orienting, *O'Connell R.* Asymmetry of parietal interhemispheric connections in humans, *Koch G.* Mind Your Left! It is the left visual field rather than the right hemisphere, *Okon-Singer H.*	Amph. 2	p. 43
11:00 - 12:40	**SY: Emotions: Towards an integrated approach** – E. Sequeira & S. Campanella Emotion and Brain-Body Activation, *Sequeira H.* Cardiovascular differentiation of emotions, *Critchley H.* The effects of transcranial Direct Current Stimulation (tDCS) to the prefrontal cortex on the neuro-circuitry of emotional control, *Vanderhasselt M-A.* Target detection through a visual oddball task: a combined ERP-fMRI study, *Campanella S.*	Amph. 3	p. 44
12:45 - ...	**Farewell buffet**		

Posters list

Poster Session N° 1

Thursday, May 10, 2012

PO: Emotions 1 p. 47

1-01 Alexithymia is associated with an augmenter profile, but not only: Evidence for anticipation to arousing music, *Grynberg D.*

1-02 An ERP study of dynamic emotional words processing: valence and source of emotion, *Imbir K.*

1-03 Approach-avoidance norms for IAPS pictures, *Czajak D.*

1-04 Brain mechanisms of motivations and emotions: A polarisation (adaptation) theory, *Murik S.*

1-05 Commonalities and differences between effects of attention and emotion control during early visual perception: behavioral and psychophysiological evidence, *Rossi V.*

1-06 Differential Emotional Modulations of STN Deep Brain Stimulation and L-Dopa in Parkinson's Disease.a, *Mondillon L.*

1-07 Facial emotion influences the face-biographical information associative processing in a function of age, *Stern J.*

1-08 Features of Perception of Emotional Intonation in Short Pseudo-words and Intelligible Speech Utterances, *Dmitrieva E.*

1-09 Internalization process of performance monitoring during probabilistic learning: behavioral and ERP effects of positive emotion, *Bakic J.*

1-10 Math anxiety effects on the processing of incorrect solutions in simple arithmetic, *Suárez-Pellicioni M.*

1-11 Neural Connectivity Underlying Individual Differences in Personality and Behavioral Reactions to Emotional Stimuli, *Okon-Singer H.*

1-12 Neural correlates of craving during cue exposure with response prevention (CERP) with chocolate, *Frankort A.*

1-13 Oxidative Stress in Pathogenesis of Posttraumatic Stress Disorder in a Contingent of International Operations, *Voicehovskis V.*

1-14 Oxytocin, social cognition and stress regulation: the importance of specific internal working models of attachment, *Baczkowski B.*

1-15 Positive emotion broadens attention focus through lessened position-specific encoding : evidence from visual ERPs, *Vanlessen N.*

1-16 Structural alterations in posttraumatic patients: Correlation to associative memory deficits, *Saar R.*

1-17 The contingent negative variation predicts the effect of appraisal frames on the late positive potential, *Wu L.*

1-18 The role of emotional vs. non-emotional factors in the speed of proactive guesses during visual scene recognition, *Schettino A.*

1-19 The study of the neurophysiologic mechanisms of perception of emotionally significant information in patients in coma, healthy adults and children, *Portnova G.*

Poster Session N° 2

Friday, May 11, 2012

2-02 Automatic facial expression processing as function of Alexithymia: An fMRI Study, *Lichev V.*

2-03 Cerebral correlates of emotional intensity perception in ASD, *Wicker B.*

2-04 Do happy words sound happy? A neuroscientific approach on phonoemotionality, *Conrad M.*

2-05 Does emotion regulation by distraction truly regulate emotion? Selective attention effects on LPP amplitudes, *Uibo H.*

2-06 EEG brain dynamics during processing of static and dynamic facial emotional expression, *Perdikis D.*

2-07 Emotional information processing in burnout: An oculomotor and electrodermal investigation, *Bianchi R.*

2-08 Exploring differences in conscious and preconscious processing of the emotional content of words, *Ponari M.*

2-09 Hypo-retrieval, hyper-suppression and emotional deficit in functional amnesia, *Tramoni-Negre E.*

2-10 Impulsivity and anterior alpha in predicting inter-temporal choices, *Uusberg A.*

2-11 Independence of valence and reward in emotional word processing, *Kaltwasser L.*

2-12 Lateralization of Emotions: Evidence from Pupil Size Measurement, *Lichtenstein-Vidne L.*

2-13 Making sense of emotion effects in lexical processing, *Ponari M.*

2-14 Neural networks of emotion processing of faces and words, *Braun M.*

2-15 Phasic cross-modal sensory boosting: visual emotion enhances auditory processing, *Selinger L.*

2-16 Preconscious processing of emotion in abstract but not in concrete words, *Vaghi M.*

2-17 The role of the basal ganglia in rhythmic entrainment and musical emotions, *Trost W.*

2-18 Time-frequency EEG differences between patients with depression and healthy controls during the anticipation of neutral and emotional faces, *Mnatsakanian E.*

2-19 Unconscious emotional stimuli effect: EEG study, *Klyuchko M.*

2-20 Valence specific effects of right vs. left prefrontal cTBS on late emotion sensitive ERPs, *Keuper K.*

2-21 When Suppressing Your Emotions Is Good: Emotion Regulation Affects Attentional Selection in Working Memory, *Okon-Singer H.*

PO: Executive functions 2 p. 75

2-22 Brain activity differentiates subjects with high and low dream recall frequencies during both sleep and wakefulness : ERPs and PET studies, *Ruby P.*

2-23 Decreasing beliefs of intentional control affects neurocognitive markers of motor control, *Rigoni D.*

2-24 Division of labor in action control: roles of (pre)supplementary and primary motor areas in Humans, *Roger C.*

2-25 Electrophysiological differences in the processing of task-irrelevant vs. task-relevant emotional words, *González-Villar A.*

2-26 Is inhibition impaired in ADHD adults?, *Suarez I.*

2-27 Prepare for the expected: the effect of predictions on proactive attentional control in conflict and task-switching experiments, *Duthoo W.*

2-28 Sleep deprivation affects the sensitivity of reactive control: An ERP analysis, *Ramdani C.*

Abstracts:
Keynotes, symposia, & oral sessions

Wednesday afternoon

15:00 – Keynote Lecture 1
Fernando Lopes da Silva

Center of Neuroscience, Swammerdam Institute for Life Sciences, Universiteit van Amsterdam

What we may learn from EEG/MEG signals about the dynamics of neuro-cognitive processes?

In this lecture I consider how dynamical neuronal assemblies are formed based on the mechanism of co-activation of neuronal elements, and how oscillations may emerge in local field potentials (LFPs). Considering that LFPs are the building blocks of EEG/MEG signals, the latter are considered in the light of 3 main functional attributes of LFP/EEG/MEG signals with respect to information processing in the brain: to enable/disable, to modulate and to encode information in neuronal networks. Some major features of the role of specific frequency components from very slow to high frequencies are reviewed, with special emphasis on synchronization of neuronal activities, phase relations and other dynamic properties. It is emphasized that most associations between LFP/EEG/MEG signals and cognitive processes should be considered taking into consideration multiple combinations of such signals, instead of single frequency oscillations. Concluding, EEG/MEG features, notably certain rhythmic activities taken jointly, can be useful to better understand the dynamics of how the brain processes and encodes information.

SY: Alexithymia and its Link with Social and Cognitive Neuroscience

Chaired by B. Herbert
16:00 – 17:40

Alexithymia from the social neuroscience perspective

Berthoz S.[1]

[1] *Institut National de la Santé & de la Recherche Médicale; Paris Sud and Paris Descartes Universities, France*

Though Sifnéos and Nemiah considered alexithymics have difficulties interacting and dealing with their social environment, very few studies attempted to objectively investigate whether alexithymia is associated with poor socio-affective skills. We explored this issue in a disorder associated with abnormal social adaptation. Thirty-eight adults with autism spectrum disorder (ASD), 87 parents of ASD and 47 typical adults completed self-reports assessing ASD traits, alexithymia, physical and social anhedonia. Autistic traits and alexithymia scores were strongly correlated. The ASD displayed higher scores than both the parents and typical adults. Further, the parents differed from the typical adults on measures of alexithymia and anhedonia. Hence, alexithymia is not only a key feature of ASD, but may also be observed in the broader autism phenotype. At the cerebral level, we explored how alexithymia modulates the responses to a social threat, with a specific emphasis on the impact of personal involvement. We compared the behavioral and cerebral responses of normal individuals with maximally divergent alexithymia scores (10 vs 11) to self- or other-oriented angry and neutral body expressions. Alexithymics showed greater activity in the human mirror neuron system and experienced high levels of threat with both self- and other-oriented angry expressions. Alexithymics displayed activation within vmPFC for self-oriented anger and experienced greater levels of threat with self- as compared to other-oriented angry expressions. This further demonstrates alexithymia is a relevant model to investigate the links between brain, social cognition and behavior, notably to delineate potential pathways between dysfunctional cerebral circuits, poor emotional insight, and intersubjectivity.

Relations between Alexithymia and Mentalizing

Subic-Wrana C.[1], Beutel M.[1], & Wiltink J.[1]

[1] *University Medical Center of the University of Mainz, Germany*

Disturbances in the ability to attribute mental states to self and others in order to understand and predict behavior (ToM = theory of mind) is discussed as an underlying mechanism in the development of severe psychiatric illnesses, e. g. autism spectrum disorders and schizophrenia. To date, there is little empirical evidence for answering the question if patients who suffer from psychosomatic and psychic conditions that require psychotherapeutic intreatment have also an impairment in building up a theory of mind and if this impairment is connected to their decreased ability to be aware of their emotions consciously. The emotional awareness construct (Lane & Schwartz, 1989) refers to alexithymia, as defined by Sifnéos, but extends this definition by relating alexithymia to a general model of cognitive-emotional development and highlighting that in alexithymia the conscious awareness of affect arousal as emotions that can be verbalized, is impaired. Empirical data will be presented that demonstrate that inpatients with somatoform disorders, as compared to healthy controls, have deficits in emotional awareness and ToM-capacity and that these deficits are interrelated (Subic-Wrana C, Beutel ME, Knebel A, Lane RD. Theory of Mind and Emotional Awareness Deficits in Patients with Somatoform Disorders. Psychosom Med, 72 (4): 404-411, 2010). Additionally, new and unpublished mentalizing data on 200 patients before and at the end of inpatient treatment will be presented. After reviewing other empirical evidence for an interrelation between alexithymia and deficits in ToM-functioning, this interrelation will be discussed from a developmental perspective.

On the relationship between alexithymia and social cognition in borderline personality disorder

Lang S.[1], Frick C.[1], & Barnow S.[1]

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Patients with borderline personality disorder (BPD) are chararcterized by emotional dysregulation, especially in social settings. It has been shown that BPD patients show particular high degree of alexithymia among psychitric disorders. Previous studies have shown reduced capability in cognitive empathy and higher levels of personal distress in healthy alexithymic individuals. Research on social cognition in BPD have revealed divergent findings with improved emotion recognition in BPD patients or impaired emotion recognition. The present study aimed at investigating the relationship between alexithymia and social cognition in 23 BPD patients and 34 healthy subjects. Alexithymia was assessed with the TAS-20. Social cognition was examined with an empathy self-report (Interpersonal Reactivity Index, IRI) and an objective approach. For the latter we performed the Reading the Mind in the Eyes task (RMET), which tests theory of mind. The results showed that BPD patients scored significantly higher in the IRI subscale 'Personal distress' than healthy subjects. Moreover, BPD patients were significantly better and faster in the RMET. Correlation analyses revealed an inverse relationship between the performance on the RMET and TAS-20 in the BPD group. In addition, a negative correlation was found between alexithymia and the IRI subscales 'empathic concern' (affective empathy) and 'perspective taking' (cognitive empathy) and a positive correlation between alexithymia and personal distress. The findings highlight the importance of considering alexithymia in BPD when testing social cognition.

Can't say what I feel: Cognitive and neural basis of alexithymia and relevance for schizophrenia

Aleman A.[1]

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Having difficulties in identifying and verbalizing one's emotions are characteristic of the personality trait of alexithymia. Schizophrenia is associated with higher levels of alexithymia. Here I present results from two recent studies in which we used event-related potentials (ERPs) and functional magnetic resonance imaging (fMRI) to investigate emotional processing in people with and without alexithymia. The results from functional neuroimaging suggest compromised activation of brain systems involved in emotional awareness. This was corroborated by an analysis of connectivity in the resting state. Twenty alexithymic and eighteen non-alexithymic healthy volunteers underwent a resting state fMRI scan. Independent component analysis was used to identify the deafult mode network (DMN). The alexithymic subjects showed lower connectivity within frontal areas of the DMN (medial frontal areas and medial temporal gyrus). In contrast, connectivity of this group was higher for the sensorimotor cortex, occipital areas and right lateral frontal cortex. These results suggest a diminished connectivity within the frontal DMN of alexithymic subjects, in brain areas that may also be involved in emotional awareness and self-referential processing. In contrast, alexithymia was associated with stronger functional connections of the DMN with brain areas involved in sensory input and control of emotion. The ERP study revealed reduced perceptual sensitivity to affective cues in emotional speech. With regard to schizophrenia, we suggest that, whereas subjective affect might be intact in schizophrenia, the more cognitive aspect (identifying, analyzing and verbalizing of emotion) is impaired. Evidence in favor of this assertion will be discussed.

Alexithymia is associated with Altered Top Down Control of Behavior

Herbert B.[1]

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Alexithymia has gained increased attention as a possible vulnerability factor for a variety of medical and psychopathological disorders. Collectively, alexithymic facets have been shown to reflect deficits in the capacity to process and consciously experience emotions as well as to regulate emotional states through cognitive processes. Ev-

idence supporting the view that alexithymia represents deficits in the top down control of cognitive-affective functions also comes from neuroimaging studies, revealing that during emotional contexts alexithymia is associated with altered activity in a brain network subserving executive and behavioral control. Response inhibition is the ability to suppress actions that are no longer behaviorally relevant and represents a key function of the human executive control system. To investigate the association between top down control of behavior regulation that reflects inhibitory control, i.e. response inhibition, and alexithymic features in healthy persons, the Stop Signal Task was used in positive, negative and neutral contexts. This task allows the indirect estimation of the capacity of behavior inhibition by calculating Stop Signal Response Time (SSRT). The results suggest that in a neutral context alexithymia is associated with a greater capacity of response inhibition. However, this capacity becomes more compromised when an emotional context is present. These findings underscore the relevance of altered inhibitory executive functions in alexithymia as a basic mechanism also for understanding its importance in different clinical populations.

SY: Face perception: insights into the visual, emotional and social brain

Chaired by N. George
16:00 – 17:40

Understanding individual face perception by means of steady-state visual evoked potentials

Rossion B.[1], Boremanse A.[1], Kuefner D.[1], & Alonso Prieto E.[1]
[1] *University of Louvain, Belgium*

A novel approach to understand face perception in the human brain by means of steady-state visual-evoked potentials (SSVEPs, Regan, 1966) is introduced (Rossion & Boremanse, 2011). In such experiments, participants are presented with pictures of faces appearing at a constant rate (e.g., 4Hz, or 4 faces/second) for a 90s duration while high-density EEG is recorded (128 channels). Time-frequency analysis shows large responses at the fundamental frequency (4 Hz) and harmonics (8 Hz, ...) over posterior electrode sites. The first and second harmonic responses are much larger at right occipito-temporal channels when different faces are presented than when the same face is repeated. This reduction of signal in the identical face condition is much smaller for inverted or contrast-reversed faces, two manipulations that are known to greatly affect facial identity perception. The SSVEP response at the specific frequency rate increases until about 10 seconds and then decreases when the same face is repeated. The sudden introduction of different face stimuli leads to an immediate increase of signal, indicating a fast, large and stimulation frequency-specific release to face identity adaptation. Overall, this sensitivity of the SSVEP to face identity in the human brain provides further evidence for face individualization in the right occipito-temporal cortex by means of a much simpler, faster and higher signal-to-noise approach than previously used. It offers a promising tool to study the sensitivity to visual features of individual faces in various populations presenting a lower sensitivity of their electrical brain responses (e.g., infants and children, clinical populations).

The neuronal dynamics of face processing: from detection to recognition

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Recognizing familiar faces rapidly and accurately is crucial for social interactions. However, how humans can move on from face detection to face recognition among hundreds of known faces remains largely unclear. In particular, the speed needed between face detection and face recognition has seldom been investigated. Event related potential (ERP) studies suggest that face detection occurs around 110ms while familiar face recognition may potentially rely on different components: the N170, the N250 or the N400.Using scalp EEG in control subjects and intracranial recordings in patients with drug-refractory epilepsy during a rapid go-no go categorization task, we compared electrophysiological responses between face detection (human vs animal faces) and face recognition (famous vs unknown faces, ie. familiarity level). We constrained participants to answer very rapidly and we used a large pool of stimuli in order to prevent top-down activation. Using both ERPs and single-trial decoding, a difference of 140ms was found between both detection and recognition conditions. This 140ms electrophysiological delay is remarkably similar with the delay observed in reaction time. Detection occurred around 100ms after stimuli onset while recognition occurred around 250ms post-stimulus. In contrast to some suggestions, this study demonstrates that individualizing a face as known (familiarity level) in a bottom-up paradigm takes a rather lengthy time compared to face detection (superordinate level). Why it takes such a long time needs to be investigated.

Early emotional modulations beyond human faces

Dubal S.[1], Chammat M.[2], & Nadel J.[3]
[1] *Centre Emotion, France* [2] *Centre Emotion, France* [3] *Centre Emotion, France*

Considering that faces are the main conveyers of human emotion is only one step to state that there is an emotional facilitation bias towards human faces. To test for this potential bias, we have designed event-related potentials studies using a set of prototypical emotions displayed by non-humanoid robots. These robotic heads were made out of complex metallic arrangements from which emotional signals had to be extracted. We compared ERP early responses to these non humanoid robots expressing hap-

piness and a neutral emotion, and sadness in a separate study.At the behavioral level emotion shortened Reaction Times similarly for robotic and human stimuli. Early P1 wave was enhanced in response to emotional - both happy and sad-compared to neutral expressions for robotic as well as for human stimuli. Congruent with their lower faceness properties compared to human stimuli, robots elicited a later and lower N170 component than human stimuli, and did not produce an inversion effect when put upside-down.These results emphasize the idea that early perceptual modulations in response to emotional expressions go beyond human faces. They also raise questions about the dissociation between affective properties and physical properties of the stimulus at the level of perceptual encoding. Besides examining the properties of the stimuli that contribute to emotionality at the level of the P1 component, our results show that positive stimuli may as well as negative ones trigger early emotional effects. A special focus will be put on the idea that positive emotion conveys high impact information.

The effect of cultural background on face and gaze scanning: An eye-tracking study

Senju A.[1], Vernetti A.[1], Kikuchi Y.[2], Akechi H.[2], Hasegawa T.[3], & Johnson M.[1]

[1] *Birkbeck, University of London, United Kingdom* [2] *Japan Society for the Promotion of Science* [3] *University of Tokyo, Japan*

A fundamental question about the development of social cognition is the effect of postnatal environment. However, it is difficult to test empirically because, unlike non-human animals, it is virtually impossible to control for the human postnatal environment. One of the promising ways to overcome this limitation is to study how the different cultural norms, which would systematically change the social experience, modulate the development of social cognition. We focused on the different cultural norms on the use of eye contact between British and Japanese cultures, and investigated whether it is related to the eve movement in response to the perceived eye contact. British and Japanese adult participants were presented with a series of animations of computer-generated faces, which made a gaze shift either toward or away from the participants, and either smiled or opened the mouth in a non-communicative manor. Results revealed differential pattern of face scanning between cultures, that Japanese participants fixated more 'in between' the eyes and less to the mouth. It was also found that participants followed the perceived gaze (i.e. looked to the same direction as the gaze shift) and looked more to the eyes when the face made eye contact and smiled. Critically, these differential response to facial displays did not interact with the cultural background of the participants, suggesting that the response to facial gestures are not modulated by the cultural backgrounds.

Investigating online joint attention during face-to-face interaction: an hyperscanning EEG study

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Within face, gaze plays a particular role in social interaction. Viewing someone gazing at an environmental object triggers attention orienting toward the object in the observer. This joint attention process involves a dynamic interplay of mutual attentiveness and coordinated attention to the environment between the persons (Tickle-Degnen, 2006); it is also a building block of theory-of-mind (Baron-Cohen-1995). Here, we aimed at studying joint attention with a setup involving online, face-to-face interaction between two agents whose brain activities were simultaneously recorded with EEG hyperscanning (60 electrodes / subject). The participants sat face-to-face, with a device subtending 4 light emitting diodes (LEDs) inbetween them, which could be switched in red, green, or orange. In "congruent" attention blocks, the subjects were requested to look at the same LED (joint attention condition), whereas in "incongruent" attention blocks, they had to look at opposite LEDs (no joint attention condition). Baseline trials where the participants could see the LEDs but could not see each other were included. Time-frequency analysis showed that induced oscillatory activity between 11 and 13Hz was reduced in the joint relative to no joint attention conditions over a large set of left centro-parieto-occipital sensors. These results suggest a modulation of centro-parietal mu rhythm, consistent with the idea that joint attention involves attention mirroring (Shepherd 2009), as well as a modulation of occipital alpha rhythm, consistent with the mutual attentiveness component of joint attention. This study emphasizes the interest – and feasibility – of moving toward a neuroscience of online face perception and real-life social interaction.

SY: How does the brain process time?

Chaired by J. Coull & L. Casini
16:00 – 17:40

The basal ganglia and temporal processing: evidence from Parkinson's disease

Jahanshahi M.[1]

[1] *UCL Institute of Neurology, United Kingdom*

Parkinson's disease (PD) is characterized by basal ganglia dysfunction due to dopamine loss, which makes it an ideal 'model' for investigating the role of the basal ganglia and dopamine in temporal processing. Furthermore, bradykinesia, or slowness of movement, is one of the primary symptoms of PD and leads to the prediction of timing deficits in this disorder. Empirical evidence has established that patients with Parkinson's disease have deficits in both motor timing and perceptual timing tasks, which increase with severity of the motor symptoms. Temporal processing in both the millisecond

and seconds ranges is impaired in this disorder. These deficits in temporal processing are generally more severe off levodopa medication and are reduced when patients are tested on medication. Imaging of PD patients during performance of a synchronization-continuation motor timing task has shown that while the fronto-striatal circuits are engaged during performance of this task by healthy controls, PD patients rely on activation of the cerebellum for task performance. Dopamine replacement medication increases striatal and frontal activation and striatal-frontal connectivity in PD during motor timing compared to when tested off medication. While evidence from PD has confirmed the importance of the basal ganglia and dopamine in temporal processing, the specific and differential roles that the striatum and the frontal areas play in temporal processing remain to be clarified.

Post-interval evoked N1-P2 amplitude reflects continuation of timing following CNV resolution

Van Rijn H.[1], & Meck W.[2]

[1] *Experimental Psychology, University of Groningen, Netherlands* [2] *Psychology and Neuroscience, United States*

Event-related potentials such as the contingent negative variation (CNV) and N1-P2 complex can be used to study the temporal flow of information and distinguish among different timing models (e.g., pacemaker/accumulator vs. coincidence detection). For example, in pacemaker/accumulator models the hypothesized link between the CNV and the clock reading suggests that the accumulator quickly returns to its base level upon resolution of the CNV. Such resolution, however, should impair the system in its timing of any subsequent events. We present data from a 'standard–comparison' timing procedure focusing on the N1-P2 complex evoked by the comparison stimuli. Based on the regularities in N1-P2 amplitude as a function of the duration of 'shorter' and 'longer' comparison stimuli, we argue that accurate temporal comparisons can be made even after the resolution of the CNV. These findings suggest that temporal information is used in at least two partly independent processes. One that drives the CNV and prepares the system for a change of response (i.e., from a default 'shorter' response to a 'longer' response). This CNV-related process resolves after the decision is made. However, there is still an ongoing timing process (perhaps sub-served by a coincidence-detection mechanism) that reflects the interval between stimulus onset and current time, which is used to give rise to the full range of the N1-P2 complex.

Automatic and controlled mechanisms in temporal preparation

Correa A.[1], Triviño M.[2], Capizzi M.[1], Sanabria D.[1], Arnedo M.[1], & Lupiáñez J.[1]

[1] *Universidad de Granada, Spain* [2] *Hospital de San Rafael, Granada, Spain*

In this talk I will present evidence from electroencephalography and neuropsychology dissociating automatic and controlled temporal preparation. Controlled temporal preparation (temporal orienting of attention) requires a functional right prefrontal cortex and competes for central resources when performed concurrently with a working memory task. Automatic temporal preparation (regular rhythms and foreperiod sequential effects) does not involve the right prefrontal cortex, it survives from dual task interference, and it suppresses rather than enhances brain electrophysiological activity related to early auditory processing.

Spatial-temporal interactions in the human brain: neurophysiological and neuropsychological studies.

Oliveri M.[1]

[1] *Psychology Department, Univesita di palermo, Italy*

Increasing evidence indicates that the representations of space and time interact in the brain but the exact neural correlates of such interaction remain unknown. Psychophysical experiments document the presence of spatially localised distortions of sub-second time intervals and suggest that visual events are timed by neural mechanisms that are spatially selective. Experiments with supra-second intervals suggest that time could be represented on a mental time-line ordered from left-to-right, similar to what is reported for other ordered quantities, such as numbers. Neuroimaging and neuropsychological studies show that processing of temporal information recruits a distributed network in the right hemisphere and suggest a link between deficits in spatial attention and deficits in time perception. However, studies on patients with focal brain lesions suggest that while a right hemispheric network is critical for explicit timing, a left hemispheric network is necessary for mediating the effects of prismatic adaptation on spatial and temporal perception, as well as for implicit timing.

Thursday morning

SY: Social cognition across development and pathology

Chaired by B. Wicker
09:00 – 10:40

Intact Mirroring in Autism

Bird G.[1]

[1] *Birbeck University of London, United Kingdom*

The ability of those with autism spectrum conditions (ASC) to mirror actions (imitation) and emotions (empathy) has been a focus of much research. The standard view is that ASC is associated with deficits in both processes with accompanying deficits in those neural systems subserving them (collectively referred to as 'mirror systems'). It shall be argued that in fact ASC is associated with deficits in neither process. With respect to imitation, data will be presented which demonstrates that rather than problems with imitation, those with ASC exhibit problems with imitation-inhibition, possibly due to a failure of top-down modulation in ASC. Furthermore, the data suggests that problems with imitation-inhibition are indicative of problems with theory of mind and perspective-taking, and are associated with wider social deficits. With respect to problems with empathy, it shall be argued that the previously reported deficits in ASC, and potentially other reported emotional deficits, are instead due to comorbid Alexithymia. Alexithymia is the term used to describe an inability to identify and describe one's own emotion, and prevalence is several times greater in the ASC population than in the typical population. It shall be argued that the presence of a high proportion of individuals with alexithymia is responsible for many of the affective symptoms of ASC including the claimed empathy deficit. Furthermore, failure to account for the presence of alexithymia in those with ASC may account for conflicting results in the processing of emotion more generally in ASC.

Emotion and action observation in the teenage brain

Grosbras M. H.[1]

[1] *Department of Psychology, University of Glasgow, United Kingdom*

Emotion recognition from facial expressions continues to improve during late childhood and adolescence (review in Herba and Phillips, 2004). How the ability to perceive emotion form other social signals develops remains largely unexplored, however. We argue that body cues are at least as important as facial cues to convey affective meaning, in particular during the transition between childhood and adulthood when social interactions are remodelled. In this symposium I will present longitudinal and cross-sectional behavioural and brain imaging data that reveal the developmental trajectory of emotion processing not only from facial expressions but also from non-communicative hand and body movements. We show that the ability to accurately recognize basic emotions follows a curvilinear development, with rapid improvement until about 10 years of age followed by a small dip, reaching adult level only in the mid-teenage years. This is delayed when point-light displays are used as stimuli, indicating that children rely more on form information. Using functional magnetic resonance imaging we observe that the activity in some brain networks (including amygdala, supramarginal gyrus and inferior frontal gyrus) during passive exposure to such emotionally laden stimuli follows a similar cubic developmental trajectory, while other brain regions (including temporal regions and premotor regions) undergo more linear changes with age. Further, I will explore the effects personality traits -such as empathy or resistance to peer influence- or formal experience in dance or drama have on interindividual differences in the ability to recognize emotion from body cues, and on brain activity.

Interactions between motor and emotional resonance investigated with a humanoid robot

Chaminade T.[1]

[1] *CNRS UMR 7289 & Aix Marseille University, France*

Humanoid robots, because they have a generic anthropomorphic form but lack human fine-grained details, are useful tools to investigate the neural bases of human social cognition. Here we describe an fMRI experiment in which behavioural and neural responses to a humanoid upper torso displaying expressions of happiness, anger and disgust or the emotionally neutral condition speech, were compared to human expressions of the same emotions while participants were required to judge either the emotional or the motion content of the videos. Increased response for robot stimuli in the occipital and posterior temporal cortex suggests increased visual processing when perceiving a mechanical anthropomorphic agent. In contrast activity in areas involved in emotional or motor resonance specific to the perceived action, as the insula for disgust or left Broca's area for speech, is reduced when actions are depicted with the humanoid robot. Finally, activity in regions generally involved in motor resonance in the ventral premotor and inferior frontal gyrus display different effects of the agent used to display the action and of the characteristic of the stimulus being judged. While activity in the ventral premotor is not affected by the task or the agent, activity in the more anterior Brodmann areas 44 and 45 is influenced by both experimental factors, supporting complex interactions between visual information and the object of attention in motor resonance. Altogether, these results are informative as to the features influencing the different areas involved in action perception.

When cartoon differ from real faces: Facial emotion processing in Autism Spectrum Disorders

Bastard-Rosset D.[1]

[1] *Institut de Neurosciences de la Timone, CNRS UMR 7289 & Aix Marseille University, France*

Deficits in facial emotion recognition are a hallmark of autistic spectrum disorders (ASD). To better understand the origins of these deficits, we conducted a series of experiments with children with and without ASD, exploring the influence of expertise in processing cartoon versus real face displays. Children with ASD demonstrated greater interest in cartoon than human faces. Further, their responses suggested a typical configural strategy for recognizing emotions on cartoon faces, but an atypical, local strategy with human faces. This suggests that a lack of expertise in examining human faces was associated with atypical perceptual processing. Interestingly, our results showed that the lack of expertise with faces influenced other domains of competences, as well. The ASD group showed greater sensitivity for cartoon faces in a perceptual categorisation task, in visual search, and in a priming task. The current results showed disparities between cartoon and human faces processing in children with ASD, linked to the role of expertise. It is possible that cartoons may be particularly useful in interventions for ASD.

Early Modulation of Perceptual Neural Activity Induced by Top-Down Social Information

Mermillod M.[1]

[1] *Laboratoire de psychologie sociale et de psychologie cognitive, France*

It is generally assumed that neural perceptual processes mainly rely on bottom-up spreading of activity from sensory receptors (e.g. retina) to high-level conceptual areas. On the basis of behavioral and electroencephalogram (EEG) experiments, we will show that both behavioral and neuronal responses to stimulation induced by emotional stimuli are modulated by the presence of social information as early as 100 to 120 ms onset. Both P1 and N170 components are significantly modulated by the positive or negative valence of social information preceding the emotional target (angry, disgusted, fearful, happy, sad or surprise facial expressions). These modulations of the P1 and N170 components are accompanied by behavioral modulation in the feeling but also in the perception of the emotional stimuli. These effects suggest that social information in an emotional target can induce early neuronal modulation at the level of perceptual extrastriate cortex (P1 component) and low-level cognitive areas (N170 component). Implications will be discussed in the context of recent theoretical models of top-down regulation (Bar, 2004; Niedenthal, Mermillod, Maringer, & Hess, 2010).

OR: Emotions 1

Chaired by M. Molnár
09:00 – 10:40

Watch the loose hanging wire! Conditioned fear modulates visual selection

Mulckhuyse M.[1], Crombez G.[1], & Van Der Stigchel S.[2]

[1] *Department of Experimental-Clinical and Health Psychology, Belgium* [2] *Experimental Psychology, Helmholz Institute Utrecht , Netherlands*

From an evolutionary viewpoint, it is suggested that our visual system is specialized in detecting threat automatically. Accordingly, previous studies investigated emotional modulation of visual selection with pictures of biological relevant stimuli. However, in our everyday lives we often learn what to fear by experience, such as a shock when touching a loose hanging electric wire. The current study is the first to investigate whether conditioned fear also modulates visual selection. Using the method of differential fear conditioning, we presented a threatening and a non-threatening stimulus distractor during an oculomotor selection task. For short as well as long saccade latencies, the deviation of the saccade trajectory was stronger for the threatening distractor than for the non-threatening distractor. Moreover, the eyes were captured more often by the threatening distractor. The results demonstrate that conditioned fear modulates visual selection immediately and fast. The current findings are interpreted in terms of a neurobiological model of threat detection.

Individual differences in emotion regulation: Why so negative?

Johnstone T.[1]

[1] *Centre for Integrative Neuroscience & Neurodynamics, United Kingdom*

In the last decade a substantial body of research has highlighted the neurobiological mechanisms by which negative emotions can be regulated. Such research has obvious direct implications for mood and anxiety disorders, in particular major depressive disorder. Neglected in such research is the importance of positive emotions and the ability to effectively regulate positive emotions in order to sustain motivation and psychological well-being. In this talk, I will present cross sectional and longitudinal fMRI results involving both healthy as well as clinically depressed individuals that highlight the importance of individual neurobiological differences in the regulation of positive emotion. Results in healthy individuals indicate the involvement of prefrontal-striatal circuitry in up-regulating and maintaining positive affect. This circuitry is compromised in clinically depressed samples, who show less sustained striatal activation and prefrontal-striatal connectivity than healthy controls. Striatal activation and prefrontal-striatal connectivity correlates positively with pre-treatment self-reported positive affect as well as the degree of improvement over the course of pharmacological treatment for depression.

Top down control of emotion: a specific example of a general mechanism?

Clarke R.[1], & Johnstone T.[1]

[1] *Centre for Integrative Neuroscience & Neurodynamics, University of Reading, United Kingdom*

Several studies point to a cortical circuit involved in emo-

tion regulation, in which specific prefrontal and cingulate regions regulate the activity of subcortical regions involved in emotion. Whilst most researchers acknowledge that many of these areas are also implicated in non-emotional cognitive control, there is little if any research that has directly probed which neural processes are modality independent and which are specific to emotions. We propose that much of the circuitry should be considered in terms of its domain general cognitive regulatory function, with emotion regulation being a specific application of this. We suggest that two prefrontal regions in particular, the ventrolateral PFC and the dorsal ACC, play a general role in cognitive control that encompasses the role played in emotion regulation. In the current fMRI study 19 healthy adult participants performed a visuospatial WM task with two load conditions in the presence and absence of anxiety induction using threat of electric shock. The same subjects completed a directed dichotic listening task as a measure of non-emotional top-down control. Threat of shock interfered with task performance in the low cognitive-load condition; however this interference was eradicated in the high cognitive-load condition. Activation in a cingulate region identified by a ThreatxDifficulty interaction contrast positively correlated with performance in the working memory task under threat of shock, as well as with performance on the dichotic listening task. Thus we propose that this region is part of a domain general network involved in cognitive control, one application of which is emotion regulation.

Toward an automatic and valence non-specific mechanism of relevance detection.

Mazzietti A.[1], Sellem V.[1], & Koenig O.[1]
[1] *Laboratoire d'Etude des Mécanismes Cognitifs, France*

In two studies involving 48 participants each (24 men and 24 women), we tested the hypothesis of a general, automatic mechanism of emotional attention relying on the relevance of a stimulus, irrespective of its valence. Participants performed 60 trials of an emotional "border task" in which they were presented with emotional pictures with an upper and a lower border (both stripped). Positive, negative and neutral pictures (20 of each) were used. Participants had to indicate as quickly as possible, by pressing a response button, whether the upper and lower borders were identical or not, irrespective of the content of the pictures. After the "border task", participants were presented again with the same pictures in order to rate them in terms of valence, arousal and relevance. Negative pictures were selected so as to be relevant for all participants, whereas positive pictures were selected so as to be relevant for male participants only in Experiment 1and for female participants only in Experiment 2. In Experiment 1, positive pictures represented plunging necklines and in Experiment 2, positive pictures represented babies. Ratings revealed that men judged positive and negative pictures more relevant than neutral pictures in Experiment 1, as did women in Experiment 2. The most important result was that relevance was predictive of the results in the "border task", since response times were longer for relevant (positive and negative) pictures than for neutral pictures. The present studies suggest the existence of an automatic mechanism of emotional attention driven by relevance and independent of valence.

Age-related time-locked synchronization likelihood changes accompanying ERP components observed in an emotional GO-NOGO task

Molnár M.[1], Boha R.[2], Tóth B.[2], & Gaál Z. A.[2]
[1] *Institute of Psychology, Hungarian Academy of Sciences, Budapest, Hungary* [2] *Institute of Psychology, Hungarian Academy of Sciences, Budapest, Hungary*

Introduction: The efficacy of inhibitory processes are presumed to decline with aging. Little is known, however, how emotional valence interferes with this process. The hypothesis of the present study was that inhibitory mechanisms as reflected by the amplitude of the N2 ERP component recorded in an emotional GO-NOGO task would be more robust in the young and would be accompanied by peculiar synchronization features. Methods: Words having different emotional valence (negative, positive, neutral) were presented to a group of young (n=15, mean age: 21.2 yrs) and old (n=14, mean age: 65.7 yrs) participants. They were instructed either to make a motor response or withhold it following the presentation of the words, depending on their valence. Synchronization likelihood (SL) was determined for EEG-epochs corresponding to the N2 component of the ERPs elicited by the words. The analyses were carried out in the delta and theta frequency bands and with respect to Fz, Cz and Pz sites. Results: Negative NOGO stimuli elicited the highest amplitude N2 component in the young. In general, SL was higher in the young but its changes were region-specific and valence-dependent. Age-specific changes were specially conspicuous for the stimuli with positive valence. Conclusions: According to the ERP-findings inhibitory mechanisms were more effective in the young particularly for negative stimuli supporting the concept of "aversive bias". However, the characteristics of nonlinear-linear synchronization pertaining to the N2 component appeared to be quite complex representing a sensitive measure of various features of emotional information processing.

SY: A question of time: subcortico-cortical interactions in speech processing

Chaired by S. Kotz & M. Schwartze
09:00 – 10:40

The motor-sensory control of speech and its role in learning a new language

Wise R.[1], Simmonds A.[1], & Leech R.[1]
[1] *Imperial College London, United Kingdom*

Articulatory movements necessary for producing native

speech can involve repeated simple motor-to-sensory mappings (such as infant babble), repeated sequences of syllables and the non-repeating complex sequences that make up connected speech. This hierarchy of overlearned speech motor control is dependent on Brodmann's areas 6, 44 and 45 in left inferior frontal cortex (IFC). The left IFC is a central component of a distributed network, consisting of higher-order prefrontal regions, subserving the cognitive control of thoughts and internal goals of communication, and posterior cortex (temporal and inferior parietal) which stores long-term phonological, syntactic and semantic representations. In addition, there is an essential link between the IFC and the sensory regions - the planum temporale and parietal operculum at the temporo-parietal junction (TPJ) – that allows a comparison between the intended motor speech goal and the one achieved, signaled by afferent feedback. Previous work has shown that regions involved in integrating motor feedforward with sensory feedback signals are more active during non-native speech production, even in proficient bilinguals, relative to native speech. This work has been extended to a prospective training fMRI paradigm, exploring rapid regional cortical plasticity and changes in functional connectivity as subjects underwent an intense period of training in the production of non-native words. The emphasis was on correct articulation, with no training on the meaning or grammatical properties of the foreign words. This study explores rapid, experience-dependent plasticity in the so-called 'dorsal language stream', and the results will have relevance to recovery of speech production after aphasic stroke.

Does the processing of segmental durations in speech engage a general timer?

Casini L.[1], Vidal F.[1], & Burle B.[1]

[1] *Laboratoire de neurobiologie de la cognition, France*

The duration of speech segments plays a critical role in the perceptual identification of these segments, and therefore in that of spoken words. Although it is obvious that timing is necessary for its perception and production, this temporal dimension has often been ignored in the study of language. Therefore, an important question is whether these mechanisms are specific to speech, or whether the perceptual handling of segment duration is accomplished by means of central timing mechanisms. Here, we will present and discuss some data centered on this question. In the first study, we investigated whether attentional manipulations known to affect explicit temporal processing similarly affect the perception of duration of speech, and in the second one, we studied effects of hyperstimulation of striatal dopamine receptors induced by sleep deprivation. Results suggest that duration perception in language share common mechanisms with explicit temporal processing. In addition, the durations involved in speech perception being sub-second durations, these results also provide arguments to propose that sub- and supra-seconds durations could share common mechanisms.

Easy guessing, hard listening – Neural mechanisms of speech comprehension

Obleser J.[1]

[1] *Max Planck Institute for Human Cognitive and Brain Sciences, Germany*

Comprehending speech is an astonishing faculty of the human brain, especially so under adverse listening conditions. How and by which neural mechanisms do we cope so well with the fleeting percepts of speech? In addition to "facilitating" influences such as semantic context, listeners also cope with challenging listening situation by fully exploiting their sensory and cognitive resources, e.g. their working memory capacities ("compensation"). I will present data from functional MRI (fMRI), magneto- and electroencephalography studies (M/EEG; with an emphasis on neural oscillations) that utilize acoustically degraded speech stimuli to pursue the neural underpinnings of these facilitation and compensation mechanisms in detail.

Timing and Speech: inherent or distinct?

Schwartze M.[1], & Kotz S.[1]

[1] *MPI for Human Cognitive and Brain Sciences, East Germany*

Our sense of hearing rests on the processing of events that unfold in time. Acoustic events form patterns of varying formal and temporal complexity extending from the clicks of a metronome and morse-code to musical notes and speech. Formal structure reflects characteristics such as pitch, timbre, loudness, while temporal structure gives rise to the concepts of succession and duration. Both are independent sources of information in auditory cognition. However, perceived regularity in either dimension can be used to generate predictions regarding the future course of events. Such predictions instantiate a powerful mechanism that allows for proactive behavior in cognition and action. Here we propose that auditory processing, and speech processing in particular, interfaces with dedicated temporal processing systems such as the cerebellum, the supplementary motor area, and the basal ganglia in order to exploit temporal regularity and to predict the temporal locus of important events. The emerging integrative subcortico-cortical framework models speech processing as a dynamic process and provides a novel perspective regarding the development, optimization, and functional loss of speech processing capacities.

SY: Advances in Developmental Cognitive Neuroscience

Chaired by T. Baldeweg
11:00 – 12:40

Development and Training induced Plasticity of Working Memory

Klingberg T.[1]

[1] *Karolinska Institutet, Sweden*

Working memory (WM) is closely related to top-down attention, with both functions depending on a common network of frontal and parietal regions. WM is important for academic performance and impairments are associated with distractibility and inattention in several clinically defined groups, such as in ADHD. WM is thus a key function for cognitive development during childhood and it is important to find out factors contributing to its development. In a longitudinal study of 6-20 year old individuals we investigated how genetic polymorphisms, environmental factors and brain development is associated with development of WM capacity. Several genes affect brain development and WM. Structural maturation predicts future WM capacity. Parietal brain activity during WM trials was also a predictor of future math performance. We have also developed and tested a computerized method for training WM. Several studies have shown that WM can be improved by this method, and that performance improves also on non-trained tasks demanding WM. Moreover, improving WM also decreases the symptoms of inattention in everyday life. Klingberg and colleagues has also shown that training of WM changes brain activity in frontal and parietal regions, and is associated with changes in the density of dopamine D1-receptors in the cortex. Training of WM might thus be a non-pharmacological way to address the key cognitive function in children with low WM.

Development of the brain's language network: structure and function

Brauer J.[1]

[1] *Max Planck Institute for Human Cognitive and Brain Sciences, Germany*

Language processing in the human brain is mainly accomplished by a network of perisylvian frontal and temporal brain regions. Differences in the language networks of adults and children are observed in low frequency fluctuations of the BOLD signal in response to language processing. Correlations in these fluctuations across the brain yield strong ipsilateral findings between frontal and temporal language areas in adults, but not in children. Children instead show stronger correlations to contralateral homolog regions. A complementary aspect of this functional network is its structural connectivity as in the course of language acquisition during childhood, linguistic abilities are established and improved while the brain matures simultaneously. Combining functional and structural data shows that children not only employ the cortical areas of the language network differently compared to adults, moreover, they also show that their use of these functional areas is related to the maturational status of the underlying white matter. Taken together, the available data suggest that the full mastery of language depends on a neural network which guarantees the functional interplay between language regions.

Development of speech and articulation and their disruption due to genetic modification and neurological injury.

Liegeois F.[1]

[1] *Developmental Cognitive Neuroscience Unit, UCL Institute of Child Health, United Kingdom*

The identification of the first gene involved in a speech-language disorder was made possible through the study of a British multi-generational family (the "KE family") in whom half the members have an inherited speech-language disorder caused by a FOXP2 mutation. I will review neuroimaging investigations in the affected members of the KE family which have revealed structural and functional abnormalities in a wide cortical-subcortical network. Functional imaging studies have confirmed dysfunction of this network by revealing abnormal activation in several areas including Broca's area and the putamen during language-related tasks, such as word repetition and generation. In the second part of my talk I will review evidence on the normal development of functional and structural maturation of neural systems underlying speech production and will show examples how acute neurological injury can disrupt these processes.

Cognitive Development under conditions of chronic hypoxia: The Bolivian Children Living at Altitude (BoCLA) Project.

Hogan A.[1]

[1] *William Harvey Research Institute, United Kingdom*

Millions of people currently live at altitudes in excess of 2500 metres, where oxygen supply is limited, but very little is known about the development of brain and behavioural function under such hypoxic conditions. We describe the physiological (including transcranial doppler, EEG and ERP), cognitive and behavioural profile of a large cohort of infants (6-12 months), children (6-10 years) and adolescents (13-16 years) who were born and are living at four altitude locations in Bolivia (from 500m up to over 4000m). Level of haemoglobin oxygen saturation was significantly lower in all age groups living above 2500 metres, confirming the presence of hypoxia, but without any detectable detriment to health. Only subtle neuropsychological changes were found below 3800m. Importantly, the proportion of European, Native American and African genetic admixture was comparable across altitude groups, suggesting that adaptation to high altitude in these children occurred in response to chronic hypoxic exposure irrespective of ethnic origin. Interestingly, above 4000m there were more changes, suggesting an altitude threshold over which the ability of the developing brain to adapt to hypoxia may be less effective. These BoCLA data have potential implications for public health and for our understanding of neurocognitive outcome in children living at sea-level with pathological forms of mild hypoxia.

SY: On the perception of the body from within and from the outside

Chaired by M.R. Longo & M. Tsakiris
11:00 – 12:40

How changes in structure and function of the physical body affect body and space representation.

Serino A.[1]
[1] *Centro studi e ricerche in Neuroscienze Cognitive, Italy*

The brain contains multiple representations of the body and of the space surrounding the body, i.e. peripersonal space (PPS). We asked how much such representations are sensitive to changes in the structure and the function of the body they represent. In order to test the effects of a change in the structure of the physical body, we tested body and PPS representations in patients undergone to upper limb amputation and prostheses implantation. Amputation deformed body and PPS representation, so that patients perceived their stump as shorter and the PPS around the stump was disorganized, as compared to the intact limb. These effects can be partially reversed by prosthesis implantation, as just wearing the prosthesis extended the perceived length of the amputated limb and the representation of the space around it. In a second study, in order to test the effects of a change in the function of the physical body, we tested body and PPS representation before and after 10 hours of immobilization of the right arm, resulting in a parallel extraordinary use of the left arm. This procedure did not change the implicitly perceived length of the immobilized right arm, but did increase the perceived length of the over-used left arm. Conversely, PPS representation was reduced around the immobilized arm, but did not change around the over-used arm. These findings show that body and space representations are plastically shaped as a function of both structural and functional proprieties of the physical body.

Just a heartbeat away from one's body: interoceptive sensitivity and malleability of body-representations

Tsakiris M.[1]
[1] *Royal Holloway, University of London, United Kingdom*

Body-awareness relies on the representation of both interoceptive and exteroceptive percepts coming from one's body. However, the exact relationship and possible interaction of interoceptive and exteroceptive systems for body-awareness remain unknown. Based on recent models of self-awareness that consider the insula as a convergence zone linked to the representation of the bodily self, we examined the interaction between interoceptive and exteroceptive awareness of the body. Across three experiments, we combined measures of interoceptive sensitivity with experimental manipulations of body representations. Consistent results suggests that interoceptive sensitivity predicts the malleability of body representations, that is, people with low interoceptive sensitivity experience stronger illusions of embodiment ("rubber hand illusion") and identification ("enfacement illusion"). In one final experiment, we manipulated interoceptive sensitivity by mirror self-observation. Overall these findings suggest that interoceptive sensitivity modulates the integration of multisensory information and predicts the strength and malleability of body-representations.

Multisensory Mechanisms of Owning an Entire Artificial Body

Ehrsson H. H.[1]
[1] *Department of Neuroscience, Karolinska Institutet, Stockholm, Sweden*

When we look down at our body we immediately experience that it belongs to us. We do not experience our body as a set of fragmented parts, but rather as a single entity. How does this perception of owning an entire body arise? Here we address this question by using a 'body-swap' illusion where people experience an artificial body as their own body, in combination with brain imaging and behavioral experiments. Our behavioral and psychophysiological results suggest that the following factors are necessary for the elicitation of the illusion: i) temporal congruency of visual and tactile signals; ii) spatial congruency of visual and tactile signals in an external reference frame centered on the body; iii) a humanoid body shape; (iv) a first person visual perspective. Importantly, we further describe how ownership generalizes from the stimulated body part to the rest of the (unstimulated) body. Our functional magnetic resonance imaging studies revealed a tight coupling between the experience of full-body ownership and neural responses in bilateral ventral premotor and left intraparietal cortices and the left putamen. Importantly, activity in the ventral premotor cortex reflected the construction of ownership of a whole body from the parts as it was present irrespectively of which body part that was stimulated to trigger the illusion, and further, this area displayed multivoxel patterns carrying information about full-body ownership. Taken together these results provide a mechanistic multisensory framework to explain how we come to experience an entire body as our own.

A Hierarchy of Body Representations

Longo M.[1]
[1] *Birkbeck, University of London, United Kingdom*

We experience our body as a coherent, 3-D, volumetric object. Initial somatotopic maps in somatosensory cortex, however, represent the body as a set of fragmented, 2-D skin surfaces. I will discuss a series of recent experiments investigating different classes of body representation of the hand, which suggest they fall along a continuum from fragmented 2-D maps of individual skin surfaces to coherent 3-D maps of the body as a whole. First, tactile localisation on the skin appears to rely on a purely 2-D representation of skin surfaces. Localisation biases, though consistent from person-to-person, differ qualitatively between the palm and the dorsum. Second, body representations underlying position sense appear to rely

on an intermediate representation. Distortions of hand shape are qualitatively similar between the palm and dorsum, suggesting that they do not rely on fully distinct 2-D representations of each surface. However, the magnitude of distortions is reduced on the palm, inconsistent with a representation of the hand as a fully 3-D object. Position sense may rely on a 2.5-D representation of the body, analogous to the 2.5-Dsketch proposed in vision by David Marr. Finally, the conscious body image appears to be largelyundistorted, with a clear match between the palm and dorsum, suggesting they rely on a fully-integrated 3-D representation of the hand as a volumetric object. Together, these findings reveal ahierarchy of body representations effecting a coordinate transformation from fragmented 2-D mapsin somatosensory cortex to a volumetric representation of our body in the world.

The Perception of Spatial Layout as a Biologically Functional Adaptation

Linkenauger S.[1]

[1] *Max Planck Institute for Biological Cybernetics, Germany*

From a biological perspective, visual and perceptual systems evolved to promote adaptive actions with minimal energetic cost. As a result, humans are only sensitive to the visual information which is necessary for successful environment interaction. Additionally, individuals perceive this information in an adaptive way which supports successful behaviors. Information specifying the spatial layout not only allows for the execution of visually controlled actions, but also allows perceivers to determine which actions they can perform. In order to make decisions about possibilities for action, visual information specifying the environment needs to be scaled to action capabilities of actors' bodies. I will provide evidence that this rescaling provides the metric to which the optical information specifying perceived sizes and distances are scaled. In other words, individuals perceive sizes and distances as a proportion of the action-relevant aspect of their body. Hence, individuals do not perceive the world, but the relationship between their body's action capabilities and the environment.

SY: Medio-frontal cortex: performance monitoring and beyond

Chaired by B. Burle
11:00 – 12:40

Rapid evaluation of error significance during performance monitoring

Steinhauser M.[1], Maier M.[2,3], & Matuschek J.[1]

[1] *University of Konstanz, Germany* [2] *Università di Bologna, Italy* [3] *Centro Studi e Ricerche in Neuroscienze Cognitive, Cesena, Italy*

The continuous monitoring for errors in ongoing behavior is crucial for achieving goal-directed performance. To adaptively adjust behavior in response to an error, it is not only necessary to detect the occurrence of an error but also to evaluate its significance for future behavior. Although evidence for such an evaluation has been provided, little is known about the speed and flexibility of this process. In the present study, we used event-related potentials to investigate whether error significance influences early correlates of performance monitoring under conditions where significance had to be evaluated during task execution. In two experiments, participants responded to the location of a target stimulus while ignoring two simultaneously presented distractor stimuli that were associated with different amounts of monetary loss. While behavioral responses to low-loss and high-loss distractors were equally frequent, the error-related negativity, a negative deflection peaking immediately after error responses, was larger if the error was associated with a higher loss. This suggests that information about error significance is evaluated during task execution, which implies a rapid and flexible evaluation process.

The role of supplementary motor area in action monitoring: evidences from intracerebral ERP recordings in Humans

Bonini F.[1], Burle B.[1], Liégeois-Chauvel C.[2], Chauvel P.[2], & Vidal F.[1]

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Performance evaluation and errors processing are fundamental for adaptive and flexible goal-directed behaviour. Electrophysiological approaches have shown a scalp-recorded event-related potential (ERP), called "error negativity" (Ne) and initially considered to reflect an "error detection" mechanism, while functional neuroimaging, together with some source localization studies, have pointed out the rostral cingulate zone (RCZ) as a possible generator of this activity. Nevertheless the evidence of a similar, even though smaller, ERP on correct trials has challenged the interpretation of Ne's nature and hence all current models of cognitive control processes. A condition necessary to establish if these two negativities reflect a common functional mechanism is the presence of a common cerebral source. In the present study we first questioned the anatomical source of the Ne, as to date only indirect data are available in humans. Secondly, we tried to assess the unicity of the generator for the negativities on correct and errors, to support the hypothesis of a unique modulated physiological process. Direct recordings from human cerebral cortex in epileptic patients show that supplementary motor areas (SMAs) are implicated in action monitoring. Moreover SMAs are involved in the generation of both error and correct trials evoked responses. These results suggest that these two scalp ERPs do not reflect two distinct brain activities but rather a single process whose amplitude is modulated by performance.

The engagement of adaptive control is reflected in oscillatory neural dynamics in mediofrontal cortex

Ridderinkhof K. R.[1]

[1] *University of Amsterdam, dept. of Psychology, Netherlands*

The mediofrontal cortex (MFC) is key to adaptive behavior. Across a variety of situations and paradigms, ranging from reinforcement learning to response conflict and post-error adjustment, the MFC recruits other brain regions to implement and fine-tune such adaptive behavior. Physiologically, these interactions may occur through local and long-range synchronized oscillation dynamics, particularly in the theta range (4-8 Hz). Here we report on time/frequency analysis of EEG data from a handful of studies in humans to demonstrate that the MFC-theta signature of such adjustments 1) differs between impulsive errors and attentional lapses, 2) differs between response conflict and stimulus conflict, 3) accurately reflects the temporal dynamics of response conflict, 4) accurately predicts successful learning from negative feedback, and 5) shows qualitative change with age. These patterns highlight the central role of MFC-theta oscillations in the neurobiological mechanisms underlying the engagement of adaptive control in response to endogenous and exogenous demands.

Neural correlates of cognitive control and its modulation during learning in monkeys

Procyk E.[1]

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Neural unit recordings in the anterior cingulate cortex have shown activity specific of particular outcomes or feedbacks during a trial and error task. This activity, which will be reviewed, represents different events that are all relevant for behavioural adaptation. This includes negative or positive feedbacks after choices, negative feedback after execution errors, or visual signals indicating new conditions. The specificity is suggestive of a mechanism involved in triggering adaptations like shifting after choice errors, compensating after execution errors, etc. In this context we are investigating the correlates of these adaptations in areas directly or indirectly connected to the anterior cingulate cortex. Neural correlates of adaptation have been studied using unit, LFP, and ECoG recordings in frontal cortex of monkeys performing a trial and error task. In this task monkeys have to find by trial and error in each block of trials which of four targets is rewarded, and then repeat the correct response. The reward schedule is deterministic. The solution is changed after the monkey has repeated at least 3 times the correct response. Animals thus alternate between exploration and exploitation periods that require different levels of control on behaviour.Our data show changes in lateral prefrontal activity and more distant precentral ECoG oscillations during adaptations. Low frequency (beta) oscillations are modulated by behavioural periods (learning vs repetitive behaviours), and after different feedbacks. These modulations seem to reflect changes in a specific task-related neural process, possibly cognitive control.

Thursday afternoon

15:30 – Keynote Lecture 2
Pascal Belin

Voice Neurocognition Laboratory, Institute of Neuroscience and Psychology, University of Glasgow, International Laboratories for Brain, Music and Sound (BRAMS), Université de Montréal & McGill University

The vocal brain: cerebral processing of social information in voices

The human voice carries much more than 'just' speech: it is rich in socially relevant, speaker-related information which normal adult listeners appear to be particularly skilled at extracting. When we hear a voice—whether or not it carries speech in a language we can understand—we form quite accurate impressions of the speaker's physical characteristics such as gender, approximate age and size; we also perceive valuable information on his or her affective state, sometimes at odds with the spoken message; we form an impression of the person's personality that strongly affects future interactions. Despite their importance in our everyday interactions, the cognitive and cerebral mechanisms of social voice processing remain largely unexplored compared to other areas of social cognitive neuroscience such as cerebral speech perception of face processing. In this lecture I will present evidence showing that our voice cognition abilities are supported by an evolutionary old, complex network of cerebral regions of which the temporal voice areas of auditory cortex constitute a crucial node, with a functional organization essentially similar to that of cerebral face processing.

OR: Social Factors

Chaired by F. van Overwalle
16:50 – 18:30

Neural Systems Underlying the Fundamental Attribution Error and its Consequences for Person Perception

Brosch T.[1]

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When trying to figure out why other people behave the way they do, we should take into account both dispositional factors (such as personality traits) and situational constraints as potential causes for a behavior. However, people often ignore the importance of situational factors, a phenomenon known as the Fundamental Attribution Error (FAE). To investigate the neural mechanisms underlying the FAE, we decomposed the attribution process by separately presenting information about behaviors and about the situational circumstances in which they occur. After reading the information, participants judged to what extent the behavior was attributable to dispositional or situational causes (attribution), and how much they liked the person described in the scenario (evaluation). FAE was associated with reduced BOLD in DLPFC during the encoding of situational information, consistent with the failure of a correctional process that integrates situational information into attributions. Furthermore, attributions were strongly linked to subsequent evaluations. We observed a dissociation between brain regions involved in evaluations that integrated situational information and evaluations based exclusively on behavior, with DMPFC emerging as potential substrate of the integration of attributions and evaluations. Our findings demonstrate how top-down control processes regulate impression formation when situational information is taken into account to understand others.

Spontaneous and Intentional Social Inferences: A Common Process

Van Overwalle F.[1]

[1] *Vrije Universiteit Brussel - Social Neuroscience lab, Belgium*

Recent neuroscientific evidence seems to contradict extant dual-process models which assume that spontaneous and intentional social inferences (e.g., on other's goals and traits) are guided by different processes. Across spontaneous and intentional inferences, ERP studies demonstrated that their onset occurs at about the same time, and fMRI studies have consistently found an overlap in core brain areas of mentalizing, including the temporoparietal junction, medial prefrontal cortex, and precuneus. These results are indicative of a common process that produces a rapid initial spontaneous inference. Differences in activated brain areas further suggest that this spontaneous process may be followed by a more intentional, flexible and cognitively demanding process during which observers qualify their initial inference.

The temporal dynamics of the processing of social rejection feedback: Insights from the FRN-P3 complex

Dekkers L.[1], Van Der Molen M.[1,2], Gunther Moor B.[1,2], & Van Der Molen M.[1]

[1] *Department of Developmental Psychology, University of Amsterdam, Netherlands* [2] *Department of Psychology, Leiden University, Netherlands*

Social rejection is a painful experience that shares neural networks with the experience of physical pain. Evolutionarily, these feelings of 'hurt' are thought to serve an adaptive behavioral function, namely promoting social connectedness. Previous neuroimaging studies associated the processing of social rejection feedback to increased activity in the anterior cingulate cortex (ACC). To date, however, the exact role of the ACC in social information processing remains elusive, as the use of various paradigms has resulted in the recruitment of different subdivisions of the ACC. In this study we recorded the FRN – an electro-cortical marker of ACC activity – and the feedback-related P3 to unravel the electro-cortical dynamics of social and non-social expectancy confirmation and violation. In line with previous findings observed using cognitive paradigms, the FRN was most sensitive to feedback that violated prior expectations. This was regardless of whether feedback communicated positive or negative valence. Furthermore, we found no evidence for preferential processing of social over non-social information. Interestingly, the feedback-related P3 seemed more sensitive to social context, as we found larger P3 amplitudes during the processing of social as opposed to non-social feedback. Together, the current findings suggest that the FRN reflects a rapid conflict monitoring system that is particularly sensitive to expectancy violation (i.e., congruent vs. incongruent), whereas the feedback-related P3 seems more sensitive to the contextual characteristics of feedback (i.e., social vs. non-social).

The left temporal pole is not necessary for mentalizing.

Michel C.[1], Pillon A.[1], Ivanoiu A.[1], Lhommel R.[1], & Samson D.[1]

[1] *Université Catholique de Louvain, Belgium*

Neuroimaging studies have shown that the anterior temporal lobes (aTLs) are part of the neural network consistently activated when people are engaged in Theory of Mind (ToM) tasks, i.e., tasks requiring to reason about other people's mental states. These findings have led some researchers to conclude that the aTLs play a critical role in our mentalizing ability, by either subtending the social scripts (Gallagher & Frith, 2003) or the social concepts that we need to infer other people's mental states (e.g., Ross & Olson, 2010). Here, we report the case of a patient, C.M., who suffers from semantic dementia following a brain degeneration affecting mainly the left aTL. The patient showed a severe impairment in tasks probing his semantic knowledge about the world, including social semantic knowledge tested in a series of tasks contrasting social and non-social concepts. However, despite his lesion, C.M. was perfectly able to attribute various types of mental states to other people in a range of non-verbal ToM tasks, including intention, knowledge and false belief reasoning tasks, even when material that has been shown to activate the left temporal pole in neuroimaging studies (e.g., Brunet et al.'s attribution of intention task, 2000) was used. These findings challenge the assumption that the aTLs play a critical role in ToM: they suggest that, as far as the left temporal pole is concerned, despite its recurrent activation in neuroimaging studies, this region is not necessary for inferring mental states, at least in non-verbal tasks.

Ongoing neural development of affective theory of mind throughout adolescence

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Affective Theory of Mind, an important aspect of Theory of Mind (ToM), involves understanding of complex emotions (Shamay-Tsoory et al., 2010). In adolescence, which is a developmental phase with major socio-emotional challenges, affective ToM is a critical ability. This is corroborated by first studies suggesting an ongoing development of affective ToM across adolescence on the behavioural level (Vetter et al., under review). Using a developmentally sensitive behavioural task in combination with fMRI we investigated the neural development of affective Theory of Mind throughout adolescence. The relationship between performance on the affective ToM task and neural activation was further explored. We scanned 18 adolescent (aged 12–14 years) and 18 young adult women (aged 19-25 years) women while they evaluated complex affective mental states depicted by actors in video clips. The ventral medial prefrontal cortex showed a significantly stronger response in adolescents in comparison to adults on the affective ToM but not on a physical control condition. In contrast, adults activated a part of the fusiform gyrus and the dorsolateral prefrontal cortex more strongly than adolescents. Task performance over both age groups was correlated with amygdala activity. Ongoing behavioural development of affective ToM throughout adolescence until young adulthood is thus paralleled by neural changes in the ventral medial prefrontal cortex. Furthermore, the results stress the importance to employ developmentally sensitive tasks and simultaneously control for performance. Overall, the ongoing refinement of affective ToM might help to master socio-emotional challenges in adolescence.

SY: Emotion dysregulation in psychopathology

Chaired by C. Lombardo
16:50 – 18:30

Ethnic Variation in Emotion Regulation: Do Cultural Differences End Where Psychopathology Begins?

Arens E.[1], Balkir N.[1], & Barnow S.[1]
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Emotion regulation (ER) via cognitive reappraisal has been shown to be superior to the use of expressive suppression regarding several aspects of mental well-being. However, a cultural perspective suggests, that the consequences of emotional suppression may be moderated by cultural values. In order to examine whether this also applies to clinical samples, we investigated healthy and depressed German women and healthy and depressed Turkish immigrants living in Germany. Groups were compared in terms of frequency of ER strategies (cognitive reappraisal and expressive suppression) and with which different aspects of mental well-being the same are associated. Healthy Turkish immigrants exhibited a greater ER balance (frequent use of suppression plus frequent use of reappraisal), which was associated with more positive outcomes of expressive suppression in Turkish than in German women. None of these differences were found in patient samples, both of which showed a greater use of emotional suppression than cognitive reappraisal. Results suggest that the cultural moderation of the link between emotional suppression and well-being is associated with a greater ER balance in healthy Turkish individuals. Depressed Turkish patients may not profit from suppression due to their more rigid use of it.

Is the enhancement of attentional allocation in social anxiety specific to emotional stimuli? Evidences for a generalized disruption of perceptual processes.

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The capacity to respond efficiently and accurately to emotions displayed on faces is necessary to ensure smooth social interactions in everyday life. However, different psychological disorders are characterized by important deficits in the recognition of emotional faces. In particular, individuals with high social anxiety show enhanced automatic vigilance to faces, indexed by higher amplitudes of early ERP components as the P1. However, P1 enhancements have been reported for negative faces but also for happy and neutral faces. One may suggest that all categories of faces represent a potential threat in social anxiety. Alternatively, another theory postulates a generalized hypervigilance to visual stimuli in social anxiety, which would extent to other categories of stimuli, even non-emotional. In that context, we conducted two studies assessing the specificity vs. generalization of enhanced visual processing in social anxiety (SA). In a first study, an emotional Stroop paradigm was proposed to SA participants who had to name the emotional expression (anger, happiness, neutrality) of faces (explicit processing) or the color of a mask superimposed on them (implicit processing). In a second study, SA participants were asked to detect targets succeeding to emotional faces, human postures, or everyday-life objects. In both studies, SAD demonstrated enlarged P100 for all visual stimulation, suggesting a generalization of the phenomenon of increased visual processing in social anxiety. These results will be discussed within the framework of the recent models of anxiety and the phenomenon of emotional regulation.

Emotion dysregulation in eating disorders

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Several etiological models of eating disorders suggest that people vulnerable to these problems often experience intense negative emotions and turn to food for up-regulating them (Polivy and Herman, 2002; Macth, 2008) and research findings evidence lower emotional awareness and higher difficulties in regulating emotions, higher use of suppression or experiential avoidance and lower use of reappraisal and problem solving (e.g. Harrison et al., 2009; Bekker, Spoor, 2008; Schmidt, Treasure, 2006) in eating disorders. Since people with AN show extreme personality features of emotional dysregulation and inhibition, which includes social avoidance, anxiousness and affective liability (Holliday, Uher, Landau, Collier, & Treasure, 2006), it could be hypothesized that the emotion dysregulation is the factor that promote both the development and/or maintenance of eating disorders and the comorbidity with other Axis I and Axis II disorders. Consistently with this interpretation, a recent meta-analysis (Aldao et al., 2010) evidence that the severity of the disorder is greatly predicted by emotion suppression. Within this conceptual framework, two studies will be presented evidencing that: 1) both ED patients and people high in eating restriction show higher use of expressive suppression than healthy control groups; 2) emotion suppression predicts the cooccurrence of symptoms of ED and symptoms of insomnia, depression, anxiety in nonclinical samples; 3) emotion suppression predicts physiological (EMG over the corrugators and zygomatic muscles, HR and SCL) responses to emotional stimuli related and not related to the main disorder complied.

Emotional dysregulation in insomnia: a possible mediating factor in the relationship between insomnia and depression

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In many patients with depression, symptoms of insomnia herald the onset of the disorder and may persist into remission or recovery, even after treatment. A meta-analysis of recent data has shown that people with insomnia have a two-fold risk of developing depression, compared to good sleepers. However, the psychophysiological mechanisms underlying this causal relationship are still not well understood. Heightened emotionality has been proposed to be a possible mediating factor; however there is a surprising lack of studies using physiological indices. The present study aimed to evaluate brain reactivity to emotional stimuli in people with primary insomnia and in good sleepers. Patients with primary insomnia (n=22) and healthy controls (n=40) were presented with different blocks of neutral, negative, and sleep-related negative pictures during an fMRI task. Neutral and negative pictures were taken from the International Affective Picture System (IAPS), while sleep-related negative pictures were previously validated. All participants previously underwent two consecutive nights of polysomnographic recordings in order to exclude those with other sleep disorders. Preliminary results are consistent with the hypothesis that people with insomnia present altered emotional responses in the amygdala and other limbic areas to negative stimuli related and non-related to sleep as compared to good sleepers. Clinical implications of the present findings, which need confirmation by further investigation, suggest that adding an emotional regulation component to standard therapy for insomnia might be effective to ameliorate sleep and to prevent the development of depression as a public health priority.

OR: Executive functions

Chaired by F. Vidal
16:50 – 18:30

Suppressing invalid response activation: RT distribution and electrophysiological arguments for common processes in Inhibition of Return and Simon tasks

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[2] *Laboratoire de neurosciences cognitives, France*

Control of responses activation is essential to prevent erroneous actions and provide appropriated ones. RT distribution and EMG analyses in conflict tasks have led to the development of the activation-suppression model: an early "automatic" response activation is followed by the inhibition of this activation. This pattern of activation followed by suppression is also a landmark of the Inhibition of Return (IOR) paradigm. However, so far, no link between the activation-suppression model and IOR has been made. In a first experiment, we used the same tools to investigate IOR. For short cue-stimulus intervals (where compatible cueing leads to faster response), precursors of the IOR were already present, as revealed by distribution analyses. EMG analyses confirmed this pattern, suggesting a common activation/inhibition between conflict task and IOR. The goal of the second experiment was to test more specifically the suppression hypothesis. Here, we combined a Simon task with a Change task, and asked subjects to switch response during reaction time (thus, congruent trials become incongruent, and incongruent trials become congruent). The activation-suppression model predicts that, early in the processing, changing from incongruent to congruent response will be easier than from congruent to incongruent response, while later in the processing, such facilitation should disappear. Our results confirm this prediction and indicate a suppression of the location-based response as time passes after stimulus onset. Those two results provide direct support for activation-followed-by-inhibition hypothesis, and allow to generalize results across tasks.

Dissociation of facilitatory and inhibitory mechanisms of auditory attention after damage of the lateral prefrontal cortex.

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The lateral prefrontal cortex (LPFC) has been shown to be involved in executive control of goal-directed behaviour, including attention. More recently, some studies have provided evidence that selective attention relies on distinct facilitatory and inhibitory mechanisms. To better dissociate these facilitatory and inhibitory mechanisms, we investigated the role of the LPFC in auditory selective attention. We added to a classic dichotic paradigm a neutral condition in which attention was equally distributed to all sounds. Participants heard standard and deviant sounds in each ear, and had to detect deviants in the right or left ear, or binaural targets (neutral condition). We recorded scalp EEG signal in 9 patients with unilateral LPFC lesion and 9 matched controls. We compared event-related potentials (ERPs) to the same standard sounds when they were attended, ignored or in the neutral condition. In control subjects, we found that ERPs to attended sounds were enhanced from 150 ms to 250 ms relative to the neutral condition; whereas ERPs to ignored sounds were reduced from 250 ms up to 400 ms. In patients with unilateral LPFC lesions, we observed that the facilitatory component was reduced with the most prominent decreases when sounds were presented in the contro-lesional ear, over the lesioned hemisphere. On the contrary, the inhibitory ERP component was not altered. These results show that the lateral PFC is specifically involved in the control of facilitatory mechanisms and not late inhibitory processes during auditory attention selection, providing evidence that independent facilitatory and in-

hibitory mechanisms support auditory selective attention.

Evidence for the automatic evaluation of self-generated actions

Aarts K.[1], & Pourtois G.[1]

[1] *Ghent University, Belgium*

The accuracy of simple actions is swiftly determined through specific monitoring brain systems. However, it remains unclear whether this evaluation is accompanied by a rapid and compatible emotional appraisal of the action that allows to mark incorrect actions as negative/bad and conversely correct actions as positive/good. In this study, we used a new method to decode the affective value of simple actions generated by participants during a standard Go/noGo task. Immediately after each Go/noGo action, participants responded to the valence of either a positive or a negative word. Results showed that False Alarms performed during the Go/noGo task led to a faster evaluative categorization of negative words relative to positive words. This action - word evaluative priming effect occurred when the interval between these two events was set to either 300 or 600 ms, but not 1000 ms. Finally, higher levels of trait anxiety were associated with a reduction of the evaluative priming effect. Our results suggest that simple actions are rapidly evaluated as positive or negative depending on the automatic monitoring of their perceived accuracy.

Reward increases early attentional control in the Stroop task and modulates interference-related ERP components

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Associating cognitive tasks with the prospect of reward is known to increase attention to the respective stimuli and to facilitate human performance. In situations in which attentional-control mechanisms are challenged, such as in traditional conflict tasks, such reward-based effects can be especially helpful in overcoming interference from irrelevant stimulus input. Here, we investigated the neural dynamics of such reward-based attentional facilitation in a Stroop task using scalp-recorded event-related potentials (ERPs). Compared to unrewarded trials, reward trials were associated with enhanced early fronto-central and occipital ERP components, potentially reflecting increased attention to the reward-predictive stimulus, which paralleled the facilitated behavioral performance on such trials. This notion was further supported by the observation that hallmark interference-related ERP components, i.e., the interference-related negativity (Ninc) and the late positivity component (LPC), seemed to occur much earlier in the context of reward, suggesting that focusing more strongly on the relevant dimension – due to the prospect of reward – may help to resolve interference at an earlier processing stage. In addition, although the semantic meaning of reward-predictive colors was always irrelevant, incongruent reward-related words appeared to interfere with the required behavior more strongly than it is usually observed, and were associated with early centroparietal ERP modulations. This latter observation suggests that the saliency of a reward-related semantic representation can trigger an automatic "response capture", which competes with the voluntary goal-directed action selection, thereby delaying the response.

Updating episodic bindings: A role for the ventral striatum

Hommel B.[1], Colzato L.[1], Van Wouwe N.[1], Zmigrod S.[1], De Sonneville L.[1], Ridderinkhof R.[2], Swaab H.[1], & Wylie S.[3]

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Three studies provide evidence that the control of the retrieval of episodic feature bindings is modulated by the ventrostriatal dopaminergic pathway. First, we found that children with autistic spectrum disorder, an impairment that is associated with atypical dopaminergic activity, show less efficient control over the stimulus-induced retrieval of episodic stimulus-response bindings. Second, less efficient control of stimulus-response bindings was also observed in healthy individuals with a genetic predisposition to lower striatal dopamine levels. Finally, we found Parkinson's disease patients to be more efficient in controlling stimulus-response bindings OFF medication than ON medication (as implied by the overdose hypothesis of PD), suggesting that the ventral striatum, but not (or not so much) the dorsal striatum, is driving the management of stimulus-response episodes.

Friday morning

SY: Cognitive and affective neuroscience of aging

Chaired by M. Falkenstein
09:00 – 10:40

Dynamics in cognitive ageing

Lorist M.[1], & Geerligs L.[1]
[1] *University of Groningen, Netherlands*

While some people age gracefully and are able to achieve levels of performance comparable to young adults, others show cognitive decline with increasing age. A pressing challenge is to understand the various ways in which aging affects cognitive performance and which mechanisms underlie the individual differences in age-related changes on cognition. In different projects, we examine these dynamics in cognitive functioning in young and older individuals. Even though all participants were healthy and functioned adequately in daily life, we found large differences between individuals on both performance and brain activity measured in working memory and attention tasks. Using functional connectivity analyses and event related potentials we showed that especially high performing elderly use more cognitive control to achieve similar performance to high performing younger participants. This shows that some of the older participants seemed to be able to effectively compensate for their age related decline. An additional question addressed in our studies followed from the knowledge that ageing is accompanied by general changes in brain structure and neuronal activity. These changes might directly affect neural connectivity. We used fMRI to examine whether changes in function brain networks are related to age related performance changes. Preliminary results suggest that aging indeed appears to be associated with changes in specificity of functional networks.

Two hemispheres for better memory in old age: role of executive functioning.

Angel L.[1], Fay S.[1], Bouazzaoui B.[1], & Isingrini M.[1]
[1] *Centre de Recherche sur la cognition et l'apprentissage, France*

A central challenge facing the cognitive neuroscience of aging is to determine whether age-related changes in brain activity reflect processes that are beneficial, detrimental, or inconsequential to cognitive functions. An intriguing result from brain imaging studies of cognitive aging is evidence of reduced hemispheric asymmetry during aging. This experiment explored the functional significance of this age-related hemispheric asymmetry reduction associated with episodic memory and the cognitive mechanisms that mediate this brain pattern. ERPs were recorded while young and older adults performed a word-stem cued-recall task. We used correlational and regression approaches to investigate directly the relationship between episodic memory performance, executive functioning and the lateralization of the ERP parietal old/new effect (indexed by an individual index of lateralization), in young and older adults. Results confirmed that the parietal old/new effect was of larger latency and reduced magnitude and less lateralized in the older group than the young group. Analyses also indicated that the degree of laterality of brain activity determines the accuracy of memory performance and mediates age-related differences in memory performance among older participants. In addition, they confirmed a cascade model in which the individual level of executive functioning of older adults mediates age-related differences in the degree of lateralization of brain activity, which in turn mediates age-related differences in memory performance.

The brighter side of brain aging: about the relationship between cognitive decline, emotional reactivity, and physical fitness

Godde B.[1], Glinka K. Voelcker-Rehage C. & Staudinger U.
[1] *Jacobs University, Germany*

Several studies demonstrated age-related differences in processing negative emotional information. Older participants recall and/or recognize fewer negative pictures than young adults, even when differences in memory performance are controlled. Moreover, older adults report less negative affect in everyday life than younger adults do. Differences in motivation as well as cumulative experiences and learning have been discussed as being at the basis of this age-related difference. However, whereas the link between brain aging and cognitive decline is clearly established, less is known about possible relationships between brain aging and emotional processing. We tested the hypothesis that brain decline might account for a reduced negativity in older adults. 82 participants between 62 and 79 years of age were examined with functional MRI during performance of a cognitive and an emotional task. Overall, our data support the hypothesis that a higher functional brain age is associated with reduced processing of negative emotional stimuli in older adults. In a next step, we performed a one-year physical intervention study (cardiovascular walking training, 3 times a week, 1 hour each). As expected, the intervention group, as compared to a control group, improved their performance in the cognitive tests. In addition, they revealed more youth-like activation patterns in the brain during the cognitive tasks. What is more, increased physical fitness and rejuvenation of brain activation patterns were related to more negative arousal. Overall, the data support our hypothesis that age-related brain changes have not only an impact on executive functioning but also on processing of emotional stimuli.

Vascular disease—is it a substrate for the changes with aging in thought and affect?

Jennings J. R.[1]
[1] *University of PIttsbrugh, United States*

The physiological changes as time accumulates can be labeled aging, but we have yet to determine whether a specific aging process occurs or whether what we call aging

is the accumulation of the chronic diseases pandemic with age—cardiovascular disease, arthritis, and cancers. Any study of the aging of psychological characteristics, e.g. change in affect or cognition, with a representative sample of the elderly is in fact also a study of these chronic diseases. An attempt to study pure aging must first be acknowledged as not representative of the population and must second cope with the likelihood that some disease is present but not detected despite careful screening. If an independent process of aging does exist, it likely co-exists with chronic disease and it may not be a single process but multiple processes with varying influences on different psychological functions. Various proposed markers of aging will be discussed. The issue will be illustrated (but hardly solved) by illustrating aging and disease effects in aging samples that have blood pressure assessed. Blood pressure is of particular interest as some researchers have characterized the psychological effects associated with hypertension as accelerated aging. Affective and cognitive correlates of blood pressure/aging(?) as well as their functional brain representations will be discussed.

To buy, or not buy: Aging and understanding of spoken language in a naturalistic 'stock price monitoring' task

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Numerous studies suggested an age-related decline in speech perception under difficult listening conditions. Here, spoken language understanding of two age groups of listeners was investigated in a naturalistic "stock price monitoring" task. Stock prices of listed companies were simultaneously recited by three speakers at different positions in space and presented via headphones to 14 younger and 14 older listeners (age ranges 19-25 and 54-64 years, respectively). The listeners had to respond when prices of target companies exceeded a specific value, but to ignore all other prices as well as beep sounds randomly interspersed within the stock prices. Older listeners did not produce more missing responses, or longer response times than younger listeners. However, differences in event-related potentials indicated a reduced parietal P3b of older, relative to younger, listeners. Separate analyses for those listeners who performed relatively high or low in the behavioural task revealed a right-frontal P3a that was pronounced especially in the group of high-performing older listeners. Correlational analyses indicated a direct relationship between P3a amplitude and spoken language comprehension in older, but not younger, listeners. Furthermore, younger (especially, low-performing) listeners showed a more pronounced P2 on irrelevant beep sounds than older listeners. These subtle differences in cortical processing between age groups suggest that high performance of older middle-aged listeners in demanding listening situations is associated with increased engagement of frontal brain areas, and thus the allocation of mental resources for compensation of potential declines in spoken language understanding.

SY: The Neuroscience of Social Conflict and Action Monitoring

Chaired by L. Koban & E. Núñez-Castellar
09:00 – 10:40

How monitoring other's actions influences one's own performance during social interactions

Núñez-Castellar E.[1]
[1] *Ghent University, Belgium*

Several ERP studies have recently shown that similar mechanisms for error processing are active in response to both self-generated errors and errors committed by others (Van Schie et al., 2005; Bates et al, 2005; Miltner et al., 2004). Nevertheless, how these mechanisms are associated with behavioral adjustments following error observation during social interactions has been seldom explored. In the talk I will present the results of a recent study in which by means of event-related potentials (ERPs) we investigated the link between the mechanisms involved in monitoring errors committed by others and the behavioral adaptations following them. The participants performed a social flanker task in cooperative and competitive contexts. Monetary reward was offered to the best couples in the cooperative interaction and to the best participants in the competitive situation. ERP analyses revealed that the error related negativity (oERN) and the error positivity (oPe) might reflect distinct aspects of error processing and consequently be differently associated to reaction times (post-error slowing) adaptations after error observation.

Social modulations of action control and adaptive behaviour

De Bruijn E.[1]
[1] *Leiden University, Netherlands*

Without often being consciously aware of it, we are involved in interactions with other people throughout the day. We greet our neighbors, meet with people at work, pass people in crowded shopping areas, or do the dishes together with our partner. When observing these social interactions in more detail, it is remarkable how complex the involved cognitive processes are in that individuals not only have to plan and monitor their own actions, but they also have to keep track of and anticipate the actions of the person they are interacting with. Moreover, they have to flexibly adapt their motor plans online to the behaviour and possible mistakes of their co-actors, generate adequate adaptive behaviour in response to their actions, and integrate the social context in which the interaction is taking place. Humans are social animals and adequate social behavior is thus crucial for efficient daily functioning. Consequently, disturbances in social behavior seriously impair one's quality of life. Severe disturbed social behavior is importantly evident in different psychiatric disorders. Hence, investigating these clinical populations

from a social neuroscience perspective may importantly advance our knowledge of these often still poorly understood disorders. I will present data from recent studies in which we investigated the cognitive and neural mechanisms of different forms of social adaptive behaviour in healthy individuals and in patients with psychiatric disorders characterized by serious deficits in social functioning, like psychopathy and major depression.

Do I care for others' money as much as for my own? Disentangling self- and fairness- related neural mechanisms involved in the Ultimatum Game.

Corradi-Dell'acqua C.[1]

[1] *University of Geneva, Switzerland*

Rejections of unfair offers in the Ultimatum Game (UG) are commonly assumed to reflect negative emotional reactions (spite, anger) to a direct unfair treatment (Pillutla & Murnighan, 1996) and to be mediated by the activity of the anterior insula and medial prefrontal cortex (Sanfey et al., 2003; Koenigs & Tranel, 2007). We aimed to disentangle those neural mechanisms associated with direct personal involvement (i.e., elicited by being the target of an unfair proposal) from those associated with fairness considerations, such as the wish to discourage unfair behavior or social norm violations. We carried two studies in which we measured electrodermal and neural response when participants played as responders in UG, and compared the condition in which they played for themselves (classical UG) from a condition in which they played on behalf on an unknown person (third-party). Unfair offers were equally often rejected in both versions of the game. However, rejections were associated to enhanced electrodermal activity and neural signal in the medial prefrontal cortex only when participants were the direct target of unfairness. Instead, the left anterior insula was implicated rejections both during the classical and Third-Party UG. These results speak against an interpretation of rejection in terms as a negative reaction to a direct mistreatment, and favor instead a role of insular processes related to promoting fair behavior also towards confederates.

Neurobiological mechanisms of social influence

Klucharev V.[1]

[1] *Basel University, Switzerland*

Humans often change their beliefs or behavior due to the behavior or opinions of others. We explored, with the use of various neuroimaging methods (fMRI, TMS, ERPs), whether social conformity is based on a general performance-monitoring mechanism. We tested the hypothesis that conflicts with a normative group opinion evoke activity of the posterior medial frontal cortex often associated with performance monitoring and subsequent adjustment of behavior. Using fMRI we showed that conflicts with group opinion triggered a neuronal response in the medial frontal cortex. The amplitude of this conflict-related signal predicted subsequent conforming behavioral adjustments. We also demonstrated that the transient downregulation of the posterior medial frontal cortex by theta-burst transcranial magnetic stimulation reduced conformity. Finally, we tested the hypothesis that conflicts with a normative group opinion evoke a feedback-related negativity (FRN) often associated with performance monitoring and subsequent adjustment of behavior. Indeed, a mismatch between individual and group opinions triggered a frontocentral negative deflection with the maximum at 200 ms, similar to FRN. Overall a conflict with a normative group opinion triggered a cascade of neuronal responses: from an earlier FRN response reflecting a conflict with the normative opinion to a later ERP component (peaking at 380 ms) reflecting a long-lasting conforming behavioral adjustment. In general, our results support the hypothesis that some forms of social influence are mediated by activity of the posterior medial frontal cortex as a part of the general performance-monitoring circuitry.

Monitoring performance and action conflicts – effects of interpersonal relationship and social consequences

Koban L.[1]

[1] *University of Geneva, Switzerland*

Action monitoring has been extensively studied in single-subject settings, suggesting specific responses to errors in anterior cingulate cortex (ACC), lateral frontal areas, and anterior insula (AI). Performance errors are also emotionally salient events and social context may influence their appraisal. In two experiments, we studied how one's own and observed errors are processed in interpersonal settings. Using EEG, we tested the influence of cooperation vs. competition between participants taking turns in performing and observing a go/no-go task. ERPs indicate differential processing of observed errors depending on social context. Additionally, feedback-related responses were more pronounced in the cooperating player, suggesting higher social relevance of negative feedback. To investigate, how the brain processes actions causing painful consequences for other persons, we designed an fMRI experiment, where participants played a visual decision task in turns with a friend placed outside the scanner. Errors always led to monetary losses to both players, but were sometimes additionally associated with painful stimulation applied to the friend. This allowed to investigate the neural underpinnings of self- vs. other-generated errors (factor: RESPONSIBILITY) which, in turn, might yield to vicarious experience of a painful vs. painless heat (factor: PAIN). Functional imaging results showed, consistently with previous studies, a main effect for PAIN in ACC and AI. Critically, AI was also associated with a significant PAIN*RESPONSIBILITY interaction, reflecting increased pain-related activations when errors were caused by oneself. By suggesting important interactions between empathic co-representation and error monitoring, these results illustrate the sensitivity of cognitive control mechanisms to social context factors.

SY: Electro-physiology of language production

Chaired by M. Laganaro & F.-X. Alario
09:00 – 10:40

The use of electroencephalography in language production research: a review

Christoffels I.[1,2], & Ganushchak L.[3]
[1] *Leiden Institute for Brain and Cognition, Netherlands* [2] *Institute for Psychological Research, Netherlands* [3] *Max Planck Institute for Psycholinguistics, Netherlands*

Speech production was long avoided electrophysiological experiments because it was suspected that artifacts caused by muscle activity of overt speech would lead to a bad signal-to-noise ratio in the measurements. Speech production has been assessed with implicit speech production tasks, such implicit or delayed naming. However, covert speech is likely to involve qualitatively different processes than overt speech. Recently, the number of papers that assessed overt speech using electroencephalography (EEG) has been rising. There is an increasing interest and demand for overt speech research within the field of cognitive neuroscience of language. In this presentation we will review available results of overt speech production involving EEG measurements, such as picture naming, Stroop naming, and reading aloud. Although there are potential problems and results should be interpreted with care. Nevertheless, our review indicated that overt speech production can be successfully studied using electrophysiological measures, for instance, event-related brain potentials (ERPs). This new approach may provide exciting new insights to studying speech production.

Tracking the Time-course of Spoken Word Production with Event-Related Potentials

Holcomb P.[1]
[1] *NeuroCognition Laboratory, United States*

For over four decades Cognitive Neuroscientists has used event-related potentials (ERPs) to augment the temporal resolution of traditional behavioral measures such as reaction time in what is now a substantial body of work aimed at providing a better understanding of perceptual, cognitive and even linguistic processes. Used in this way ERPs offer the advantage of allowing the investigator to explore both the fine-grained time-course of information processing, but also to gain more direct insight into the brain systems involved in processing. Such studies have yielded important new insights into a host of mental and neural phenomena. However, until recently one area of traditional language use that has not been studied nearly as often using ERP techniques is language production. The primary reason for this is that movement of the articulators during speech production results in substantial electrical artifact that makes examination of the comparatively small changes in electrical brain activity very difficult. I will discuss this limitation and its ramifications, as well as review a number of recent studies that have attempted to circumvent speech artifacts during ERP language production experiments.

Towards a component-free, correlative approach to event-related potentials acquired during overt speech tasks: A more natural context to test language production

Thierry G.[1]
[1] *Bangor University, United Kingdom*

In several recent event-related brain potential studies of language production, participants were asked to produce overt speech while their EEG was being recorded. Whilst motor artefacts engendered by the contraction of the jaw and that of facial muscles during speech are clearly incompatible with EEG recording, the signal before speech onset seems relatively unaffected (indeed it is unlikely that different experimental conditions would lead to systematic differential effects on EEG signals prior to speech initiation). I will present data from two studies which have used such a paradigm and show how relating ERP signals with voice reaction times can lead the way to component free mental chronometry.

Comprehensive spatio-temporal analysis of event-related potentials

Michel C.[1]
[1] *University of Geneva, Switzerland*

In this talk I will explain ERP analysis methods that are based on the temporal variations of the scalp electric field, rather than on changes of amplitudes or latencies at certain electrodes. The spatial analysis techniques have the advantage of being reference-independent and thus non-ambiguous and that they do not require a pre-selection of electrodes or time periods of interest. The basic aim of the spatial analysis approach is to look for significant topographic changes of the electric field across time or between conditions, because differences in topography directly indicate differences in the underlying generators. I will illustrate the method with ERPs in language comprehension as well as language production tasks.

OR: Emotions 2

Chaired by G. Pourtois
11:00 – 12:40

The role of the ventromedial prefrontal cortex in negative emotion: Implications for well-being

Van Reekum C.[1]
[1] *Centre for Integrative Neuroscience and Neurodynamics, United Kingdom*

Recent data suggest that individual differences in well-being are reflected in distinct patterns of prefrontal and amygdalar functioning when regulating negative emotion, and that these differences predict diurnal patterns of the stress hormone cortisol. Our research also shows that de-

pressed individuals fail to successfully recruit some of the same regions in prefrontal cortex to successfully down-regulate activity in the amygdala, a key area involved in the generation of emotion. These data lead to the speculation that a specific medial subregion of the prefrontal cortex – the VMPFC - plays a vital role in well-being: People characterised by high psychological well-being are likely to effectively recruit this brain region when confronted with potentially aversive situations. As a consequence, they show reduced activity in subcortical regions such as the amygdala, and exhibit more adaptive bodily responses that may be important for longer-term health. I will present new data from a population with a large age range demonstrating that increasing age is associated with a prefrontal lateral-medial shift in processing of negative information. We further show that this shift is associated with cognitive decline and impacts psychological well-being. Furthermore, recent data suggest that the involvement of the VMPFC in processing of negative information could be the extent to which individuals spontaneously or deliberately employ "positive reappraisal" strategies. The implications of these findings to the empirical study of emotion regulation will be discussed.

Behavioral, Neural and Cardiovascular Responses to Emotional Stimuli: Simultaneous Recording of fMRI and Continuous Blood Pressure Reactions

Okon-Singer H.[1,2], Mehnert J.[3], Hoyer J.[1], Hellrung L.[1], Dukart J.[4], & Villringer A.[1,2]

[1] *Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany* [2] *Mind and Brain Institute and Berlin School of Mind and Brain, Berlin, Germany* [3] *Charité Universitätsmedizin, Berlin, Germany* [4] *University of Lausanne, Lausanne, Switzerland*

Introduction: Recent evidence suggests that the brain is causally involved in the initiation and progress of cardiovascular diseases, by failing to regulate blood pressure responses to emotional events. This study examines the neural regions regulating blood pressure reactions to negative stimuli. Methods: 24 healthy subjects (11 females; age = 24.75 ± 2.49 years) were asked to ignore task-irrelevant emotional content, while engaging in emotional Stroop and emotional perceptual load tasks. fMRI data was collected in a 3T-Siemens scanner simultaneously to continuous blood pressure recording. The data was analyzed by a whole-brain general linear model including task relevant events as covariates and blood pressure as regressor. Results were threshold at $p < 0.05$ and corrected for multiple comparisons. We furthermore used a small volume correction for the amygdala. Results: In the emotional Stroop task, negative words resulted in enhanced activation the left inferior frontal gyrus and bilateral amygdala. Blood pressures significantly correlated with neural activation in the left amygdala. In the perceptual load task, high perceptual load resulted in reduced activation in bilateral amygdala and orbitofrontal cortex. These results are in line with previous evidence that emotional reaction depends on sufficient resources. Blood pressure significantly correlated with activation in the right amygdala. Conclusions: Taken together, the fMRI results suggest that emotional irrelevant content activates emotion-related neural network, albeit this activation depends on sufficient resources. The blood pressure findings corroborate previous results suggesting a role for the amygdala in blood pressure regulation. These findings have implications regarding early neuro-therapeutic interventions for individuals at high risk to develop cardiovascular diseases.

Comparison of physiological characteristics during unconscious and conscious perception of emotional audio stimuli

Vaisertreiger A.[1], Kotyleva A.[2], Kulikov G.[1], & Ivanova V.[1]

[1] *Laboratory of Physiology of Sensorimotor Systems, Russia* [2] *Laboratory of Physiology of Sensorimotor Systems, Russia*

A set of psychological studies proves that cognitive and affective reactions are more likely to be influenced by unconsciously than by consciously perceived stimuli (Merikle, 1998). Nevertheless the qualitative distinction between physiological responses during conscious and unconscious perception remains controversial. Current research investigates the dynamics of physiological parameters like electrocardiogram, skin galvanic response and breathing during presentation of emotional audio stimuli. As emotionally-provocative stimuli we used natural vocalizations of 3-month-old infants in positive, negative and neutral emotional state, presented either in ordinary (conscious) conditions or with extremely low intensity through pink noise (unconscious). To maintain subjects' unconscious perception their attention was shifted to special visual task appearing at the same time with acoustic signals. Both ways of presentation – first-order unconscious and second-order conscious stimuli - were applied to the one subject within one experiment with a brief inter-trial interval. A comparative analysis of physiological measures revealed the significant difference between results obtained in two conditions of audio stimuli presentation. The changes of physiological parameters to emotional vocalizations relative to neutral or resting state were more salient in the case of the unconscious perception. This data indicates that infant vocalizations presented in experiment under unconscious conditions had changed the level of subject's emotional tension stronger than conscious stimuli did.

Disentangling the effects of affective dimensions and emotional categories in the perception of facial expressions of emotion: Affective ratings and event-related potential (ERP) findings

Ferreira-Santos F.[1,2], Marques-Teixeira J.[2], & De Haan M.[3]

[1] *Developmental Cognitive Neuroscience Unit, UCL Institute of Child Health, United Kingdom* [2] *Laboratory of Neuropsychophysiology, University of Porto, Portugal*

[3] *Developmental Cognitive Neuroscience Unit, UCL Institute of Child Health, United Kingdom*

Facial expressions of emotion have been widely studied and have played an important role in theories of human emotion. However, the neural underpinnings of the emotional processing of faces are still not fully understood. In most studies, facial expression stimuli are simply categorized as basic emotions (e.g. happiness, fear) into experimental factors according to which emotion they express but their affective properties such as emotional intensity, arousal and valence are rarely controlled for and may confound the results. The first objective of the present study was to obtain dimensional ratings of perceived arousal and valence for a set of commonly used facial expressions (NimStim Face Stimulus Set). We found that the affective properties of emotion categories present relatively high intra-categorical variability and that ratings of arousal and valence show a quadratic association, mimicking findings for non-facial affective pictures. Secondly, we examined brain event-related potential (ERP) responses to affective dimensions and emotional categories by designing an experimental ERP task where these two factors were manipulated independently. Previous ERP studies relying on emotional categories alone have produced mixed results: some studies reported no emotional modulation of the N170 whereas others found differences between emotional categories. We found that affective arousal modulated N170 amplitude (high > low arousal), whilst basic emotion categories and valence did not. Our findings suggest that the emotional effects on the N170 may be driven by arousal, which could explain both negative and positive previous findings, depending on whether stimuli would, respectively, be matched for arousal or not.

A distributed cortico-limbic network decodes the emotional tone of a voice

Frühholz S.[1,2], & Grandjean D.[1,2]

[1] *Neuroscience of Emotion and Affective Dynamics Lab, Department of Psychology, University of Geneva, Geneva, Switzerland* [2] *Swiss Center for Affective Sciences, University of Geneva, Geneva, Switzerland*

The superior temporal and inferior frontal cortex as well as medial limbic brain regions have been previously shown to respond to the emotional tone of a voice. We supposed that this neural network not only consists of this tripartite cortico-limbic network with strong inter-regional connections, but also of several intra-regional subnetworks including subregions with different functional roles during the decoding of emotional cues from voices. Here, we used high spatial resolution brain scans covering the superior temporal, inferior frontal and medial limbic brain regions to determine the exact location and connectivity within this inter- and intra-regional emotional voice network. We additionally manipulated the level of attentional processing to determine the influence of explicit (attention directed towards the emotional feature) and implicit processing (attention directed to a non-emotional voice feature) on functional activations and connectivity patterns. The analysis revealed, first, several regions in right superior temporal gyrus (STG) and bilateral inferior frontal gyrus (IFG) sensitive to emotional cues from voices. Second, we found a posterior-to-anterior gradient in right STG and a left-right differentiation for explicit processing of emotional cues. The left amygdala was only active during explicit processing of emotional voices, and a subsequent region specific analysis activity was located in selected subnuclei of the bilateral amygdaloid complex. Finally, connectivity analyses revealed that activity in the distributed temporo-fronto-limbic network differentially generates inter- and intra-regional connections depending on the level of processing.

SY: Communicating brains

Chaired by S. Anders & T. Ethofer
11:00 – 12:40

Encoding and integration of social information from human faces and voices

Ethofer T.[1]

[1] *University of Tübingen, Germany*

Successful social interaction requires correct interpretation of dynamic facial and vocal signals, such as emotional facial expressions and speech melody (prosody). It has recently been shown that the neural correlate for integration of signals from these modalities is situated at the overlap of right hemispheric face- and voice-sensitive superior temporal sulcus (STS) cortices. Building on this research, we show that the fine-scale spatial activation patterns within modality-specific areas in the STS areas indeed carry information about perceived emotional tone. Furthermore, we combine functional magnetic resonance imaging (fMRI) and diffusion tensor imaging (DTI) to clarify which other brain areas are recruited in concert with STS regions to extract the meaning of facial and vocal stimuli. Using a factorial adaptation design we demonstrate significant response habituation in the orbitofrontal cortex (OFC) which occurs similarly during perception of emotional faces, voices and face-voice combinations. These functional data are in line with DTI findings showing converging fiber projections from three different STS modules to the OFC which run through the external capsule for the voice area, through the dorsal superior longitudinal fasciculus (SLF) for the face area and through the ventral SLF for the audiovisual integration area. This suggests a key role of the OFC for processing of dynamic social signals and proposes that the OFC is part of the extended system for both face and voice perception. Our findings show that combining different neuroimaging methods can successfully be used to tap social signal processing stages in great detail.

Coordination of EEG between speakers and listeners

Kuhlen A.[1,2], Allefeld C.[2], & Haynes J-D.[1,2]

[1] *Berlin School of Mind and Brain, Humboldt Universität*

zu Berlin, Berlin, Germany [2] *Bernstein Center for Computational Neuroscience, Charite Universitätsmedizin, Berlin, Germany*

When two people talk to each other they coordinate both their linguistic and nonlinguistic behavior. To capture the neural basis of social interaction processes, studies in social neuroscience have recently begun to extend their focus from the isolated individual to investigating two or more interacting individuals. In this study we uncover a coordination of neural activity between two individuals' ongoing EEG (electroencephalogram) – a person speaking and a person listening. The EEG of 12 speakers was recorded while narrating short stories. The EEG of another set of 12 participants was recorded while watching video recordings of these narrations. To ascertain that a neural coordination is indeed due to processing communicated information, audiovisual recordings of two speakers were superimposed on each other, and listeners were instructed to attend either to one or the other speaker. Using multivariate analyses of variance we found evidence that listeners show similar time-locked activity when attending to the same speaker. Furthermore, a canonical correlation approach revealed that listeners' EEG coordinates with speakers' EEG at a delay of about 13 seconds. This finding suggests that speakers and listeners coordinate their representations of larger semantic units. Going beyond previous studies, our study ascertains that the established neurophysiological marker of interpersonal coordination is not driven by individuals synchronously processing shared sensory input. Instead, our measure reflects an interpersonal coordination between two individuals that is based on the information one interlocutor conveys to the other.

Mapping the flow of affective information between communicating brains

Anders S.[1]

[1] *Universitaet zu Luebeck, Germany*

When people interact, affective information is transmitted between their brains. We used information-based functional magnetic resonance imaging (fMRI) in a 'pseudo-hyperscanning' setting to map the flow of affective information between the brains of senders and perceivers engaged in ongoing facial communication of affect. We found that the level of neural activity within a distributed network of the perceiver's brain can be successfully predicted from the neural activity in the same network in the sender's brain, depending on the affect that is currently being communicated. Furthermore, there was a temporal succession in the flow of affective information from the sender's brain to the perceiver's brain, with information in the perceiver's brain being significantly delayed relative to information in the sender's brain. This delay decreased over time, possibly reflecting some 'tuning in' of the perceiver with the sender. I will show that these data support current theories of intersubjectivity by providing direct evidence that a 'shared space' of affect is successively built up between senders and perceivers of affective facial signals.

Dual-EEG of joint tapping: what can two interacting brains teach us about social interaction?

Konvalinka I.[1,2]

[1] *Center of Functionally Integrative Neuroscience, Denmark* [2] *DTU Informatics, Denmark*

The neural mechanisms underlying real-time social interactions remain largely unknown. Only a small number of recent studies have explored what goes on in brains of two people during true social interaction. Here, we asked whether information gained from two truly interacting brains can better reveal the neural signatures of social interaction than separate investigation of two brains. We measured dual-EEG during an interactive finger-tapping task. Pairs of participants were asked to synchronize with an auditory signal coming either from their partner (interactive or 'coupled' condition) or from a computer ('uncoupled' computer-controlled condition). Time-frequency analysis revealed stronger left-motor and right-frontal suppression at 10 Hz during the interactive condition than during the uncoupled computer-driven condition. We used machine-learning approaches to identify the brain signals driving social interaction. We combined data from both participants in each pair (raw-power at 10 Hz during tapping at each electrode), and applied logistic regression using feature selection in order to classify the two tapping conditions. The first seven (frontal) electrodes consistently emerged as good classifiers, with 85-99% accuracy. Moreover, there was a tendency for one member's frontal electrodes to drive the classifier over the other's, which predicted the leader of the interaction in 8/9 pairs. This study shows how analyzing two interacting brains can give better classification of behaviour; and hence that the whole of two brains is indeed better than the sum of its parts, at disentangling neural signatures of interaction.

Using fMRI-hyperscanning to study social interaction

Bilek E.[1], Ruf M.[1], Akdeniz C.[1], Kirsch P.[1], & Meyer-Lindenberg A.[1]

[1] *University of Heidelberg, Germany*

We developed a hyperscanning environment using two 3T MRI scanners which are functionally connected and time-synchronized, enabling online interaction (cooperation/competition) between dyads of participants while they are being scanned simultaneously. Among others, we use a joint attention task in which a target stimulus is presented to one participant only, and cooperation between both participants (engagement in joint attention) is required to complete the task successfully. The presentation gives an overview of technical characteristics of the hyperscanning set up and method implementation. Data analysis includes conventional statistic parametric mapping, but considers time lagged connections to detect maximally covarying systems in the simultaneously acquired datasets. Results from the ongoing data analysis will be presented. Finally, we will discuss the usefulness

of fMRI-hyperscanning in clinical social neuroscience.

SY: Basal ganglia and cognition

Chaired by W.P.M. van den Wildenberg & S.A. Wylie
11:00 – 12:40

Cognitive functions of the rat subthalamic nucleus

Baunez C.[1]
[1] *Institut des Neurosciences de la Timone, France*

Within the basal ganglia, the subthalamic nucleus (STN) has long been considered a relay structure on the so-called 'indirect pathway' of the motor loop. For the two last decades, this view has changed when the hyperdirect pathway, connecting directly the cortex to the STN, has been highlighted and when data revealing non-motor deficits induced by manipulation of the STN started to accumulate. Here, our data obtained in the rat using STN lesions, high frequency stimulation or electrophysiological recording, will be summarized, demonstrating a critical role for the STN in attention (Baunez and Robbins, 1997; Baunez et al., 2007), control of inhibition (Baunez et al., 1995; Eagle and Baunez, 2010) and encoding of error in execution or in reward prediction (Lardeux et al., 2009).Baunez C., Nieoullon A. and Amalric M. (1995) J. Neurosci. 15: 6531-41Baunez C. and Robbins T.W. (1997) Eur. J. Neurosci., 9: 2086-99Baunez C, Christakou A, Chudasama Y, Forni C, Robbins TW (2007) Eur. J. Neurosci. 25: 1187-94Lardeux S, Pernaud R, Paleressompoulle D, Baunez C (2009) J. Neurophysiol. 102:2526-37Eagle DM and Baunez C (2010) Neuroscience and Biobehavioral Reviews 34:50-72

Deep brain stimulation impairs on-line executive control in Parkinson's disease patients

Fluchère F.[1], Burle B.[2], Vidal F.[2], Azulay J-P.[1], & Hasbroucq T.[2]
[1] *Pôle de Neurosciences Cliniques de la Timone, France*
[2] *Laboratoire de neurobiologie de la cognition, France*

High frequency DBS is thought to inactivate the subthalamic nuclei (STNs) and to restore the thalamo-cortical projections impaired by PD. This therapy dramatically improves PD motor symptoms. Recent fMRI data collected in healthy volunteers suggest that the STNs are involved in the urgent inhibition of ongoing actions. We reasoned that a side effect of DBS could be to impair this ability in PD patients. 16 PD patients treated by DBS for performed a conflict reaction time (RT) task involving thumb responses in 4 treatment conditions: Stimulator ON – Medication ON, Stimulator OFF – Medication ON, Stimulator ON – Medication OFF, Stimulator OFF – Medication OFF. The electromyographic activity of the response agonists was recorded and analysed, allowing the detection of partial errors, that is of subliminal activations of the muscles involved in erroneous responses. Responses were thus classified in 3 categories: correct, partial errors and overt errors. The medication exerted no notable effect on the patients' performance. DBS shortened correct RT but increased the overt error rate and decreased the number of partial errors. Analyses of the temporal distribution of the 3 response categories revealed that the increase in overt error rate observed when the stimulator was ON was specifically due to a failure to detect, inhibit and correct partial errors before they resulted in overt erroneous responses. While it improves motor performance and shortens RT, DBS impairs the patients' faculty to suppress erroneous response activations as revealed by their inability to counteract partial errors when the stimulator was ON.

The Role of the Subthalamic Nucleus in Multiple Alternative Perceptual Decision Making revealed by 7T Structural and Functional MRI

Forstmann B.[1], Turner R.[2], Van Maanen L.[1], Bogacz R.[3], Schaefer A.[2], Neumann J.[2], & Keuken M.[1]
[1] *University of Amsterdam, Netherlands* [2] *Max Planck Institute for Human Cognitive and Brain Sciences, Germany* [3] *University of Bristol, United Kingdom*

Recently, quantitative mathematical and neurocomputational models have been developed that make predictions about the latent psychological processes and brain structures involved in multiple alternative decision-making. In particular, the subthalamic nucleus (STN), a small structure in the basal ganglia (BG), is hypothesized to become more active with an increasing amount of choice alternatives. This increase of activity is thought to reflect a decrease in baseline activity causing a delayed response of the output nuclei of the BG so that more evidence can be accumulated in favor of the correct response.In the present study, first the behavioral data were fit with the linear ballistic accumulator (LBA) model to capture the latent psychological processes involved in multiple alternative perceptual decision-making. Secondly, ultra-high resolution 7T functional and structural MRI data were collected to test our STN hypotheses.7T functional data showed higher stimulus-related activation with an increase of choice alternatives only in the right STN. These results are also captured by the LBA model fits as the drift rate decreases and the threshold increases due to a prolonged decision process. In sum, the present study highlights the functional role of the STN in multiple alternative perceptual decision- making.

Dopamine Agonists and the Suppression of Impulsive Actions in Parkinson's Disease

Wylie S.[1], Van Den Wildenberg W.[2], Ridderinkhof R.[3], & Claassen D.[1]
[1] *Vanderbilt University Medical Center, United States*
[2] *University of Amsterdam, Netherlands* [3] *University of Amsterdam, Netherlands*

The suppression of impulsive actions is an essential facet of human cognitive control that has been linked to frontal-basal ganglia circuitry. Basal ganglia dysfunction caused by Parkinson's disease (PD) disrupts the proficiency of

action suppression, but how pharmacotherapy for PD impacts impulsive action control is poorly understood. Dopamine agonists improve motor symptoms of PD, but also provoke impulsive-compulsive behaviors (ICB) in a subset of patients. We investigated whether dopamine agonist medication has a beneficial or detrimental effect on impulsive action control in PD. Thirty-eight PD patients, half of whom had current ICB, performed the Simon conflict task both on and withdrawn from their agonist medication. The Simon task measures one's susceptibility to acting on spontaneous action impulses as well as the proficiency of suppressing these impulses as an act of cognitive control. Compared to the off state, patients on their agonist were no more susceptible to reacting impulsively, but they were less proficient at suppressing the interference caused by the activation of impulsive actions. Importantly, the impact of agonist medication on the suppression of impulsive actions depended on baseline performance in the off agonist state. Patients with active ICB were no more susceptible to making fast, impulsive response errors than patients without ICB, suggesting that problems with impulsive behavior in this vulnerable subset of patients may not be related to impulsivity in the motor domain. Our findings show that agonist medication exerts a direct impact on a key component of action control.

Deep-Brain Stimulation Improves Overriding but not Re-engagement of Actions in Parkinson's Disease

Van Den Wildenberg W.[1], Ridderinkhof K. R.[1,2], Van Wouwe N.[3], Lubin A.[4], Siegel A.[4], Bashore T.[5], & Wylie S.[6]

[1]*Psychology Department, University of Amsterdam, Netherlands* [2]*Cognitive Science Center Amsterdam, University of Amsterdam, Netherlands* [3]*Department of Psychology, Leiden University, Netherlands* [4]*Neurology Department, University of Virginia Health Systems, United States* [5]*School of Psychological Sciences, University of Northern Colorado, United States* [6]*Department of Neurology, Vanderbilt University Medical Center, United States*

Recent fMRI work and patient studies have shown that the basal ganglia play a key role in a distributed brain network that controls the non-specific abortion of motor responses. The aim of the present study was to specify the involvement of the basal ganglia in selective action control of responses as a more fine-grained form of cognitive control. We employed the stop-change task (based on a horse-race model) to investigate the ability to interrupt and change an ongoing overt action. Our sample consisted of 17 patients diagnosed with Parkinson's disease who received deep-brain stimulation (DBS) in the subthalamic nucleus (STN). All patients performed the tasks on and off stimulation to address the question whether stimulation is effective in improving stop-signal RT in the stop-change task. DBS shortened go reaction time (RT) related to generating overt responses. In addition DBS yielded shorter stop-signal RT, pointing toward improved inhibitory control over overt responses. Interestingly stimulation did not shorten response latencies to the change signal. This pattern is interpreted to suggest a functional dissociation of the effects of DBS on generating and inhibiting voluntary actions.

Friday afternoon

15:30 – Keynote Lecture 3
Katya Rubia

Department of Child & Adolescent Psychiatry, Institute of Psychiatry, King's College London

Neuro-functional development of "cool" and "hot" executive functions and its abnormalities in ADHD

The talk will provide a review on our functional magnetic resonance imaging (fMRI) findings on the development of the neurofunctional networks of "cool" and "hot" executive functions between childhood and adulthood. The findings show that across development, and concomitant with cognitive maturation, there is progressively increased functional activation in task-relevant lateral and medial prefrontal, striatal and parieto-temporal brain regions that mediate "cool" cognitive control functions, such as inhibition, performance monitoring, attention and timing, as well as of ventromedial fronto-limbic neural networks that mediate "hot" reward-associated functions such as temporal discounting or gambling. This process of age-associated activation increase in task-relevant regions appears to be accompanied by progressively stronger functional inter-regional connectivity within these fronto-striatal and fronto-limbic networks, with evidence for progressively stronger top-down control of frontal over posterior and subcortical regions. Negative age associations are observed in earlier developing posterior and limbic regions, suggesting a shift with age from the recruitment of "bottom-up" processing regions towards "top-down" fronto-cortical and fronto-subcortical connections, leading to a more mature, supervised cognition. The impairment of this normal neurocognitive maturation of fronto-striato-parietal and fronto-limbic networks will be illustrated in a child psychiatric disorder that is characterised by a developmental delay of brain structure, i.e. Attention Deficit Hyperactivity Disorder (ADHD). Children and adolescents with ADHD have deficits in the same fronto-striato-parietal and fronto-limbic neural networks of "cool" and "hot" EF that are progressively developing with age between childhood and adulthood, likely reflecting a delay in normal functional brain maturation.

SY: Developmental Affective Neuroscience

Chaired by S. Mueller
16:50 – 18:30

The relationship between puberty and social brain development

Goddings A-L.[1,2], Burnett Heyes S.[3], Klapwijk E.[3,4], Bird G.[5], Viner R.[6], & Blakemore S-J.[7]
[1] *UCL Institute of Cognitive Neuroscience, United Kingdom* [2] *UCL Institute of Child Health, United Kingdom* [3] *UCL Institute of Cognitive Neuroscience, United Kingdom* [4] *University of Leiden, Netherlands* [5] *Birkbeck College, United Kingdom* [6] *UCL Institute of Child Health, United Kingdom* [7] *UCL Institute of Cognitive Neuroscience, United Kingdom*

The social brain undergoes developmental changes during adolescence, and it is hypothesized that pubertal hormones contribute to this development. We used fMRI to explore how pubertal indicators (salivary concentrations of testosterone, oestradiol and DHEA; and pubertal stage determined by Tanner staging and menarcheal status) relate to brain activity during a social emotion task. 42 females aged 11.0 to 13.7 years underwent fMRI scanning while reading scenarios that pertained either to social emotions, which require the representation of another person's mental states, or to basic emotions, which do not. Across the entire group, the social versus basic emotion processing contrast resulted in activity within the social brain network, including the dorsomedial prefrontal cortex (DMPFC), the posterior superior temporal sulci, and the anterior temporal cortex (ATC) in both hemispheres. The group comparison showed that increased hormone levels (independent of age) were associated with higher activity in the left ATC during social relative to basic emotion processing. More advanced age (independent of hormone levels) was associated with greater activity in the DMPFC during social relative to basic emotion processing. Psychophysiological interactions showed that participants in later stages of puberty had increased functional connectivity between the DMPFC and other social brain network regions. This pattern of results suggests functionally dissociable effects of pubertal hormones and age on the adolescent social brain.

Reward-related neural responses are dependent on the beneficiary

Braams B.[1], Peper J.[1], Guroglu B.[1], De Water E.[1], Meuwese R.[1], Koolschijn C.[1], & Crone E.[1]
[1] *Leiden University, Netherlands*

Rewards are primary reinforcers for human behavior. The involvement of the striatum in reward processing has been well established and shown in different studies, using different reinforcers such as money or food (Delgado, 2007). Most previous studies focused solely on neural responses associated with winning for the participant himself. In this study we investigated neural responses during a gambling task in which participants (N=34; 18 females) could

win or lose money for themselves, their best friend or a disliked other person. Results indicate that the striatum shows a different pattern of activation for these three people. Winnings for yourself and best friend resulted in activation of the striatum, whereas winnings for a disliked other did not result in an elevated striatum response. Furthermore, the outcomes for best friend and disliked other (both winning and losing) resulted in activation in medial prefrontal cortex (PFC) and the temporal parietal junction (TPJ), regions known to be part of the social brain network. Together, the results show that: (1) striatum activation to winning depends on the receiver of gain, and (2) medial PFC/TPJ activation is most pronounced for friends and others.

Incidental contextual threat in adults and adolescents: an fMRI study

Mueller S.[1]

[1] *Ghent University, Belgium*

Recent developments chart the neuronal fear pathways during context conditioning. Yet, little is known how, and whether, the same pathways are activated during development given differences in maturation between structures involved in emotional and cognitive processing. Here, in an fMRI task, we used differential context conditioning to (aversive) facial stimuli that were either presented in a context in which conditioning could occur (room A) and a context in which no conditioning occurred (room B). Eighteen adolescents (9 female, mean age 14.92 years) and 18 IQ and sex-matched adults (9 female, mean age 31.22 years) were required to navigate through two different rooms in a virtual maze while encountering the conditioned stimuli. The results revealed a significant two-way interaction between context and threat cue in the orbitofrontal cortex (OFC). This interaction showed that activations to aversive faces relative to non-aversive faces were reduced in the conditioned context. The reverse effect, larger activations for conditioned faces relative to non-conditioned faces were present in the non-conditioned context. In addition, presence in the conditioned context increased insula activation for both groups. Main effects of group on the other hand were restricted to heightened activations for adolescents relative to adults in amygdala and hippocampus. By comparison, no differences emerged on behavioural performance measures or fear ratings. The data implicate a differential role of the OFC in contextual threat. The findings are discussed in relation to recent findings in cue conditioning during development.

The development of attentional systems and modulation of emotion across adolescence

Ernst M.[1]

[1] *NIMH, NIH, United States*

Heuristic models of the neurobiology of adolescent behavior have emerged, promoting the central role of reward and motivation, coupled with cognitive immaturities in adolescent risk-taking proclivity. In contrast, fundamental processes such as attention or conditioning have not been considered as potential contributors to the unique characteristics of adolescent motivated behavior. Here, we will focus to two basic sets of processes, attention and conditioning, which are essential for adaptive behavior. Using the dual-attention model developed by Corbetta and Shulman (2002), which identifies a stimulus-driven attention and a goal-driven attention network, we propose a balance that favor stimulus-driven attention over goal-driven attention in youth. Regarding conditioning, we hypothesize stronger associations of environmental cues with appetitive stimuli and weaker aversive associations in youth relative to adults. An attention system geared to prioritize stimulus-driven attention, together with more powerful association-learning with appetitive incentives can provide an additional mechanism that can contribute to the impulsive, novelty-seeking and risk-taking behavior of the typical adolescent.

SY: Perceiving and acting in a world with others

Chaired by C. Lopez & P. Romaiguère
16:50 – 18:30

Lateral occipital cortex and self-other processing

Romaiguère P.[1], & Felician O.[2]

[1] *Laboratoire de Neurosciences Intégratives et Adaptatives, France* [2] *Institut de Neurosciences des Systèmes, France*

Because humans are a social species, we interact with others on every aspect of life. Much information on others identities, emotions and intentions can be gathered from visual processing of their faces. However, the rest of the body also carries substantial information. Body movements are an essential communication media, whether for identifying others intentions or actions or for learning from them. Over the last ten years, much attention has been given to an area in the lateral occipital cortex, named Extrastiate Body Area (EBA), that responds to vision of body parts when presented as photographs, line drawings, stick figures or silhouettes. However, responses in EBA have also been observed during imagined or executed movements. It is also more activated in response to images of body parts presented from an allocentric rather than an egocentric perspective. Taken together, these findings suggest that EBA is not only involved in the visual processing of static body representations, but could represent the body in a multisensory and dynamic manner. EBA is very likely involved in self processing as well as in disentangling self- from other bodies and actions. In the present talk we will present results from several experiments exploring the role of EBA in self-other discrimination and in understanding others actions. Taken together, our results suggest a strong implication of EBA in the processing of dynamic and socially relevant body and action representations.

Putting affordances in social context

Costantini M.[1]

[1] *University "G. d'Annunzio", Italy*

Although perception and action have been widely investigated on the assumption that they can be completely accounted for by focusing on single individuals, several cognitive neuroscientists, experimental and developmental psychologists and philosophers have recently argued for the need to take a social perspective on perceptual, motor and cognitive activities. Progress has been made by researchers in investigating the different levels of real-time social interactions by studying how mechanisms of sharing attention and action might subserve joint attention and action. However, little research has directly explored whether and to what extent sharing and joining attention and action could shape the perception of target objects as well as whether and to what extend object perception in social contexts, far from being a private business of single perceivers, could tell us something about the mechanisms underlying the primary ways in which we interact with others. In this talk, by taking advantage of empirical data collected in my laboratory, I will try to answer the following questions: How does our perception of objects change in a social context, at least at the basic level? Is it the case that the possibility for other individuals to act on an object modifies the way in which that object is given to us, starting from its affording features? And to what extent can such change shed light on the basic mechanisms of social engagement?

Being moved by the self and others: empathy traits influence vestibular mechanisms of self-motion perception

Lopez C.[1,2], Falconer C.[2], & Mast F.[2]

[1] *Laboratoire de Neurosciences Intégratives et Adaptatives, France* [2] *Department of Psychology, University of Bern, Bern, Switzerland*

The observation of conspecifics influences our bodily perceptions and actions: Contagious yawning, contagious itching, or empathy for pain, are all examples of mechanisms based on resonance between self and others. These effects are associated with a mirror neuron system, which has been demonstrated for the processing of motor, auditory and tactile information. To date, however, no study has yet investigated the role of a mirror system in self-motion perception. Using a state-of-the-art full-body motion we showed that vestibular perception is modulated by the observation of a full body (either one's own body or another age- and gender-matched body) in motion. Viewing one's own body or another body being passively rotated influenced vestibular perception, but in different ways. The observation of one's own body in motion disrupted the detection of physical self-motion when it was incongruent, while the observation of incongruent motion of another body had a weaker influence. In addition, we found that empathy traits modulated this effect: The congruency effect was correlated with individual empathy scores, subjects with high empathy scores being more disturbed by the observation of another body being moved incoherently. The results from this study provide first evidence for a vestibular mirror system.

Body ownership as manipulated by a simple social interaction is reflected in hand-specific subregions of primary somatosensory area: an ultra-high 7T fMRI study

Martuzzi R.[1], & Blanke O.[1,2]

[1] *Laboratory of Cognitive Neuroscience-Ecole Polytechnique Fédérale de Lausanne, Switzerland* [2] *Department of Neurology, University Hosprital, Geneva, Switzerland*

The experience that our body and its parts belong to us is a key aspect of the 'self' and daily social life and is called body ownership. It has been shown that ownership can experimentally be changed such as in the rubber hand illusion (Botvinick and Cohen, 1998) or the numbness illusion (NI; Dieguez et al., 2009). In these illusions the hand or finger of another person is felt as one's own and have been linked to primary somatosensory cortex (S1) as well as other parietal and frontal regions. Focusing on the NI and S1 activity, I will first describe a 7T fMRI method for mapping single finger representations in three of the four Brodmann areas (BA) forming S1, namely BA3b, 1, and 2, observing in each BA a complete representation of all fingers. We used this method as a functional localizer and manipulated the timing and the agent (self or other) to study whether and how body ownership relates to finger specific regions. Our results show that BA1 (but not BA3b and 2) of the stroking hand, at each single finger region, reflects body ownership as quantified through the NI. Additionally, BA3b (but not BA1 and 2) of the touched hand showed a reduced response during self-touch (compared to being touched by another person) conditions. These results suggest that well-localized S1 activity reflects body ownership when interacting with other people and that this interaction involves differently BA3b and 1, depending on whether we are touching or are being touched.

SY: Emotion word processing

Chaired by L. Kuchinke
16:50 – 18:30

Contributions of Arousal and Valence to Word Recognition

Estes Z.[1], & Adelman J.[2]

[1] *Bocconi University, Italy* [2] *University of Warwick, United Kingdom*

Common words such as "kitten" and "coffin" have emotional connotations that are often described in terms of arousal (from calming to exciting) and valence (from negative to positive). Moreover, these factors of arousal and valence are automatically detected, and they influence the recognition of and responding to words. Specifically, negative words such as "coffin" tend to elicit slower responses than positive words such as "kitten", and arousing words

such as "dead" tend to be recognized faster than calming words such as "sad". However, the relationships among arousal, valence, and word recognition are the subject of much current debate. First, some argue that arousal and valence are independent factors, but others argue that they are inherently related. Furthermore, some argue that valence exerts a categorical effect on word recognition, such that moderately negative (e.g., "dirt") and extremely negative words (e.g., "death") are recognized equally slowly, whereas others argue instead that valence has a graded influence on word recognition. To examine (a) the relationship between arousal and valence in ordinary language, and (b) their independent and/or interactive contributions to word recognition, we aggregated emotionality ratings of over 10,000 English words and merged it with response times and accuracy rates in the lexical decision and reading aloud tasks (acquired from E-Lexicon). Regression analyses revealed that arousal and valence (1) are non-independent, (2) contribute uniquely to word recognition, and (3) exert graded effects on word recognition. Implications for neuroscience research are discussed.

Effects of Word Frequency during the Processing of Emotional Words

Méndez-Bértolo C.[1], & Hinojosa J.[2]
[1] *Centro de Tecnología Biomédica, Laboratorio de Neurociencia Clínica, Spain* [2] *Universidad Complutense de Madrid, Spain*

High frequency words are usually processed faster compared to those words that are less frequently used in a language. This word frequency effect has been demonstrated to modulate the processing of words with an emotional connotations. In this regard, several studies have reported an interaction between word frequency and affective content with behavioural and neural activity measures in word recognition. Despite methodological differences in the experimental parameters examined in these studies, it can be shown that some of the variables that affect the processing of emotional connotation were not adequately controlled in some of these studies. This might account for the lack of convergent results. In the present study we aimed at clarifying the effects of word frequency on the processing of emotional words. Event-related potentials were recorded while participants made lexical decisions on high- and low-frequency negative and neutral nouns. Those components that reflect interactions between word frequency and emotion were detected with temporal and spatial principal component analyses. Low-frequency negative nouns were recognized faster than low-frequency neutral nouns. Low-frequency neutral nouns also elicited reduced amplitudes in a late positive component compared to low-frequency negative nouns. No differences were evident between high- and low-frequency neutral nouns. In sum, these findings are discussed to reflect an involvement of attentional mechanisms during the evaluation of the lexicality of a presented letter string that facilitate the processing of low-frequency negative nouns.

Effects of mood and emotional content on visual word processing – an fMRI study

Kissler J.[1,2], Gerling B.[3], Daniel R.[3], & Tempelmann C.[3]
[1] *University of Bielefeld, Germany* [2] *Otto-von-Guericke University Magdebug, Germany* [3] *Otto-von-Guericke University Magdeburg, Germany*

Compared to neutral words, processing of emotional words has been shown to be associated with distinct activity in the extended visual cortex as well as, less consistently, frontal cortices, the amygdala, insula and cingulate cortex. Some of the inconsistencies are likely due to task differences, others have been attributed to implicit effects of mood congruency. Here, we examine to what extent experimentally induced transient mood alters brain activation during processing of emotional and neutral words using a semantic monitoring task. Different moods states were induced following which participants were instructed to monitor sequences of positive, negative and neutral adjectives for occasional occurences of color adjectives. Effects of mood and word content were analysed, excluding responses evoked by color words. Analyses revealed robust effects of emotion on extended visual cortex activity for both positve and negative compared to neutral words. Overall, mood affected cerebral activity in the cingulate gyrus and an interaction between mood and emotional content occurred in the left fusiform gyrus. Amygdala activity could only be identified using a region of interest approach and only following negative mood induction. Across different mood states, findings confirm enhanced extended visual cortex activity in response to emotional compared to neutral words, underscoring the robustness of these effects, but partially also interacting with mood states. Although amygdala activity was identified, it was considerably less consistent than visual cortex activity, casting doubt on the idea that back-projections from the amygdala are an obligatory driving source of visual cortex activity in emotional word processing.

Emotion processing and its regulation: What words can tell us about it

Herbert C.[1]
[1] *Department of Psychology, University of Wuerzburg, Germany*

Emotion perception in self and others is important for successful social interactions. It is involved in the generation of subjective emotional experiences (i.e., feelings) and the regulation of emotions. Building upon previous research using verbal material for emotion induction the present studies investigated by means of ERP and functional imaging methods how emotional words describing the own emotion are processed in the brain and what the underlying mechanisms are. In association with this, we investigated if verbally negating the own emotion serves as an effective emotion regulation strategy when exposed to emotional facial expressions. The results allow a number of conclusions: During reading, emotional words describing the own emotion are more deeply processed compared to unreferenced or other-related emotional words. Second, processing of self-related emotional words increases

activity in medial prefrontal brain structures involved in conscious emotion processing, whereas reading of emotional words, particularly unpleasant ones, leads to an increase in amygdala and insula activity irrespective of the word's reference. Third, reframing one's emotion by using negated emotional cue words decreases cortical processing of fearful faces and spontaneously triggers emotion regulation strategies that appear more closely associated with cognitive reappraisal than with emotion suppression. Theoretically, these findings support an embodied view of language. More specifically, they demonstrate that investigating emotional word processing in social contexts could tell us much about the neural mechanisms underlying the most private and subjective aspects of emotion processing, i.e., of emotional experience and its regulation.

Processing emotional words and nonwords: an evaluative conditioning ERP study

Kuchinke L.[1,2], & Fritsch N.[3]

[1] *Ruhr-Universität Bochum, Germany* [2] *The Cluster of Excellence 'Languages of Emotion', Free University Berlin, Germany* [3] *Ruhr-Universität Bochum, Germany*

Numerous studies have shown that word recognition differs depending on theemotional connotation of a particular word. Emotional connotation, i.e. differences inemotional valence and arousal, have been shown to affect response times andaccuracy measures in the lexical decision task and to modulate very early (80-120ms; e.g., Hofmann et al., 2009) and later components of the event-relatedpotentials (ERP). It is widely accepted that words receive their emotional connotationthrough the learning of emotional-semantic associations, but direct evidence for thisproposal is lacking. To address this question we conducted an evaluativeconditioning study using meaningless pseudowords. Participants learnedassociations between randomly selected 50 pseudowords and 150 affective picturesand between another 50 pseudowords and 150 neutral pictures on five consecutivedays. Each pseudoword was associated with more than one picture and with differentpictures (of the same connotation) each day to guaranty that only the emotionalconnotation and not a particular association to one picture was learned. This wastested in both, a subsequent ERP lexical decision study and in an explicit valencejudgements task. The results reveal effects of learned negative connotations inpseudowords in early and late ERP components, replicating the effects known fromword processing. These findings support the assumption of learned associations asthe basis of a words' emotional connotation. Still, the nature of the very early effectsthat are most probably related to modulated attention to emotional (pseudo)words isin need of further clarification.

Do words stink? Investigating the effects of disgust on word processing

Silva C.[1], Montant M.[1], Ponz A.[1], & Ziegler J.[1]

[1] *Laboratoire de psychologie cognitive, France*

In this study, we investigated how disgust, a culturally learned discrete emotion, would affect visual word processing. In a behavioral study, we first investigated whether the processing of disgust words would lead to a facilitatory or inhibitory effect in a lexical decision task. Second, following the idea that "knowledge" about discrete emotions is shaped by learning and experience, we added measures of individual differences in disgust sensitivity, general emotion sensitivity, and perceived valence and arousal of our items. Results yielded an inhibitory effect of disgust on lexical decision performance (i.e. longer latencies and more errors to disgust than to neutral words). However, the effect was modulated by participants' sensitivity to disgust (only subjects with high disgust sensitivity showed clear inhibitory effects). Interestingly, disgust sensitivity but not perceived valence or arousal nor general emotion sensitivity predicted inter-individual differences in the size of the disgust effect in lexical decision. The latter finding is consistent with a theory which suggests that specific experience with an emotion rather than its general valence or arousal properties drive emotion effects in word processing. Finally, we investigated the neural correlates and the time course of the disgust effect in word processing using ERPs. Results showed an effect of disgust on both early (EPN) and late (N400, LPC) ERP components. Interestingly, neural source localization of the N400 suggested an involvement of the right anterior insula, which is known to be involved in processing disgust in faces or odors.

Saturday morning

SY: Affective neuroscience: Fear and pain

Chaired by P. Pauli
09:00 – 10:40

Startle potentiation in humans – an indicator of fear and anxiety

Pauli P.[1]

[1] *Department of Psychology, University of Würzburg, Germany*

Seminal animal studies (e.g. by M. Davis) demonstrated that startle response potentiation by fear-conditioned stimuli is mediated by the amygdala. In humans, startle responses include an eye-blink which can be reliably measured with orbicularis oculi EMG. Human studies revealed potentiation of startle responses by fear-conditioned or negatively valenced stimuli, and neuropsychological and imaging studies indicated the amygdala's importance. Our studies on healthy subjects revealed that startle potentiation is modulated by darkness, movement of stimuli, context, and a genetic polymorphism affecting dopaminergic efficiency (DRD4 receptor polymorphism). Importantly, we found evidence that CS – UCS timing can reverse startle potentiation effects, although explicit emotional responses are unaffected. Since phobias presumably are based on fear-conditioning, we expected and found potentiated startle responses in phobic patients, yet stronger effects in spider phobics than in flight phobics presumably indicating biological preparedness. However, our studies with virtual reality indicate that cognitions modulate fear responses triggered be fear-specific stimuli. Unlike phobic patients, patients with an attention deficit/hyperactivity disorder generally exhibited normal startle potentiation but deficits in startle attenuation indicating normal fear but deficient reward processing. In sum, startle potentiation seems to be a valuable indicator of fear and of psychopathology of the emotional-motivational system.

Neural Basis of Biased Information Processing in Phobics and its Modulation by Exposure Therapy

Miltner W.[1]

[1] *Department of Psychology, University of Jena, Gemany, Germany*

Many studies have demonstrated biased processing of threat information in phobics and patients with other anxiety disorders. Functional MRI data and data from other imaging methods like ERPs and source analysis of neural activities indicate that several neural networks in the brain of these subjects are critical for this processing peculiarities including the amygdala, the anterior insula, the subgenual anterior cingulate cortex and several networks of the frontal brain including Brodmann area 9 and 10, and the ventromedial part of the orbitofrontal cortex. Several fMRI and ERP-studies will be presented that show increased activities of these structures in phobics as compared to non-phobic subjects when subjects were exposed to threatening stimuli of personal concern as compared to general threatening or neutral stimuli. In the second section of the presentation results of three studies will be presented that show that the hyperactivities of these brain structures might become significantly modified in accordance with subjects fear behaviors and subjective experiences in response to threat following brief periods of exposure therapy.

Gender differences in pain responses under emotional stimulation: an ERP study

Angrilli A.[1]

[1] *Department of Psychology, University of Padova, Italy*

Research on pain and emotions has shown clear gender differences in psychophysiological responses of these domains, however less investigation has been carried out on the interaction between the two variables. In the present experiment, emotions were elicited through five categories of pictures with different content, valence and arousal: pleasant (erotic and sport), neutral (household objects) and unpleasant (threat and mutilation). During the 4s picture presentation, electrical painful stimuli were delivered to the left forearm with a fixed intensity of 40% above subjective pain thresholds. 17 female and 17 male participants were required to watch each picture and then to rate the perceived pain intensity and the picture pleasantness on two 10 point visuo-analogue scales. Results showed for erotic pictures compared with the other four categories, decreased self-perceived pain intensity ($F4= 15.11$, $p < 0.001$) and dampened N150 and P260 ($F4 > 5.69$, $p < 0.001$) amplitudes independently from gender. Also Sport pictures were able, although to a less extent, to evoke dampened pain perception compared with mutilation slides, and no clear self-perceived pain differentiation was found among neutral, threat and mutilation pictures. In addition, a significant Gender by Electrode by Category interaction ($F8,256= 2.08$, $p < 0.05$) for the N150 component was found. Women showed N150 amplitude significantly varying across all categories while males had smaller N150 to erotic compared with all other categories. Men and women showed clear differences in emotion modulation of pain responses with women exhibiting a stronger and more complex modulation.

Brain responses to others' expressions of pain in chronic pain patients

Montoya P.[1]

[1] *Research Institute on Health Sciences (IUNCS), University of the Balearic Islands, Spain*

It is well-known that facial expression is one of the most relevant components of pain and that viewing others' emotional faces may influence our own affective mood. Nevertheless, little is known about physiological responses to pain and other emotional faces in chronic pain patients. Event-related potentials (ERPs) and brain oscillations, corrugator activity, and heart rate were recorded in 20 patients with fibromyalgia and 20 pain-free controls, while

they were passively viewing pain, anger, happy and neutral faces. In addition, ratings of valence and arousal elicited by the faces were obtained. Pain and anger faces elicited greater unpleasantness, arousal and corrugator activity than happy and neutral faces in all participants. Results also indicated that brain and heart rate responses to pain, anger and happy faces were different in fibromyalgia patients and pain-free controls. Thus, fibromyalgia patients displayed more enhanced ERP amplitudes, larger theta power and more reduced alpha power to pain and anger faces, as well as more prominent cardiac deceleration to anger faces than to either happy or neutral faces. Pain-free controls showed larger ERP amplitudes to happy faces than to negative faces. These findings indicate that information processing in fibromyalgia patients was characterized by enhanced defensive reactions and increased mobilization of attention resources to pain and anger faces, as well as by reduced allocation of attention to happy faces. Furthermore, our results suggest that pain symptoms in fibromyalgia would be worsened by a greater vulnerability to negative mood and an inappropriate response to positive emotions.

Emotional effects of the putative pheromone androstadienone on human participants

Esteves F.[1]

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The existence of human pheromones is widely accepted among layman. However, the scientific evidence for possible effects on humans is scarce and still under scrutiny. The goal of this experiment was to test possible effects of androstadienone on mood changes (verbal evaluation) and peripherical psychophysiological measures (skin conductance, heart rate and modulation of the startle reflex). Sixty female participants were randomly assigned by two double-blind male experimenters to the experimental group (exposed to androstadienone) or to a control condition. They had to rate their mood before and after the experiment, and look to a series of emotional pictures (pleasant, unpleasant and neutral) while their skin conductance, heart rate, and startle reflex were monitored. In general, no differences between groups were obtained in the subjective ratings of the pictures and in the mood ratings before and after the exposure. However, the analysis of the eyeblink response comparing positive versus negative pictures showed a significant interaction between Group and Valence, revealing a better differentiation between positive and negative images in the experimental group. Although the general pattern of results is unclear, the fact that exposure to androstadienone seems to enhance the emotional differentiation between positive and negative stimuli, could be interpreted as a higher sensitivity to emotional material after exposure to androstadienone.

OR: Cognitive and Affective Disorders

Chaired by P. Maurage
09:00 – 10:40

Disrupted regulation of social exclusion in alcohol-dependence: an fMRI study.

Maurage P.[1], Joassin F.[1], Philippot P.[1], Heeren A.[1], Vermeulen N.[1], Mahau P.[1], Delperdange C.[1], Corneille O.[1], Luminet O.[1], & De Timary P.[1]

[1] *Faculty of Psychology, Catholic University of Louvain, Belgium*

Objective: Alcohol-dependence is associated with cognitive and biological alterations, but also with interpersonal impairments. While overwhelming in clinical settings and involved in relapse, these social impairments have received little attention from researchers. Particularly, brain alterations related to social exclusion have not been explored in alcohol-dependence. Our primary purpose was to determine the neural correlates of social exclusion feelings in this population. Method: Forty-four participants (22 abstinent alcohol-dependent patients and 22 paired controls) played a virtual game ("cyberball") during fMRI recording. They were first included by other players, then excluded and finally re-included. Brain areas involved in social exclusion were identified and the functional connectivity between these areas was explored using psycho-physiological interactions (PPI). Results: While both groups presented dorsal anterior cingulate cortex (dACC) activations during social exclusion, alcohol-dependent participants exhibited increased insula and reduced frontal activations (in ventrolateral prefrontal cortex) as compared to controls. Alcohol-dependence was also associated with persistent dACC and parahippocampal gyrus activations in re-inclusion. PPI analyses showed reduced fronto-cingulate connectivity during social exclusion in alcohol-dependence. Conclusions: Alcohol-dependence is linked with increased activation in areas eliciting social exclusion feelings (dACC-insula), and with impaired ability to inhibit these feelings (indexed by reduced frontal activations). Altered frontal regulation thus appears implied in the interpersonal alterations observed in alcohol-dependence, which seem reinforced by impaired fronto-cingulate connectivity. This first exploration of the neural correlates of interpersonal problems in alcohol-dependence could initiate the development of a social neuroscience of addictive states.

Predicting treatment outcome in depression: combining EEG and personality.

Böcker K.[1], Arns M.[2,3], Höhle D.[4], & De Lange R.[4]

[1] *Alan Turing Institute Almere, Netherlands* [2] *Research Institute Brainclinics, Nijmegen, Netherlands* [3] *Dept. of Experimental Psychology, Utrecht University, Netherlands* [4] *Alan Turing Institute Almere, Netherlands*

In recent years, the development of guidelines has supported the application of evidence-based medicine in the

treatment of major depressive disorder. However, it is less clear which of multiple treatments that are available at a certain level of severity and given the outcome of previous treatments (if any), is suitable for a given the patient. This question is answered by research on personalized medicine. Personalized medicine requires predictive models with high sensitivity and high specificity. One way to attain this goal is to use data mining techniques with adjustable weighting of false positive versus false negative predictions. Another way is to combine multiple predictors from different levels of observation. In the present study, we applied decision tree data mining, with weighted confusion matrices, to develop a predictive model of treatment outcome. The data consisted of EEG and NEO-FFI personality baseline assessment and the clinical outcome of 76 patients with MDD, treated with a combination of rTMS and psychotherapy. Given the high response rate (79%), we only accepted models with $\geq$ 90% sensitivity. The final model attained 93% sensitivity and 62.5% specificity (overall accuracy 87%). As expected, the model combined personality (low Openness, high Anxiety) and EEG parameters (excess slow waves) to predict treatment non-response. The subgroup that showed excess slow wave power probably consisted of patients with impaired vigilance regulation. On the other hand, high beta power predicted favorable treatment outcome. High beta power might indicate the presence of onset-stage, probably anxious, symptoms.

Modifications of attentional bias and emotion processing in PTSD after EMDR treatment

Khalfa S.[1]

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Avoidance and hypervigilance to reminders of a traumatic event are among the main characteristics of post traumatic stress disorder (PTSD). Attentional bias toward aversive cues in PTSD has been hypothesized as being part of the dysfunction causing etiology and maintenance of PTSD. The aim of the present study was to investigate the cognitive strategy underlying attentional bias in PTSD and whether normal cognitive processing is restored after a treatment suppressing core PTSD symptoms, as well as brain functioning while processing emotions . Nineteen healthy controls were matched for age, sex and education to 19 PTSD patients. We used the emotional Stroop and Detection of Target tasks, before and after an average of 4.1 sessions of Eye Movement Desensitization and Reprocessing (EMDR) therapy. They also underwent fMRI recordings in task of emotional faces recognition. We found that on both tasks, patients were slower than controls in responding in the presence of emotionally negative words compared to neutral ones. After symptoms removal, patients no longer had attentional bias, and responded similarly to controls. In addition, brain activities modified in PTSD patients (at the prefrontal cortex) were restored after treatment. These results support the existence of an attentional bias in PTSD patients due to a disengagement difficulty. This bias may be related to prefrontal activity disorders that have also been restored after symptom removal.

Novelty-processing in infants with acyanotic congenital heart defects: a behavioural and ERP study

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Children with congenital heart defects exhibit subtle cognitive deficits in mid-childhood, particularly in the domain of attention. Whether analogous deficits could be observed in infancy is currently unknown. We investigated the allocation of attention to novel stimuli in 12 infants with acyanotic congenital heart defects (Acyanotic-CHD), as this is thought to underpin cognitive development, and may explain the deficits seen in later childhood. Infants with Acyanotic-CHD (n=12) and matched controls (n=12) aged between 6 and 9 months, participated in a behavioural task (novel object exploration), and an event-related potential (ERP) auditory novelty oddball paradigm. Children were also assessed using the Bayley Infant Neurodevelopmental Screener (BINS). Infants with Acyanotic-CHD exhibited decreased exploration of novel objects (P=.044), and altered ERP (negative component) activity, particularly over the centro-parietal cortex (P=.018). However, no significant differences in BINS scores were observed. These findings suggest a mechanism for the cognitive profile of older children.

Reduced interhemispheric temporal lobe connectivity predicts language impairment in adolescents born preterm

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Background: Language impairment is common in children born very prematurely, but robust neuroanatomical correlates for these deficits have not yet been established. A potential explanation could be the vulnerability of two regions: (i) the periventricular white matter and (ii) the corpus callosum. Methods: We carried out a comprehensive assessment in a group of adolescents born very pre-

maturely (n=50, mean age 16 years) and compared them to a term-born control group (n=30). All children underwent structural and functional MRI. Results: Language impairment (in 38% of preterm children) was not related to abnormalities in the periventricular white matter, including the arcuate fasciculus, but was strongly associated with reductions in the corpus callosum. This reduction was most pronounced in the splenial region, which contains the interhemispheric connections of the occipital, parietal and temporal lobes. DWI-tractography revealed a specific reduction in the language-impaired group of the temporal fibres only. Furthermore, language impairment was more likely to occur if the other commissural bundle that connects the temporal lobes, the anterior commissure, was also reduced. Regression analyses showed that a combination of anatomical measures of temporal interhemispheric connectivity explained 60% of variance in language abilities preterm adolescents, partially independent of non-verbal IQ scores (32%). Conclusions: Reduction in the interhemispheric connections between the temporal lobes via the splenium of the corpus callosum (tapetum) and the anterior commissure are limiting factors in the development of normal language abilities.

SY: Stopping action and cognition

Chaired by R. J. Huster
09:00 – 10:40

Electroencephalographic indicators of response inhibition: Where to look?

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Response inhibition paradigms, whose most famous representatives are stop signal and go/nogo tasks, are often used to study cognitive control processes. Because of the apparent demand to suppress motor reactions, the electrophysiological responses evoked by stop and nogo trials have sometimes likewise been interpreted as indicators of inhibitory processes. Recent research as well as current theories on the families of N200- and P300-like potentials, however, suggest a richer conceptual background. We shortly review studies stressing a functional differentiation of the N200 and P300, a finding further supported by differences in generator constellations giving rise to these event-related potentials. Results from experiments manipulating stimulus probabilities and response priming will be presented showing that neither the N200 nor the P300 serve as unambiguous indicators of a proper inhibitory process. The N200 rather seems to reflect the monitoring of conflicts in information processing. Although the exact functional correspondence of the P300 is still elusive, recent findings at least support an association with evaluative processing of response alternatives. However, recently it was suggested that when subjected to time-frequency compositions, EEG responses reveal differences between go and stop trials in the beta frequency range which might more directly reflect inhibitory processing. Data from single-trial EEG of a stop signal task indeed support differential associations of delta, theta and beta frequency components with inhibition success.

Meta-analytic evidence for impaired cognitive inhibition in schizophrenia

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Meta-analyses unambiguously indicate an impairment of executive functioning in schizophrenia. However, these previous studies treat executive functions as unitary cognitive faculty, pooling the results of different paradigms and neuropsychological instruments, and ignoring that executive functions can also be seen as group of partially independent cognitive sub-components, such as updating, shifting, or inhibition. The present meta-analysis focused on the schizophrenia-related impairment in the sub-component of cognitive inhibition as represented by the color-word interference effect in the Stroop paradigm. The analysis was based on 36 studies which in total included 1081 patients and 1026 healthy controls. A fixed-effect analyses – using the effect size statistic Hedges' g for the differences between patients and healthy controls in the interference effect as dependent variables – revealed that patients exhibit an increased interference effect (M(g) = 0.43; CI95%: 0.35-0.52; Z = 9.62, p=0.0001; Fail Safe N = 828). A significant meta-regression analysis (b = -0.44; t(32) = -2.88, p=0.007) further showed that the card version (M(g) = 0.60) of the Stroop paradigm produces a larger effect size than the single-trial computerized version (M(g) = 0.19). The overall group difference indicates that the reported global deficits in executive functioning in schizophrenia are at least partly due to reduced cognitive inhibition. However, the differences in mean effect size between card and computerized version also indicate that methodological aspects (even within the same paradigm) significantly affect the results and need to be considered when assessing clinical groups.

Discerning proactive and reactive mechanisms of inhibitory cognitive control: a combined EEG-fMRI study

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[1] *University of Oldenburg, Germany* [2] *University of Oldenburg, Germany*

Some authors claim inhibitory processes are not purely reactive, but contain both reactive and proactive mechanisms. Recent literature has highlighted this importance and has stated that discerning neural substrates of both proactive and reactive mechanisms of inhibition would provide a richer model for understanding inhibitory control. In this study, concurrent measurements of EEG

and fMRI were used to simultaneously explore spatial and temporal characteristics of reactive inhibition and proactive control. We employed a modified stop-signal task consisting of frequently presented go-trials (61%) and two different stop-signals (13% and 26%). Subjects were cued in three conditions, providing information on withholding their response to (i) both stop signals, (ii) only the first stop signal (13%) and (iii) only to the second stop signal (26%). This design allowed us to discern effects of cueing on task performance, as well as exploring cognitive processes, such as proactive control, reactive inhibition and conflict monitoring. Go-response times and stop signal reaction times differed significantly between conditions of reactive inhibition and proactive control. Manipulations of conflict possessing demonstrated larger effects in theta than in other EEG frequency bands. Prediction of BOLD-responses from power fluctuations of EEG frequency bands on a trial-by-trial basis revealed a differential association of delta, theta and beta activity with functional networks known to be associated with conflict processing.

Dissociating action cancellation and action restraint – Evidence from prefrontal and basal ganglia lesion patients

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Research on inhibitory motor control has implicated several prefrontal as well as subcortical and parietal regions in response inhibition. Whether prefrontal regions are critical for inhibition, attention or task-set representation is still under debate. We investigated the critical influence of the lateral PFC on response inhibition by using cognitive electrophysiology in prefrontal lesion patients. Patients and controls did not differ in their inhibitory speed (stop-signal and change-signal reaction time, SSRT and CSRT), but patients made more errors in a Go/Nogo task and showed more variable performance. These data stress the role of the PFC in maintaining inhibitory control but not in actual inhibition supporting a dissociation between action cancellation and PFC dependent action restraint. Laplacian transformed event-related potentials (ERPs) revealed reduced parietal activity in PFC patients in response to the stop-signals, and increased frontal activity over the intact hemisphere. This electrophysiological finding supports altered PFC dependent visual processing of the stop-signal in parietal areas and compensatory activity in the intact frontal cortex. Interestingly, when administering the Go/Nogo and Stop-signal tasks in a group of patients with unilateral basal ganglia lesions, we found evidence for a dissociation in terms of behavioral impairments: PFC lesion patients made more commission errors in the Go/Nogo task but had an average SSRT, whereas basal ganglia patients showed a clearly increased SSRT but not more commission errors than controls. I will discuss implications of these findings for current models of response inhibition.

SY: déjà vu, déjà vecu and other mnesic experiential phenomena

Chaired by E. Barbeau
11:00 – 12:40

Déjà vu in unilateral temporal-lobe epilepsy is associated with selective impairments in familiarity assessment

Köhler S.[1], & Martin C.[1]

[1] *University of Western Ontario, Canada*

In déjà vu, a phenomenological impression of familiarity is experienced with a sense that the current environment or situation should in fact not feel familiar. How can such a paradoxical experience arise? In the present study, we sought to elucidate the mechanisms involved in déjà vu by examining unilateral TLE patients who experience this phenomenon as part of their seizures (TLE+). Specifically, we tested whether these patients show a unique pattern of interictal memory deficits that reflects selective impairments in familiarity assessment, as defined in current dual-process models of recognition memory. Phenomenological reports confirmed that ictal déjà vu experiences reflected feelings of familiarity for the immediate visual environment that were experienced as subjectively inappropriate. In Experiment 1, we employed a Remember-Know paradigm for visual scenes and we observed recognition impairments that were indeed limited to familiarity assessment in TLE+ patients. In Experiment 2, we administered an exclusion task for visual scenes in which both recognition processes were placed in opposition. TLE+ patients again displayed recognition impairments - but these impairments spared their ability to counteract familiarity with recollection of contextual detail. The selective pattern of deficits in TLE+ patients contrasted with the pattern we observed in our control group of TLE patients without déjà vu (TLE-), whose deficits encompassed familiarity as well as recollection. Notably, the pattern of behaviour across patient groups paralleled differences in structural integrity of the medial temporal lobes, with significantly smaller and hints of more focal volume reductions in the affected hemisphere of TLE+ patients.

Forced-choice recognition in patients with chronic deja vecu

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We have previously reported cases of dementia who present with almost continuous deja vecu - what we have described as recollective confabulation. By our view, these patients have a fronto-temporal deficit by which they misinterpret novelty as a retrieval experience, and in this leads them to experience 'recollection' of the present

moment. On formal testing, this pattern is particularly pronounced for 'novel' low frequency words. In a case series we present 13 patients with dementia who presented with sensations of deja vu and deja vecu, and describe the core features of their experience. In particular, these patients are significantly more likely to assign false positives in yes/no tasks with the experience of recollection. For the first time we present an analysis of forced-choice recognition data, and find that the pattern of responses given by these deja vecu patients is no different from a group of participants with Alzheimer's disease without deja vu and deja vecu experiences. We suggest that intact familiarity processes are sufficient to overcome false sensations of recollection in this group - and this relatively normal performance establishes a boundary around recollective confabulation and its impact on recognition memory.

Déjà vu induced by direct intracerebral stimulations studies

Bartolomei F.[1]

[1] *Inserm, France*

The phenomenon of 'déjà vu' is caused by acute disturbance of mnemonic systems of the medial temporal lobe (MTL). In epileptic patients investigated with intracerebral electrodes, déjà vu can be more readily induced by stimulation of the rhinal cortices (RCs) than the hippocampus (H). Indeed, in a previous stimulation, study we provided evidence that the probability to induce DV was maximal after stimulation of the entorhinal cortex, while reminiscences of vivid memories were obtained after stimulation of the basal temporal cortex including the perirhinal region (Bartolomei et al, Neurology. 2004;63(5):858-64). Recently, we analysed the synchronisation of intracerebral electroencephalography (EEG) signals recorded from RC, H and amygdala (A) in epileptic patients in whom déjà vu was induced by electrical stimulation (Bartolomei et al, Clin Neurophysiol. 2011 In press). In comparison with RC stimulations that did not lead to déjà vu (DV-), stimulations triggering déjà vu (DV) were associated with increased broadband EEG correlation (p=0.01). Changes in correlations were significantly different in the theta band for RC-A (p=0.007) and RC-H (p=0.01) and in the beta band for RC-H (p=0.001) interactions. These findings suggest that Déjà vu is the results of changes in synchronization process between mesial temporal structures.

Recollection of vivid memories following intracerebral stimulations in epileptic patients

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Electrical stimulation of the temporal cortex in patients with epilepsy sometimes elicits experiential phenomena such as recollection of vivid memories. The neurophysiological substrate of such phenomena is poorly understood. Furthermore, the relation between the site of stimulation and the type of memory elicited has only recently started to be investigated. We investigated these issues in several patients and take patient FGA as an example. FGA had intracerebral electrodes stereotaxically implanted in the right temporal lobe for investigation of drug-resistant epilepsy. We report the results of electrical stimulations of the perirhinal region. Two stimulations elicited experiential phenomena consisting of visual memories that belonged to FGA's past, but which were not related to any particular episode (autobiographical semantic memory). These visual memories consisted of objects or of details of objects. These two stimulations were contrasted with other stimulations in the same subhippocampal region. Cross-correlation analysis of the depth-EEG signals [U+FB01]ltered in frequency sub-bands revealed that experiential phenomena occurred only when the various brain structures involved in the after-discharge were synchronized in the theta range. These structures included the perirhinal region, the hippocampus, other limbic structures as well as a primary visual area. Our results suggest that recollection of vivid memory after electric stimulation of the cortex may rely on wide networks of brain areas that transiently synchronize. However, the phenomenological experience could depend on the site of stimulation: context-free when subhippocampal structures are stimulated, context-rich when the amygdala/hippocampus are stimulated.

Unveiling the mystery of déjà vu

Brázdil M.[1], Mareček R.[1], Urbánek T.[2], Kašpárek T.[3], Mikl M.[4], Rektor I.[4], & Zeman A.[5]

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Déjà vu is an eerie experience that is characterized by the recognition of a situation concurrent with the awareness that this recognition is inappropriate. This feeling of irrelevant familiarity is a common phenomenon occurring both in clinical (mainly epileptic) and nonclinical population. Despite numerous theories have been suggested as to what nonpathological déjà vu is and what causes it, until now no ultimate explanation has been generally accepted. We investigated differences in brain morphology between healthy subjects with and without déjà vu using a novel multivariate neuroimaging technique, Source-Based Morphometry. The analysis revealed a set of cortical (predominantly mesiotemporal) and subcortical regions in which there was significantly less gray matter in subjects reporting déjà vu. In these regions gray matter volume was inversely correlated with the frequency of déjà vu. Our results demonstrate for the first time a structural correlate of déjà vu in healthy individuals and implicate a direct pathogenetic link between nonpathological and

epileptic déjà vu. We hypothesize our findings reflect an alteration of hippocampal function and postnatal neurogenesis in subjects with déjà vu.

SY: The asymmetry of attention in visual processing

Chaired by R. Verleger
11:00 – 12:40

Laterally presented targets in rapid visual series: Why left is better than right

Verleger R.[1], Smigasiewicz K.[1], & Asanowicz D.[2]
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When two letter streams containing two targets (T1 and T2) are presented left and right, T2 is better identified in the left visual field. This remains true under strict fixation control and also holds true in right-to-left and top-to-bottom readers. By varying the type of targets and distractors, by comparing left & right to top & bottom streams, by degrading stimuli, by cueing T2 side, and by measuring ERPs, we studied whether this advantage is due to better processing in the right hemisphere or to overload of the left one.Visual evoked potentials (VEPs) evoked by the ongoing stream of distractor stimuli peaked earlier at the right than at the left hemisphere at the onset of the stimulus series already, T2-evoked N2pc peaked earlier and T2-evoked P3 was larger with left than with right T2. Out of our many experimental variations of stimulus material, the most consistent interaction with the left-visual-field advantage was obtained by cueing T2 side in advance. Thus, the advantage probably arises due to better sensitivity of the right hemisphere to attentional cueing induced by the targets. The ERP results suggest that this might be due to both speed and capacity advantages of the right hemisphere.

Dependence of hemispheric asymmetry on alertness in healthy subjects and in visual hemineglect patients

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Typically, in healthy subjects watching a multiple-object display, a slight processing advantage for left as compared to right visual field stimuli can be observed. This subtle bias in attentional competition is assumed to result from a functional dominance of the right hemisphere for spatial attention. As evidenced by visual hemineglect patients, damage to this right-hemispheric spatial attention system gives rise to a clear rightward bias and visual extinction for left-sided stimuli. Recent evidence, however, indicates that this holds true actually only for the "default state" of arousal, i.e. in conditions of adequate intrinsic alertness in healthy subjects and of low-level intrinsic alertness in neglect patients. In a series of experiments we systematically investigated the consequences of manipulations of arousal level on spatial and non-spatial components of visual attention in healthy subjects with different baseline arousal levels as well as in neglect patients. Our paradigms were based on Bundesen's (1990) theory of visual attention, which permits to extract parametric estimates of independent components of selective attention. Our results indicate that the degree and direction of spatial attentional imbalances are strongly influenced by arousal level: On the one hand, persons with a low general level of intrinsic alertness are specifically vulnerable to leftward extinction. On the other hand, enhancement of phasic alertness can optimize the spatial distribution of attentional weights even in neglect patients. We conclude that the brain system underlying spatial attention is decisively influenced by the alertness system and that efficient neglect treatment might build upon this relationship.

Attentional Load Asymmetrically Affects Early Electrophysiological Indices of Visual Orienting

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[1] *School of Psychology and Trinity College Institute of Neuroscience, Ireland* [2] *Trinity Centre for Bioengineering and Trinity College Institute of Neuroscience, Ireland*

Recent behavioral studies suggest that asymmetries in visuospatial orienting are modulated by changes in the demand on nonspatial components of attention but the brain correlates of this modulation are unknown. Participants performed a dual-task involving monitoring for transient targets appearing at central and lateralised locations. Behavioural analysis indicated a subtle reaction time bias favouring targets appearing in the left visual field. Manipulation of the attentional load of the central task led to a disruption of the right hemisphere orienting response as indexed by ERP (N1) and source analysis. Further analysis revealed that participants' left bias was abolished with increasing time-on-task and this was accompanied by a failure to suppress alpha activity during the inter-target interval. These data support the view that spatial asymmetries in visual orienting are modulated by nonspatial attention due to overlapping neural circuits within the right hemisphere. Finally, we highlight some new experiments designed to isolate continuous electrophysiological markers of visuo-spatial bias.

Asymmetry of parietal interhemispheric connections in humans.

Koch G.[1]
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Visuospatial abilities are preferentially mediated by the right hemisphere. Although this asymmetry of function is thought to be due to an unbalanced interaction between cerebral hemispheres, the underlying neurophysiological substrate is still largely unknown. Here, using a method of trifocal transcranial magnetic stimulation, we

show that the right, but not left, human posterior parietal cortex exerts a strong inhibitory activity over the contralateral homologous area by a short-latency connection. We also clarify, using diffusion-tensor magnetic resonance imaging, that such an interaction is mediated by direct transcallosal projections located in the posterior corpus callosum. We argue that this anatomo-functional network may represent a possible neurophysiological basis for the ongoing functional asymmetry between parietal cortices, and that its damage could contribute to the clinical manifestations of neglect.

Mind Your Left! It is the left visual field rather than the right hemisphere

Hendler T.[1], Siman-Tov T.[2], Podlipsky I.[3], & Okon-Singer H.[4]

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A leftward bias is well known in humans and animals, and has been commonly related to the right (R) hemisphere dominance for spatial attention. Previous fMRI studies from our lab suggest that this bias is mediated by faster conduction from the R to left (L) parietal cortices than vice versa, supporting the importance of inter-hemispheric functional connectivity in the leftward bias. Furthermore, bilateral differential activations were demonstrated for fearful vs. neutral faces only if presented in the L hemifield. This was true not only in a core limbic region, the amygdala, but also in major visual-attention and orientation subcortical nodes, the pulvinar and superior colliculus, respectively. These results are consistent with the well-known leftward bias of danger-associated behaviors in animals. Recently, by using simultaneous EEG-fMRI and causal modeling, we found an association between faster neural conduction (ERPs) from R to L hemisphere and higher fMRI-activation in the left pulvinar, probably led by the R hemisphere. This finding suggests the involvement of major sub-cortical attention nodes even in non-emotional leftward bias.Together this multi-scale evidence highlights the relation between hemispheric dominance and asymmetric inter-hemispheric information transfer as the underlying mechanism of leftward bias in spatial attention. This insight may guide future efforts in alleviating attention deficits by focusing on brain-based diagnosis and improving delays in network connectivity. Additionally, the proposed neural model for asymmetry of visuospatial attention might provide important insights into the mechanisms underlying functional brain lateralization in general

SY: Emotions: Towards an integrated approach

Chaired by E. Sequeira & S. Campanella
11:00 – 12:40

Emotion and Brain-Body Activation

D'Hondt F.[1], Honoré J.[1], Lepore F.[2], Lassonde M.[2], & Sequeira H.[1]

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Emotion appears to be a key link between mental states and physical disease (Lane et al., 2009). It is also known that emotional visual information receives an attentional priority capture and activates brain-body responses that could be critical to the emotional regulation and general adaptation. However, emotional processing involves cerebral, physiological and behavioral responses which integration remains poorly explored. Consequently, we aimed to develop a neurophysiological approach linking central and peripheral neural reactivity to emotion. To this end, we carried out simultaneous recordings of evoked-related magnetic fields (ERFs) and skin conductance responses (SCRs), a reliable autonomic marker of emotional arousal, during the presentation of emotional scenes to healthy participants. Firstly, scenes were centrally presented to 18 participants. ERFs results revealed a greater activity at 180 ms in an occipito-temporal component for emotional pictures relative to neutral ones; this emotional arousal effect was significantly correlated with late-coming increases in SCRs magnitude. Secondly, the same pictures were presented at 12° of eccentricity in the left or the right visual fields to 16 participants. Results showed a differential hemispheric contribution in the emotional processing. Importantly, the observed differential hemispheric impact of emotional stimulations persists at body level, as revealed by SCRs magnitude differences. In conclusion, this integrated approach allowed us to identify an early brain-body impact of emotional arousal and a hemispheric specialized effect of emotional valence processing.

Cardiovascular differentiation of emotions

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We have explored how cardiovascular responses relate to the differential processing of emotions using a combination of detailed autonomic cardiovascular monitoring and functional magnetic resonance imaging of brain (fMRI) during the performance of emotional tasks. Across a set of studies, we have identified generators of efferent cardiovascular responses to affective stimuli within anterior cingulate cortices, orbitofrontal cortex, amygdala and hypothalamus / periaqueductal grey matter (PAG). The magnitude of evoked effect on the cardiovascular system is reflected in the amplitude and pattern of neural responses across these regions. In parallel work, we

have shown that the state of cardiovascular autonomic arousal impacts on the subsequent processing (perceived intensity) of stimuli evoking different emotions, and is reflected in the engagement of regions including insula orbitofrontal cortex, amygdala and PAG suggesting again that there is distinct patterning linking autonomic response and emotion type. Our interpretation of these data attempts to understand emotions within of a predictive coding model of bodily arousal state.

The effects of transcranial Direct Current Stimulation (tDCS) to the prefrontal cortex on the neuro-circuitry of emotional control

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Transcranial Direct Current Stimulation (tDCS) is the application of weak electrical currents (1-2 mA) to modulate the activity of cortico-subcortical circuitries in the brain. Given the effects of tDCS on the neuro-circuitry of emotion and emotional control, we were interested in the effects of the stimulation on cognitive control for emotional information. Hence, using a placebo controlled cross over design, anodal tDCS to the left DLPFC was administered in healthy volunteers. During each stimulation session (placebo or real), participants completed the Internal Shift Task (IST) to measure the ability to switch attention between emotional items in working memory. This process of cognitive control for emotional material is thought to be a crucial information-processing factor related to the tendency to ruminate, which is a maladaptive strategy to control over our emotions. Moreover, 128 resting state EEG was compared between real and placebo stimulation. Prefrontal EEG asymmetry is associated with poor emotion regulation. Results demonstrate an effect of tDCS on cognitive control for emotional information. More specifically, tDCS increased the ability to switch between emotionally negative information in working memory, and influenced resting frontal EEG asymmetry associated with affective responses of approach. Based on this study, we propose a beneficial effect of anodal tDCS to the left DLPFC on the ability to control over emotions, possibly through its influence on cognitive control over emotional material.

Target detection through a visual oddball task: a combined ERP-fMRI study

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Detection of infrequent target stimuli evokes a widespread neural activity reflected in both electrophysiological and hemodynamic measures. In the classical "oddball task", participants have to identify infrequent target stimuli within a monotonous series of rapidly presented, similar stimuli. The popularity of this task is a direct result of its success in evoking robust and reliable responses that are deemed markers of various cognitive functions. On the one hand, rare visual targets elicit in ERP studies a posterior N2 component, related to the orientation of attention, which precedes a parietal P3 component, referring to cognitive contextual integration. On the other hand, despite the oddball task's simplicity, fMRI data have shown that processing of even simple cognitive tasks is associated with widespread activation in all brain areas potentially involved in the rapid evaluation and processing of the stimuli. However, due to poor spatial resolution, localizing generators of ERP components is still uncertain, and fMRI alone do not present the temporal resolution needed to segregate the neural sources underlying an N2 versus a P3 component in the oddball task. To solve this discrepancy, we scanned 16 participants using a combined ERP-fMRI recording during a visual oddball task in which they had to detect 3 types of deviant faces (representing a change in emotion -fear or happiness- or in identity) within a series of frequent neutral faces. Results show that constraining fMRI analyses by ERP data (N2 versus P3) provides novel evidence for specific neural networks underlying specific cognitive-related electrophysiological responses to deviant stimulations

Abstracts:
Posters

Thursday noon

Poster Session 1

PO: Emotions 1

(1-01) **Alexithymia is associated with an augmenter profile, but not only: Evidence for anticipation to arousing music**

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Alexithymia is defined as difficulties in identifying and describing feelings and is characterized by an external way of thinking. Alexithymia is well represented in somatization, characterized by amplification and misinterpretation of somatic sensations. It has been suggested that high alexithymia scorers (HA) amplify their sensations because of their "augmenter" profile, which is defined as the tendency to amplify psychophysiological and subjective responses to arousing stimulations. The lack of studies focusing on the augmenter profile of HA at a physiological level has motivated us to test this theory using physiological (skin conductance level, pulse volume, and interbeat interval) and subjective measures (arousal, somatic sensations, positive and negative mood). We also aimed to assess if alexithymia is associated with reduced habituation abilities. Therefore, we manipulated the order of presentation of the stimuli, and hypothesized that the increase (decrease) of autonomic responses would be stronger (weaker) in HA compared to low scorers, in the 'increasing' ('decreasing') condition of arousing stimuli presentation order. Twenty-seven female listened to musical excerpts of different arousing levels, but were not informed of this manipulation. The results showed no effect of habituation but showed that HA had an augmenter profile for subjective reports to the most arousing excerpt (higher negative mood, somatic sensations and lower positive mood) and stronger skin conductance responses when the most arousing excerpt is presented first. These results partially support the augmenting hypothesis and suggest higher negative anticipation among HA for the first excerpt, which may be apparent only when this excerpt is highly arousing.

(1-02) **An ERP study of dynamic emotional words processing: valence and source of emotion**

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In our laboratory, studies on emotion are based on conceptualization describing different sources, manifestations and consequences of negative, as well as positive emotions (Jarymowicz, 2009; Jarymowicz, Imbir 2010). Namely, our studies distinguish emotions due to automatic affective reactions vs. evaluations based on deliberative thinking. The taxonomy includes eight categories of emotions: (1) four automatic ones (negative and positive: homeostatic vs. hedonic) and (2) four reflective ones (negative and positive due to the ideal self standards vs. general, axiological concepts of good and evil). This study aims to explore the neurobiological basis of processing emotional words connected with our taxonomy. The experimental design contains the stimulation of different types of emotions and the registration of brain reactions. For this EEG is used, especially ERP. We use odd ball paradigm to investigate ERP's after words connected with automatic and reflective source of emotions. Mean amplitude were tested in 120 – 850 ms period after stimulus appeared. We found amplitude differences in early ERP components (N1, P2) to be due to differences in valence and amplitude differences in late ERP components (P3, Early Slow Wave) to be due to different source of emotion.

(1-03) **Approach-avoidance norms for IAPS pictures**

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Examining affective influences on cognitive processes (especially executive functions or breadth of attentional scope) requires using normalized material evoking given types of emotional load. IAPS [International Affective Picture System (Lang, Bradley & Cuthbert, 2005)] is one of the best sources of such material providing norms for emotional valence, arousal and dominance. Recent investigations (e.g. Gable & Harmon-Jones, 2008, 2010) show, that approach-avoidance aspect of stimuli influences cognitive processes (e.g. breadth of attentional scope) in a way that was previously ascribed to emotional valence of

stimuli. Nevertheless there is no relevant set of norms of approach-avoidance motivation for IAPS pictures. The aim of presented project was to provide such norms for preselected set of IAPS pictures. Psychologists and psychology students (N=200) were rating those pictures on the level of (approach-avoidance) motivation they evoked. This let us to differentiate 5 kinds of pictures: (1) positive affect with high approach motivation (e.g. meals); (2) positive affect with low approach motivation (e.g. smiling people); (3) neutral (e.g. buildings); (4) negative affect with high avoidance motivation (e.g. snakes); (5) negative affect with low avoidance motivation (e.g. graveyards). Norms are aimed to be available from authors on request.

(1-04) **Brain mechanisms of motivations and emotions: A polarisation (adaptation) theory**

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A new approach in understanding of motivations and emotions, so called "Polarisation (adaptation) theory", will be suggested. According to this theory (Murik, 1990-2011) motivations and emotions occur in afferent (sensory and associative) systems, and their mechanism is related to formation of the certain metabolic (vital) and functional state (FS) in afferent neurons, which depends on polarisation of their cellular membrane (i.e. resting potential). Formation under the influence of irritants or while changes of environment circumstances of adverse metabolic (vital) and FS of brain cells lies in the ground of negative emotions as subjective experience of this phenomenon so motivation (aimed behavior) as organism's striving for recovery of good metabolic (vital) and FS of afferent neurons. The current FS of brain neurons characterizes tension of cells adaptation mechanisms and results in appropriate changes of membrane potential. We distinguish four consecutive adaptive stages in the reaction of nerve cells to irritants and unfavorable factors: (I) hyperpolarizing inhibition; (II) hyperpolarising (posthyperpolarising) excitation; (III) depolarising excitation; (IV) depolarising inhibition. Each of these stages is characterized by its own peculiarities of the elapse of living processes, the functional capacities of neurons and different resistance to unfavorable factors. It is supposed, that any negative subjective experience and formation of motivational state is related to excitation or inhibition of neurons with a background bad metabolic and FS, though the excitation or inhibition of the same cells with a background good metabolic and FS mediates positive subjective experience.

(1-05) **Commonalities and differences between effects of attention and emotion control during early visual perception: behavioral and psychophysiological evidence**

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Recent neurophysiological findings suggest that not only selective attention, but also affective state may gate early and late stimulus processing in human visual cortex. In a series of behavioral and ERP studies we tested (i) whether attention vs. emotion control mechanisms lead to comparable changes in early sensory perception, and (ii) whether different types of affect modulation (self-efficacy challenge vs. threat exposure) can mimic effects of cognitive load at the behavioral and/or psychophysiological level. Healthy participants were tested using a dual task, enabling a parametric modulation of perceptual load for the primary task, while accuracy for the spatial encoding of visual stimuli shown at different locations in the upper visual field was measured (secondary task). Results show a decrease of accuracy (secondary task) when either load at fixation increases (Experiment 1) or state anxiety was transiently enhanced (Experiment 2). However, self-efficacy challenge vs. threat exposure led to different effects for the processing of the primary task stimuli (Experiment 3). Whereas attention and affect produce similar changes in visuo-spatial perceptual abilities, different effects of state anxiety on goal-related stimuli may be observed depending on the nature (either self- or threat-related) of these state anxiety modulations. Additional analyses focusing on early ERPs showed lower C1 amplitudes for high load or negative affect, compared to the control condition, indicating that attention and affective state each can modulate early sensory processing. Altogether, these findings suggest that concurrent attentional and emotional control mechanisms can exert top-down modulatory effects during early stages of visual perception.

(1-06) **Differential Emotional Modulations of STN Deep Brain Stimulation and L-Dopa in Parkinson's Disease.a**

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Deep Brain Stimulation of the Subthalamic Nucleus (STN DBS) is a widely used surgical technique to avoid motor symptoms in Parkinson's disease (PD), which improves patient quality of life. However, STN DBS may produce emotional disorders such as a reduced ability to recognize emotional facial expressions (EFE). Previous studies did not considered the fact that STN-DBS and L-Dopa can have differential or complementary consequences on EFE processing. An alternative way of investigating the differential effects of STN-DBS and L-dopa medication is to compare patients' performances after surgery with both therapies turned 'on' vs. 'off'.

We therefore used an EFE recognition paradigm under the four conditions (L-Dopa and STN-DBS 'on' vs. 'off',) in surgically treated PD patients compared to healthy controls. The results confirmed previous studies by emphasising significant detection impairment on some facial expressions relative to controls. More interestingly, interaction between STN-DBS and L-Dopa modalities revealed that the combined effect of the two therapies seemed much more beneficial for emotional skills than when each is administered separately. We discuss the implications of these findings regarding the "so called" "inverted U curve" function related to the differential effects of dopamine (DA) level on the right Orbitofrontal cortex (OFC). Although L-Dopa overdoses the ventral stream of the OFC, STN-DBS could compensate for this overactivation by decreasing its activity, restoring the necessary OFC-amygdala interplay. In addition, and in line with the embodiment theories, PD patients exhibited higher neutral faces recognition, but their performance did not correlate with their degree of facial amimia. Nevertheless, we consider that these theoretical frameworks constitute an original and innovative basis for further investigations into emotional recognition impairment in PD.

(1-07) **Facial emotion influences the face-biographical information associative processing in a function of age**

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Few studies took an interest in the effect of emotion on face-biographical information associative process. We investigate the effect of facial expression on the retrieval of face-biographical information associations. We also look at age effect since that individual factor seems to disturb several sociocognitive processes. 43 young, 38 middle-aged and 42 older adults were compared. After an encoding phase where participants saw 30 faces associated to names and jobs, they were told to decide in the retrieval phase whether the presented associations were correct or not. In the encoding phase, faces could express neutrality, happiness or anger. In order to test the effect on recognition of the emotion seen in encoding, all faces were neutral in the retrieval phase. The main result shows an interaction between age and facial emotion that suggests a clear change with age in the influence of emotion on associations memory. Young and middle-aged adults recognize better associations when the face expressed no emotion in encoding, than when it expressed happiness or anger, whereas older adults recognize better associations when the face expressed no emotion or happiness in encoding, than when it expressed anger. This set of results suggests that aging modulates the influence of emotion on such memory task and especially enhances the influence of emotional valence. Results are discussed in light with hemispheric asymmetry theories of emotion and socioemotional selectivity theory of aging.

(1-08) **Features of Perception of Emotional Intonation in Short Pseudo-words and Intelligible Speech Utterances**

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Affective prosody encompasses non-verbal aspects of language necessary for recognizing and conveying emotions in speech communication. The aim of the study was to comparatively examine the characteristics of perception of speech emotional prosody at different linguistic levels. The created corpus of speech signals of happy, angry, neutral emotional intonations contained two semantically neutral simple sentences and two bisyllabic pseudo-words (varying in one vowel phoneme only). The test stimuli were presented at random at noisy and noiseless conditions through the headphones to 43 listeners of 20-79 years old. Time and accuracy of recognition of emotional intonations were assessed. ANOVA showed that "noise level" and "type of emotion" were significant factors ($p < 0.01$) influencing in similar way the recognition parameters obtained for both types of speech material. Sentences' meaning did not influence the emotional perception ($p > 0.05$) while phonemic composition of pseudo-words had a significant effect ($p < 0.05$) on it. The set of acoustic characteristics underlying the perception of emotional prosody according to stepwise Discriminant Analysis appeared to be similar for speech utterances and pseudo-words, though the fundamental frequency variation (sd(F0)) was the most significant under both noisy and noiseless conditions only for perception of pseudo-words. The findings indicate that though, in the whole, recognition of speech emotional prosody has been found to be invariant with regard to linguistic level of stimuli, perception of emotional intonations at phonological and lexico-semantic levels has not only common features but also certain peculiarities. Support by grant RFH 10-06-00002a.

(1-09) **Internalization process of performance monitoring during probabilistic learning: behavioral and ERP effects of positive emotion**

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Dominant models advocate a role of Reinforcement Learning (RL) during performance monitoring (Holroyd & Coles, 2002). In this study, we assessed, using a standard probabilistic learning task (Eppinger et al., 2008), whether RL and the transition from external to internal monitoring (i.e. internalization process) may be influenced by the current affective state of the participant, with a focus on positive mood. Twenty healthy adult participants were asked to find out by trial and error the rule underlying the (arbitrary) association of specific visual stimuli (S) with specific manual responses (R). The S-R associations were easy, intermediate or hard to discover (random order), enabling to compute and contrast these different conditions. Results confirm different learn-

ing slopes depending on the ease to decipher the hidden S-R associations (i.e., significant interaction between condition and time). Another sample of 20 participants was asked to perform the exact same probabilistic learning task, but after positive mood had been reliably induced using a classical procedure. We tested the prediction that positive mood may lead to a change in the exploration vs. exploitation trade-off in RL, i.e. exploration is enhanced/prolonged while exploitation is guided equally well by reward and avoidance learning. The results of this second experiment will be presented at the conference.

(1-10) **Math anxiety effects on the processing of incorrect solutions in simple arithmetic**

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This study focuses on the capacity to solve numerical incongruities in high and lower mathematical anxiety individuals by investigating behavioral data and event-related brain potentials. Thirteen high mathematical anxious (HMA) and thirteen low mathematical anxious (LMA) individuals were presented with simple addition problems in a verification task (a + b = c). The proposed solution was manipulated by presenting correct or incorrect solutions. Incorrect solutions were constructed by adding or subtracting one to or from the correct solution (small-split solution) and by adding fourteen to the correct solution (large-split solution). Due to previous evidence suggesting HMA´s difficulties in processing large-split solutions (Faust, Ashcraft & Fleck, 1996) we investigated this phenomenon by using the event-related potential technique. No differences were found neither on reaction times nor in error rates. However, large-split solutions elicited an enhanced late positive potential (LPP) for the HMA group. Given that LPP´s amplitude have been related to the amount of attentional resources devoted on a task, the HMA group seems to be expending more attentional resources on processing such an implausible solution than the LMA group. Results are interpreted according to two theories explaining the negative effects of anxiety on performance, the Processing Efficiency Theory and the Attentional Control Theory.

(1-11) **Neural Connectivity Underlying Individual Differences in Personality and Behavioral Reactions to Emotional Stimuli**

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Individuals differ in their ability to control emotional reactions. This study focused on the neural networks underlying individual differences in the relation between emotion-related personality traits and individual cognitive control abilities. 24 healthy subjects (11 female; age=24.75±2.49 years) participated in a behavioral battery including neuropsychological tests and personality questionnaires. The scores in the behavioral battery entered a principal component analysis. Resting-state fMRI data was collected on a 3T-Siemens scanner, and analyzed using seeds in bilateral amygdala, with the individual scores of the first principal component entered as a covariate-of-interest in the group level. Results were threshold at $p < 0.05$ and corrected for multiple comparisons. The behavioral scores were further correlated with performance in an emotional task. The principal components combined scores in cognitive tests and emotional questionnaires. The first principal component was composed from scores of chronic stress, neuroticism, negative affect and cognitive interference. This suggests a relation between emotional behavior and executive functions, possibly related to emotion control. Resting-state fMRI analysis revealed a negative correlation between the score in the first principal component and the strength of connectivity between the left amygdala and bilateral orbitofrontal cortex and sub-genual anterior cingulate cortex, regions recently suggested to be related to emotion regulation (Etkin, Egner, & Kalisch, 2011). In line with the latter suggestion, the scores of the first component were correlated with the performance in a behavioral task: The higher the score on this component, the more difficult it was for the participants to ignore task-irrelevant but highly emotional pictures.

(1-12) **Neural correlates of craving during cue exposure with response prevention (CERP) with chocolate**

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In this study, the neural correlates of food cue exposure with response prevention (CERP) were investigated. CERP is exposure of the participant to cues or contexts that predict food-intake, while intake is not allowed. Previous research showed that a brief CERP procedure increases craving (top of craving is reached after approximately 20 minutes), whereas a one-hour CERP procedure disrupts the conditioned link between the food-cue and eating behaviour, and thereby reduces craving. Therefore CERP may be an effective treatment for excessive food cue reactivity in obese people. As of yet it is un-

known whether the elevation and reduction of craving due to CERP are accompanied by corresponding changes in brain reward activity. To investigate this, CERP was performed with chocolate or a control-stimulus (pencil) in an fMRI-scanner in 34 healthy-weight participants. CERP was interrupted by seven short scanning sequences measuring the brain responses to chocolate and neutral control pictures.Preliminary analyses suggest that activation in response to chocolate pictures in several reward-related areas (e.g., amygdalae) after 20 minutes of exposure was higher in the chocolate-exposure group than in the control-group. In these areas group differences disappeared after one hour of CERP. In an area related to cognitive control (left dlPFC), activation after 20 minutes of CERP was lower in the chocolate-exposure group than in the control-group. Again, after one hour of CERP, activation was similar in the two groups. These results indicate that the changes in brain reward activity during CERP are probably linked to the changes in craving noted before.

(1-13) **Oxidative Stress in Pathogenesis of Posttraumatic Stress Disorder in a Contingent of International Operations**

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Objective: The Contingent of the International Operations (CIO) is subject to various extreme factors in action, which can cause Posttraumatic Stress Disorder (PTSD). Besides considerably growing excitotoxity level this leads to uncompensated Oxidative stress (OS) because of the accumulation of the excess of the reactive oxygen species. Neuronal membranes phospholipids are especially vulnerable to damage by OS, the injury leads to the receptor-mediated signal transduction and, furthermore, information processing disorders. Indeed there are difficulties in rating and interpreting because of inhomogeneities in gender, race, age, nutritional and deployment factors, different stressful military experiences. Research aim: to assess PTSD and OS levels and their correlation in CIO. Methods: Prospective study. Totally 143 participants: Latvian CIO, regular personnel, males, Europeans, average age of 27.4, before and after the same Peace Support Mission (PSM) were examined. Questionnaires PCL-M, the valid Latvian language "military" version were used for PTSD evaluation. Antioxidant enzyme activity - Glutathione peroxidase (GPx) and lipid peroxidation intensity - Malondialdehyde (MDA) as OS indicators in blood were determined. Data were processed using SPSS 15.0. Results: Before PSM: response rate (RR) 97.9%, answers of study participants corresponded to PTSD diagnosis necessary criterions, constituent 1.4%, GPx level decreased in 33.0%, MDA level increased in 75.5% of samples. After PSM: RR 93.8%, PTSD 6.7%, GPx level decreased in 51.7%, MDA level increased in 80.0%. Conclusions: There is positive correlation between increase of OS and PTSD levels in CIO. Increased free radical level beyond excitotoxity is a possible causal factor for clinical manifestation of PTSD.

(1-14) **Oxytocin, social cognition and stress regulation: the importance of specific internal working models of attachment**

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Studies on animals have shown that the neuropeptide oxytocin is involved in maternal behaviour and pair-bond formation (Insel, Young, 2001). It also seems plausible that oxytocin plays a key role in adult attachment relationships and prosocial behaviour in humans (Heinrichs, Domes, 2008). Intranasal administration of oxytocin demonstrated beneficial effects on social cognition (e.g. improvement in emotions detection) and stress regulation (e.g. alleviating HPA axis; for a review, see Meyer-Linderberg et al., 2011). However, initial optimism about main effects has been questioned and a nuanced view about oxytocin has been introduced regarding context and/or person as a moderator (Bartz et al., 2011). In this poster, we further elaborate this interactionist approach from an attachment theory perspective. We outline Mikulincer & Shaver's (2007) multi-modular model of attachment system-activation and extend this view by evidence that individuals posses multiple attachment relationships. In line with this, we underline researchers' current attention for general and relationship-specific internal working models of attachment (IWMs; Fraley et al., 2011).In this context, we review 4 published papers on the topic and their experiments in normal controls and patients with borderline personality disorder regarding the differences between general and specific IWMs by emphasizing the kind of methods used by researchers and their results. Therefore, we outline future hypotheses to be investigated and implications of this approach for further research in order to explain inconsistent and sometimes unexpected findings of the effects of oxytocin in the social domain.

(1-15) **Positive emotion broadens attention focus through lessened position-specific encoding : evidence from visual ERPs**

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The efficiency of attention selection is not only determined by stimulus-specific effects or top-down expectations, but also by the internal state of the participant. As opposed to

when we feel sad or angry, feeling happy usually broadens our thought –and action repertoires. However, the precise neural mechanism underlying these effects and their exact electrophysiological time-course remain largely unclear. For example, it remains unresolved whether a broader attention focus under positive mood may be accompanied by a break-down in selectivity (e.g. enhanced distractibility) during attention selection. To address this question, we used high density EEG during a standard paradigm enabling to lock primary attention focus in the center of the visual field, while visual textures/distractors are shown in the periphery relative to the centrally presented task-relevant stimuli. Either a neutral or a positive mood was induced and sustained throughout the realization of the task. ERP results for the central stimuli confirmed that selective attention was engaged towards them, equally so in both mood groups. As predicted, the earliest/retinotopic ERP response to the peripheral textures (i.e. the C1 component) showed a larger amplitude for close relative to far positions. However, this spatial gradient of visual attention was only observed for participants in a neutral mood, and not in a positive mood. A control behavioral study confirmed that positive emotion actually disrupted attention allocation to the peripheral distractors. A decreased position specific encoding of the stimulus in the primary visual cortex might possibly underlie a broadening up of attention allocation in positive mood.

(1-16) **Structural alterations in posttraumatic patients: Correlation to associative memory deficits**

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Memory deficits are a common complaint reported by posttraumatic stress disorder (PTSD) patients. Despite their vivid trauma-related memory, studies in PTSD patients confirmed memory impairment for non-trauma related stimuli when compared to controls; specifically in associative memory. Magnetic resonance imaging (MRI) studies in PTSD patients have demonstrated specific volume and fractional anisotropy (FA) reductions in various brain regions. The aim of this study was to explore to what extent anatomical changes in PTSD patients are associated with memory deficits. Specifically we focused on brain regions often related to intact inter-hemispheric communication, required for binding items to create associations, e.g., the corpus callosum (CC). We carried out an item-association (words and pictures) memory test in PTSD and matched controls (N=12 per group). In parallel, we performed anatomical and diffusion tensor imaging MRI scans. We report that associative memory deficits are correlated with decreased volume of the posterior, mid-posterior and anterior portions of the CC in PTSD patients. These preliminary results highlight structural and functional changes in connectivity as a potential mechanism underlying associative memory deficits in PTSD.

(1-17) **The contingent negative variation predicts the effect of appraisal frames on the late positive potential**

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Appraisal frames are orienting narratives that influence subsequent interpretations of emotional stimuli. Previous studies have indicated that appraisal frames affect interpretations of up-coming stimuli so as to regulate emotions. Considering interconnection of attention and emotion, it is hypothesized that appraisal frames should modulate attention as well as emotion. The present study aims to investigate the effect of appraisal frames (down-regulation vs. maintaining) on attention enhancement and emotion regulation as indexed by the amplitude of the contingent negative variation (CNV) and the late positive potential (LPP). 62 participants were presented with 125 pairs of appraisal frames and visual images reflecting down-regulation conditions (i.e., to down regulate unpleasant and pleasant emotions), and maintaining conditions (i.e., to maintain unpleasant and pleasant emotions). Results indicate that down-regulation conditions evoked larger CNV and smaller LPP in comparison with corresponding maintaining conditions, suggesting that appraisal frames to down-regulate emotion rather than maintain emotion effectively enhance attention and reduce subsequent emotional reaction. Moreover, the increases of CNV are noted to be positively correlated with the decreases of LPP, suggesting that enhanced anticipatory attention by appraisal frames is predictable for subsequent regulation of emotion.

(1-18) **The role of emotional vs. non-emotional factors in the speed of proactive guesses during visual scene recognition**

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Several models have emphasized the role of proactive processes through which perceptual evidence accrues over time before a decision can be made about the identity of a visual object. However, the role of emotion in these predictive coding processes is still unclear. Recently, we found that emotional (pleasant or unpleasant) scenes were associated with a delayed accumulation of evidence relative to neutral scenes, suggesting that emotion may

rapidly modulate proactive processes during visual object recognition. Here, we investigated whether this emotion effect may be explained by trial-to-trial fluctuations along other non-emotional properties, namely familiarity and visual complexity. Independent ratings of every visual stimulus along these two dimensions were obtained and included as concurrent predictors in a multi-level proportional odds model, used to estimate at the single trial level the probability of response at each stage of perceptual processing. Results showed that, overall, more familiar and less complex visual scenes were associated with earlier recognition times. Importantly, when controlling for these two factors, a substantial delay in recognition times for pleasant relative to neutral or unpleasant scenes was still significant, suggesting a positivity offset during emotional scene perception. These results indicate that proactive guesses during visual scene recognition are reliably influenced by the rapidly extracted emotional content of the visual input, even when controlling for non-emotional factors.

(1-19) **The study of the neurophysiologic mechanisms of perception of emotionally significant information in patients in coma, healthy adults and children.**

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This study investigates the problem of finding indicators of brain activity in patients with depression of consciousness and to identify predictors of the dynamics of their condition. It is suggested that, despite the absence of any behavioral activity, patients can be diagnosed with some brain activity, distinct from the brain activity of healthy adults. The level of preservation of cognitive function can be determined by measuring the response of the brain rhythms to emotionally significant stimuli in different modalities. Such a response has prognostic value and can be used as effective rehabilitation procedure. Stimulation consists of: auditory stimuli (physiological (cough, vomiting), emotional (laughing, crying), nature sounds (bird song), human speech, household sounds, neutral sounds (white noise). As a tactile stimulation we used pleasant stimuli (soft brush), unpleasant (prickly brush) and writing on the hand of different words. EEG was recorded using portable device "Entsefalan" with polygraph channels (POLY-4), power of rhythmic activity was assessed by presenting the different groups of stimuli, changes in vegetative characteristics and the ERP. Patients in a coma had only a reaction to an emotionally significant stimulation: we observed significant differences in Delta- and beta- oscillations during presentation of this kind of stimuli. We varied emotional and cognitive components of stimulation and found that, electrical response disappeared when stimuli became less emotionally important and more cognitively difficult. In addition, the change in the power of rhythmic brain activity in patients was closer to a change in rhythmic activity in children than adults.

(1-20) **Valence-specific relevance-modulated performance in a two-choice detection task: A mental imagery study.**

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The aim of this study was to build a personalized emotional induction paradigm using mental imagery, in order to investigate the effect of relevance modulations on the performance of a two-choice detection task. In a first phase, 28 participants evaluated pictures representing various emotional themes so as to determine which theme evoked the most emotion for them. Their ratings were used to select a pair of positive, one of negative and one of neutral scenarios, for each participant. A pair of scenarios was made of a same situation that differed in terms of relevance (relevant VS very-relevant). Relevance was defined by the effects that the situation could have on participants (moderate effects VS strong effects). In the second phase, participants were presented with the personalized induction scenarios to mentally imagine for twenty seconds. Immediately thereafter, they performed a two-choice detection task. Eventually, participants evaluated their mental images on valence, relevance, arousal and quality. Results showed a valence-specific relevance modulation of performance, reaction times being faster for relevant than for very-relevant positive scenarios, and slower for relevant than for very-relevant negative scenarios. These patterns also differed from the one found for neutral scenarios, since reaction times did not differ between relevant and very-relevant neutral scenarios. Results for relevant scenarios were discussed in terms of valence-specific attention modulation (i.e., focused attention for negative stimuli and broadened attention for positive stimuli), whereas results for very-relevant scenarios were discussed in terms of valence-specific action tendencies (i.e., approach versus avoidance), both effects being mediated by relevance.

PO: Executive functions 1

(1-21) **Alcohol-related context modulates performance of social drinkers in a visual Go/NoGo task: an event-related potentials study**

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Objective- Heavy alcohol drinking is associated with cognitive biases toward alcohol-related cues associated with the development and maintenance of alcoholism. Poor response inhibition has been associated with addictive behaviours, and could represent a general vulnerability factor. Standard tests of response inhibition have mostly used neutral stimuli. This study used contextual inhibitory paradigm approach to examine the interaction of bias and response inhibition, to help eliciting approach

or withdrawal tendencies. Method- 17 Heavy Drinkers and 18 Light Drinkers performed a Go/Nogo task in which neutral Go and No/Go cues were superimposed on the centre of background pictures, so that they performed the task during three different conditions: a No-context generated by a black screen background and two different contexts generated by pictorial backgrounds: Alcohol and Non-Alcohol-related. Results- Behavioral analyses revealed that during Alcohol-Related Contexts, Heavy Drinkers showed poorer inhibition capacities than Light drinkers. ERP analyses showed that in Heavy Drinkers, suppressing responses to Nogo cues within the Alcohol-Related Contexts elicited longer Nogo-P3 latencies than Light Drinkers. Analyses of pictures' evaluation used as contexts revealed that the heavy Drinkers Group reported Alcohol-Related scenes as more arousal than Non-alcohol Related ones. Conclusions- Results indicated that Alcohol-Related Contexts has a modulatory effect on response inhibition at the behavioral and neural levels, in Heavy Drinkers: withholding a prepotent response within Alcohol-Related contexts is more difficult and requires more inhibitory control for Heavy Drinkers than within Neutral or Non-Alcohol-related Contexts.

(1-22) **Early processing stages in cognitive control**

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Flexible adjustments to a changing environment require the representation, maintenance and updating of contextual information – the task-set. Cognitive control needs to be adaptive in order to allow the awareness of new and relevant stimuli even if they occur outside the current focus of attention. Presenting a card sorting task to 17 healthy subjects, we aimed to investigate how the extraction of two distinct aspects of cue information (namely, "Does this cue convey any task-relevant information?" versus "what is the correct stimulus-response mapping?") are mirrored in the event-related potentials. We combined the experimental factors of endogenous preparation and exogenous adjustment (cue repetition, cue switch, task switch) with the factor of "Foreknowledge" (informative, non-informative cues). Interestingly, we found a modulation in the frontal cue-locked P2 component for task switch trials compared to repeat trials or non-informative trials. This suggests that the P2 can indicate whether anticipation is possible on the current information for task-set. In a former study we found the N1 and P2 but not the P3 amplitudes of schizophrenic patients differed from those of healthy subjects (n=16 in each group). Taken together, these results suggest that the early processing mirrored in the N1, as well as the evaluation of the stimulus and its salience reflected by the P2, play important roles in successful task-switching. Particularly the P2 seems to reflect early aspects of cognitive control. The inferior performance in schizophrenic patients compared to controls and the foreknowledge effects show how important early stimulus processing is for successful task-switching.

(1-23) **How positive response outcomes guide task performance**

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In a recent model by Verguts and Notebaert (2008, 2009), cognitive control effects such as the conflict adaptation effect and the task switch cost modulation are captured in terms of adaptation by binding. It has recently been shown that positive response outcomes increases binding (Colzato, van Wouwe, & Hommel, 2007; Waszak & Pholulamdeth, 2009). If reward strengthens task-relevant associations, it can be expected that conflict adaptation and the conflict-modulated task switch cost will increase after reward. In a series of experiments we have put this hypothesis to the test combining both a standard flanker task and a task switch paradigm with reward signals. Both experiments confirmed our predictions. Moreover, individual differences, as measured by the BAS Reward Responsiveness scale, show that the more sensitive people are to rewards, the more reward strengthens task-relevant associations. In a second series of studies we demonstrated by both reaction time analyses and electrophysiological markers how task- or stimuli-specific reinforcement schedules modulate overall task performance. More specifically, our results show how reward associations enhance early frontocentral attentional components, for congruent rewarding stimuli only. This difference in amplitude is also shown to correlate with the congruency effect, as well as individual differences in BAS Reward Drive These findings suggest that reward probability alters stimuli processing in a very early stage (150 ms). Together, these studies point towards the beneficial effects of (relative) reward signals on both trial-to-trial cognitive adaptations and overall task focus.

(1-24) **Interference control on different levels of required effort and motivation in impulsivity**

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In our study event-related potentials (ERPs) were measured during a flanker task. The participants were undergraduate students classified as high and low impulsives based on the Barratt Impulsiveness Scale. As the Cognitive Energetic Model (CEM) proposes, the information processing is determined by the interaction of three main factors: executive control; energetic/state factors such as effort; and computational mechanisms of atten-

tion consisting of feature extraction, searching, encoding, and motor organization. The flanker trials had three levels of required effort manipulated by visual degradation of the stimuli. Performance-based monetary reward (+10 Forints), punishment (-10 Forints), abstract (correct, incorrect) or no-feedback information were given to the subjects after their responses.We measured the ERPs time-locked to the presentation of the flanker stimuli. Impulsive participants differed from controls in the feature extraction. While the P1 amplitude was less sensitive to the modulation of the effort level in the incongruent condition, the N1 decreased in the more degraded trials in the impulsive group. The binary evaluation of the motivational state was reflected in the N2b and N2c components as in the no-feedback condition they had larger amplitudes compared to all other conditions with feedback. The amplitude of P3 was largest in the neutral condition while it peaked later in the most degraded and in the incongruent conditions. Our results show that impulsivity affects the early information processing in interference control, i.e. the computational mechanisms of information processing in CEM, but not later stages, where only the effect of congruency and effort manipulations are reflected in ERPs.

(1-25) **Is the interaction between hemispheres asymmetric during bilateral RSVP? Evidence from behavior and N2pc and P3 components of ERPs.**

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In dual-stream Rapid Serial Visual Presentation (dual-RSVP), the second target (T2) is worse identified in the right than in the left hemifield (LVF advantage). This asymmetry might reflect different abilities of the two independently functioning hemispheres, or result from asymmetric interaction, specifically from stronger inhibition exerted by the right hemisphere over the left. In order to differentiate between those two possibilities, we facilitated T2 identification by replacing the usual letter distractors by a set of easy symbols in one of the two streams. If the LVF advantage reflects different abilities of the two hemispheres, then right-side T2 should be better identified only when presented in the easy-symbol stream. If the LVF advantage reflects mutual inhibition between hemispheres, then right-side T2 should additionally be better identified when the easy symbols are presented in the opposite, left stream. Indeed, in two experiments T2 improved when presented both in the same and in the opposite stream to symbols. However, this improvement, reflecting hemispheric interaction, was symmetric for left and right T2. Furthermore, the LVF advantage was reflected in N2pc latency and in P3 amplitude evoked by T2, but only P3 amplitude was increased by symbols independently of their side. Overall the results suggest that there is interaction between hemispheres during the dual-RSVP task in form of mutual inhibition. However, the LVF advantage seems to be better explained by different abilities of each hemisphere.

(1-26) **Patterns of brain rythms at performing cognitive tasks with gradually changing properties**

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This study was designed to investigate the relationships between brain rhythms, mental activity and individual human differences. Our recently obtained results demonstrate that performing mental tasks in mind is accompanied with an establishment of certain rhythmical patterns in subject's EEG. If a task being performed in mind implies using both modes, a mixed rhythmical pattern is observed, which possesses the properties of both. To understand how EEG signs of thinking modes change throughout smooth transformation of one mode into another, a line of tasks with gradual changes in spatial and verbal thinking involvement was designed. Specifically, six task types were elaborated, each containing 60 stereotyped tasks presented to 30 healthy subjects while their EEG was recorded. After that we realized that some tasks required imagination of objects rather than spatial thinking. This mistake led us to an interesting result. We introduced a measure of 'distance' between EEG rhythmical patterns (pertinent to different mental conditions) as a statistically calculated index of difference between appropriate power spectra. We then plotted task types as circles on a plane in a way that approached distances between them as closely as possible to measured 'distances' between rhythmical patterns. On such plots we could see that circles did not lie on a straight line connecting two outmost thinking conditions – purely verbal and purely spatial. Instead, circles formed a two-dimensional structure spanned over two axes: 'verbal-spatial' and 'pictorial-abstract'. Thus, quantitative characteristics of EEG rhythmical patterns form a continuum that reflects a continuum of different types of cognitive activity.

(1-27) **The brain's cognitive control network is used in a more effective way by adults than by adolescents**

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In order to address the question concerning developmental differences in conflict monitoring between adolescents and adults, we analysed behavioural (i.e. reaction time, error rate) and fMRI data of 184 14-year-olds (93 female) and 28 adults (12 female) while performing an interference and switch task. fMRI data analysis was limited to brain regions of interest relating to the cognitive control network (i.e. ACC, dlPFC, preSMA, PPC). Groups did not differ in reaction time, but adolescents made significantly more mistakes compared to adults. On imaging level we only found a higher increase in neural activation in adults in the left superior parietal cortex (BA 7, $p < 0.001$ uncorrected, 25 contiguous voxels) irrespective of trial type.

We further extracted the mean of the time course from this region: Mean error rate correlated significantly with the standard deviation (ρ = 0.186, p = 0.007), but not with the mean (ρ = -0.111, p = 0.106). Moreover the time course's standard deviation in the left BA 7 is higher in adolescents than in adults. The superior parietal cortex was associated with attention in prior studies. We assume that there exists an "error probability threshold" within the activation of the left BA 7: If the activation or attention, respectively, falls below this threshold, it is more likely to make a mistake. Due to their overall lower brain activation and due to their higher time course's standard deviation, adolescents have a higher probability to make mistakes than adults.

(1-28) **The effect of alcohol on implicit and explicit measures of cognitive control**

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Alcohol seems to have a detrimental impact on control processes, as shown by deficient conflict monitoring (Curtin & Fairchild, 2003) and error adaptation (Ridderinkhof et al., 2002). We aimed to extend these findings by investigating the effect of alcohol on two distinct manifestations of cognitive control. A conflict selection task was administered, in which participants had to respond to Stroop stimuli appearing from two categories. One category (i.e. low-conflict category) was associated with 80% congruent Stroop trials and 20% incongruent Stroop trials, while for the other (high-conflict) category this congruent/incongruent proportion was reversed. The placebo group showed context-specific control throughout the experiment, as expressed by a larger Stroop effect in the low- compared to the high-conflict category (i.e. CSPC effect). In contrast, participants in the alcohol group did not show this CSPC effect at first, however, at the end of the experiment a significant CSPC effect was demonstrated. Furthermore, in some blocks of the experiment, participants were asked to choose between the two categories. The alcohol group developed a bias away from the high-conflict category, thus implementing cognitive control by means of selecting the most optimal task strategy. Surprisingly, the placebo group did not show this low-conflict preference, which possibly reflects a compensatory effect. The results indicate the dissociable effects of alcohol on implicit (i.e. CSPC effect) and explicit (i.e. choice bias) measures of cognitive control.

(1-29) **The influence of value and task-difficulty prediction on ERP components related to different stages of a cued visual discrimination task**

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Reward-related processes have moved into the center of much research recently, which partly relates to its crucial role in improving human performance in various task contexts. However, an important question that remains to be clarified is in how far this reward influence is distinct of reward-independent effort-related processes. By using a factorial design that systematically crossed these two factors, we could recently demonstrate with fMRI that predicting the possibility to earn monetary reward vs. predicting higher task difficulty on a given trial invoked largely overlapping neural circuits (Krebs et al., 2012, Cerebral Cortex), with only few areas exhibiting an interaction between the two factors. With the present EEG study we sought to investigate the temporal dynamics of these processes, which cannot be dissociated with fMRI due to its low temporal resolution, while additionally separating activity related to the different phases of the task, i.e., the cue, target, and feedback phase. The results indicate that during the cue-phase prominent markers of attentional orienting and response preparation are primarily dominated by reward prediction (e.g., larger contingent-negative-variation amplitudes for reward vs. no-reward cues), while evaluative processes during the feedback phase display a more multifaceted pattern of results, showing robust influences by both factors. Taken together, the present results display a complex interplay of reward-based and reward-independent processes, with the prospect of reward triggering increased attentional control at an early stage, which may in turn lead to an effective resource allocation and execution in the light of the level of task demands at hand.

PO: Perception 1

(1-30) **Attention directed to body movements changes their encoding by muscle receptors, a microneurographic study**

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Body awareness relies on multisensory information. Among them, the muscle proprioceptive information probably plays a crucial role since it informs about positions and movements of the body. This information arises from muscle receptors, the muscle spindles, which sensitivity may be selectively regulated, by the central nervous system, via the fusimotor system. The aim of the present study was to analyse whether this top-down regulation of muscle spindle sensitivity may be triggered in humans. More specifically, we analyzed whether a fusimotor drive is triggered when selective attention is directed on a two-dimensional movement trajectory in order to recognize it as a writing symbol. A microelectrode was inserted into a superficial nerve to record the activity of single sensory muscle fibers in healthy volunteers (microneurography). The muscle afferent responses to imposed movements forming cursive letters were enhanced when subjects recognized and named the character as compared to when they did not pay attention to the

imposed movement. This is the first demonstration of a context-dependent adjustment of muscle spindle sensitivity in humans. We suggest that this top-down regulation acts as a cognitive filter liable to select, as soon as the periphery, the more accurate information depending on the behavioural and environmental context.

(1-31) **Early ERP correlates of view-invariant face memories to unfamiliar faces**

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Humans show excellent recognition memory for familiar faces across a variety of changes. However, little is known about how the brain processes and represents unfamiliar faces across image changes. To study the time course of the acquisition of perceptual memories to unfamiliar faces across view changes, early identity-sensitive event-related brain potential (ERP) components were recorded. Participants performed an identity-matching task where two unfamiliar faces were presented in succession, with a very short stimulus onset asynchrony (SOA) of 400 ms. The two faces showed either the same or two different individuals, and either the same view or two different views. Reliable occipito-temporal N250r repetition effects (200-300 ms) for same as compared to different facial identities were obtained not just in trials where faces were shown in the same view, but also when they were shown in different views. Importantly, the size of this N250r component was not modulated by view, demonstrating that this component reflects individual face recognition regardless of view. Findings confirmed that the N250r indexes the successful match between newly acquired perceptual face memories with on-line faces. Importantly, the present study showed that rapid repetition of unfamiliar faces results in the formation of view-invariant face memories. This highlights the ability of the human face processing system to extract viewpoint-independent neural codes for individual unfamiliar faces as early as 200 ms.

(1-32) **Inter-individual differences in motion direction perception: physiological correlates in hMT+**

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Visual motion direction is processed both in the primary visual cortex (V1) and the human motion complex (hMT+) along the dorsal visual stream. While behavioral studies have revealed inter-individual differences in motion-direction perception, it remains unclear on which processing level these differences are reflected in neurophysiology. Results from animal studies point to the hMT+ as a likely candidate: neurometric functions of MT direction sensitive neurons have been shown to relate to psychometric functions within individual monkeys. In humans, the physiological correlates of inter-individual perceptual differences are still largely unknown. To investigate, we used functional magnetic resonance imaging (fMRI) while participants viewed translational motion in different directions, and we measured thresholds for direction discrimination of moving stimuli in a separate psychophysics experiment. After determining hMT+ in each participant with a functional localizer, we characterized its signal variability during stimulus and rest periods with a generative model. Relating perceptual performance to physiology, individual direction discrimination thresholds were significantly correlated with the variability measure in hMT+, but not V1. Higher levels of fMRI signal variability compared to rest correlated with higher perceptual sensitivity. This is in line with theories on stochastic resonance, which suggest that endogenous or exogenous noise can increase the sensitivity to incoming signals. What remains unclear however is whether the observed variability reflects intrinsic hMT+ properties or top-down signal modulation. As to elucidate this point, we started to address the contribution of cognitive control on hMT+ signal characteristics by means of a conflict task.

(1-33) **P3-like wave occurs in diverse contexts of the target and nontarget ERPs elicited in human brain during visual oddball task**

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This study concerns the P3-like wave in the context of the target and nontarget event-related potentials (ERPs) recorded in cortical and subcortical regions. Electrical activity from 152 brain regions of 14 epileptic patients was recorded by means of depth electrodes during a visual oddball task. P3-like wave as one of the target ERP components was generated in 34 regions of 12 patients. Among these regions the target ERP varied: (1) in configuration (the number of the components - from 1 to 5, most often 2; the latency of the earliest component -from 86 to 594 ms after the stimulus onset; the symmetry in polarity of the components - number of positive and negative components either differed or not), and (2) in similarity with the nontarget ERP (the number, latency, and polarity of the nontarget components were almost identical in 10 and different in 24 brain regions). The study showed that the P3-like wave may be elicited as a component of various target ERPs, which either differ or not from the nontarget ones.

The fact that the active regions generated the P3-like wave in such diverse contexts could signify that these regions are engaged in the task differentially.

(1-34) **Self-motion fluency has a specific effect on episodic memory**

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Fluency is the relative ease and speed with which stimulus information is processed. It leads to an increase of recognition for items processed more fluently (Jacoby, Kelley, Dywan, 1989). Previous experiments using Remember-Know paradigm have shown an impact of perceptual fluency only on familiarity and not on episodic memory (Rajaram, 1993, Kurilla & Westerman, 2008). Recent episodic memory models have postulated a strong link between episodic memory and spatial processes (Burgess, 2008, Nadel & Moscovitch, 2001), especially with navigation and self-motion (Gomez et al, 2009). The present experiment was conducted to determine whether self-motion fluency affects recognition performance and particularly has an impact on "Remember" responses. Thirty participants learned a four-minute path movie as if they were really doing the track, and then had to recognize among short paths if they were part of the learned path, followed by a Remember-Know procedure for recognized items. Self-motion fluency was manipulated with the presence of nimble acceleration applied on a small part of the video recognition paths. Results show that the presence of a self-motion fluency increases significantly the proportion of remember responses on learned paths only. This study spotlights for the first time a specific fluency effect on recollection and indicates an implication of self-motion in episodic memory retrieval.

(1-35) **The extent of the effect of humorous meaning on visual processing**

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Early visual ERPs recorded at around 100-200 ms post-stimulus are indexes of structural encoding of physical characteristics of stimuli. Nevertheless, it has been shown that emotions can modulate amplitudes and latencies of the components arising at this time range. While emotions are generally thought to arise through the interaction of both bottom-up and top-down processes (Ochsner et al. 2009) it is unclear how each process distinctly contributes to the modulation of early visual processing. In the following experiment, we studied the extent of the effect of top-down modulation of emotion generated by humorous meaning, on visual processing. Subjects were first recorded while exposed to schematic meaningless drawings. These same stimuli showed different P100 and P200 activities when they were consecutively shown after the stimuli had received descriptive labels, in a separate learning phase. Moreover, P100 and P200 amplitudes differed in response to images previously paired with humorous descriptions compared to their neutral counterparts. Our study shows that early perceptual processing of identical visual stimuli can produce differential activities on the account of emotional meaning

(1-36) **When balance is likely to be threatened, the brain triggers a "sensory vigilance" by facilitating proprioceptive afferent inputs**

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It has been recently proposed that the transmission of afferent inputs from the periphery to the somatosensory cortex is attenuated during the preparation phase of voluntary movements. However, it appears counterintuitive and dysfunctional to suppress sensory inputs conveying critical somatosensory information to perform a task such as in gait initiation task. Indeed, gait initiation requires information about the standing condition relative to the equilibrium constraints prior to initiate a step (i.e., during movement preparation). In such conition, we hypothesise that sensory attenuation is selectively alleviated. Here we directly tested this hypothesis with 8 subjects by recording cortical somatosensory potentials (SEPs) evoked by lower limb vibration (i.e., proprioceptive inputs) during the preparation phase of a voluntary step movement. In a control condition the subjects were standing still during the vibration. SEPs were significantly larger in the stepping condition than in the static condition. To determine whether this facilitation of proprioceptive inputs was related to step movement preparation per se or to equilibrium constraints, we performed the same experiment with 6 subjects in microgravity (parabolic flights) in order to remove equilibrium constraints. In microgravity, no difference was observed between the SEPs in stepping condition as compared to the static condition. Most likely, the absence of equilibrium constraints in microgravity did not call for a facilitation of proprioceptive inputs. Our observations suggest that the brain exerts a dynamic control over the transmission of the afferent signal (i.e. facilitation) according to their current relevance during movement preparation.

PO: Cognitive and Affective Disorders 1

(1-37) **Anarchic-hand syndrome: ERP reflections of lost control over the right hemisphere**

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In patients with the callosal type of anarchic-hand syndrome, the left hand sometimes does not act as intended and counteracts the right hand. Reports are scarce about the underlying neurophysiological mechanisms. In our patient G.H. the syndrome developed after infarction of the left arteria pericallosa. It has been suggested that the syndrome arises out of lacking inhibition from the dominant

left hemisphere on the right hemisphere. Yet, in tests of spatial intelligence G.H. performed much better with his "anarchic" left hand than with his dominant right hand, similar to split-brain patients. Left-right manual choice responses and ERPs to laterally presented stimuli were measured. Asymmetries were evident in G.H.'s behavior and ERPs. His right-hand responses were fast and unaffected by incompatibility with stimulus location, whereas his left-hand responses were variable and accompanied by a large negative central-midline potential, probably reflecting efforts in initiating the response. His N1 component peaked earlier and was larger at the right than the left side of the scalp, and the P3 component was grossly reduced at the right side. The effort indicated by the midline negativity and the asymmetrically reduced P3 might directly reflect G.H.'s lack of control on his right hemisphere's processing. The N1 asymmetry might reflect that the right hemisphere processes stimuli faster such that control impulses cannot exert their effect. Altogether, these results tend to support the split-brain account which assumes that the syndrome arises by the lack of communication between hemispheres that act according to their respective competences.

(1-38) **Chemosensory event-related potentials in alcoholism: A specific impairment for olfactory function.**

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Olfactory abilities are crucial in the development and maintenance of alcoholism, as alcohol-related odours are highly involved in craving and relapse. But while olfaction has been widely explored in other psychiatric states, little is known concerning this sensorial modality among alcoholics. Indeed, some studies (e.g. Rupp et al., 2006) suggested reduced ability to discriminate and identify odours at behavioural level in alcohol-dependence, but the brain impairments related to this olfactory deficit remain totally unknown. The present study thus explored the brain correlates of olfaction deficit in alcoholism, notably to determine whether this deficit is associated with low (i.e. olfactory bulb) or high-level (i.e. cortical areas like orbitofrontal cortex) cerebral impairments. Ten alcoholics and ten matched controls took part in psychophysical and electrophysiological olfactory testing. At behavioural level, we showed odor identification deficits in alcoholism, for orthonasal and retronasal testing. Electrophysiological data showed abnormalities (in latency and amplitude) for N1 and P2 olfactory components among alcoholics, which constitutes the first description of the cerebral correlates of olfactory impairments in alcoholism. This deficit appears associated with alterations in the brain structures responsible for the secondary, "cognitive" processing of odors. These results underline the importance of olfaction in clinical practice, as olfactory deficit are known to have a deleterious impact on nutrition and emotional-social everyday life. These results might also lead to reevaluate the studies exploring the cerebral correlates of craving by means of alcohol odors, as these studies were based on the assumption that alcohol-dependence was not associated with general olfactory abilities deficit.

(1-39) **Processing of self-related information in autism**

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Abundant work in the field of autism research has been devoted to emotional processing, social interactions, executive functions etc. However, recent studies suggest that self-related information processing in Autism Spectrum Disorder (ASD) may also be altered. The aim of this study was to investigate whether subjects with ASD show different pattern of brain activity in response to their own name when compared to controls. This stimulus has been chosen because of its close relation to the 'inner sense of self'. Sixteen ASD and sixteen controls participated in this study (they were all young adults and adolescents). The groups were matched in terms of age, gender, handedness and IQ scores. Clinical diagnosis was confirmed by standardized tests such as ADOS and ADI-R. We investigated event-related potentials to self-name, significant other's name (e.g., a family member or a friend), famous name and unknown name. All stimuli were presented visually. The ASD group showed significantly higher P300 response to self- than to significant other's name, whereas no such effect was found for the controls, who showed similar responses to both of these names. This pattern of results might suggest that controls have a partly shared neural representation of self and close other, while this feature might be attenuated in autism.

(1-40) **Reduced BOLD response in the striatum during the receipt of social rewards in Autism Spectrum Disorder (ASD)**

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The 'Social Motivation Hypothesis' posits that impairments in social interaction in ASD are due to a failure to associate social stimuli with emotional rewards. In this study we examined BOLD response in the striatum in ASD during the receipt of social and monetary rewards. 21 ASD participants and 21 controls performed adapted versions of the Social and Monetary Incentive Delay Tasks. Reward feedback consisted of either a smiling face or a coin. A 2-by-2 ANOVA carried out in SPM8 (Factors: group (ASD/CON) and reward type (Social /Monetary)) indicated a significant interaction in the striatum during the receipt of rewards (uncorrected $p < 0.001$; extent threshold 10; SVC (striatum) $p < .05$ FWE). Follow up t-tests indicated that this was due to reduced activity in the striatum in the ASD group during the re-

ceipt of social rewards but not monetary rewards. These results suggest that there may be a specific deficit in the processing of social rewards in ASD, characterised by a hyporesponsive striatal response to positive social feedback.

(1-41) **The neural network sustaining crossmodal integration is impaired in alcohol-dependence: an fMRI study.**

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Background: Crossmodality (i.e. the integration of stimulations from different sensorial modalities) is a crucial ability in everyday life. Nevertheless, while sensory binding difficulties have been described in several psychiatric conditions, crossmodality per se has not received much attention in psychiatry. We showed earlier that crossmodal processing is impaired at behavioural (Maurage et al., 2007) and electrophysiological (Maurage et al., 2008) levels in alcohol-dependence, but the brain areas involved in this deficit are still undetermined. Centrally, it is unknown whether this crossmodal deficit is related to (1) the accumulation of unimodal impairments; (2) specific crossmodal areas alterations; (3) reduced connectivity between these areas. The present study investigated the cerebral correlates of crossmodal integration in alcohol-dependence.Methods: 14 alcohol-dependent subjects and 14 paired controls were scanned while performing a categorization task on faces (F), voices (V) and face-voice pairs (FV). A subtraction contrast [FV-(F+V)] isolated the brain areas involved in crossmodal face-voice integration. The functional connectivity between unimodal-crossmodal areas was explored using psycho-physiological interactions (PPI). Results: Alcohol-dependent subjects presented only moderate alterations during unimodal processing. More centrally, in the [FV-(F+V)] contrast, they did not show any specific crossmodal brain activation while controls presented activations in crossmodal areas. Moreover, PPI analyses showed reduced connectivity between unimodal and crossmodal areas in alcohol-dependence. Conclusions: This first fMRI exploration of crossmodal processing in alcohol-dependence showed a specific face-voice integration deficit indexed by reduced activation of crossmodal areas and reduced connectivity in the crossmodal integration network. Using crossmodal paradigms is thus crucial to correctly evaluate the deficits presented by alcohol-dependent subjects in real-life situations.

(1-42) **Voxel-based morphometry correlates of Body Mass Index and eating behavior**

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Many brain areas including ventral striatum (VS) and the limbic system are involved in the control of eating behavior. Previous studies indicate that the VS shows increased or decreased responses to food in overweight subjects, who are classified as Hedonic and Self-medicating eaters, respectively. We investigated whether these differences in functional anatomy were reflected in the relationship between brain anatomy (more specifically, gray matter density) and Body Mass Index (BMI) for distinct eating subtypes. To this end, we performed voxel-based morphometry (VBM) on T1-weighted structural MRI scans of 245 20-25 years-old participants. Eating personality subtypes were based on individual BIS-BAS questionnaire scores. Participants scoring either high or low on Behavioral Activation Scale (BAS) were defined as Hedonic or Self-Medicating eaters, respectively. The preliminary results showed an overall negative association between VBM values in the right inferior frontal operculum and BMI, confirming two earlier studies. The positive association between BMI and VBM values in the thalamus and the caudate nucleus has also been described previously. Interestingly, the strongest correlations in this cluster were present in the right nucleus accumbens. Regarding subtypes, the association between high BMI and high VBM values in the right ventral striatum was observed in Hedonic participants only. In contrast, only in the Self-medicating participants high BMI was associated with high VBM values in the left ventral striatum and with low VBM values in the right operculum. These results indicate subtype-specificity of associations between BMI and brain anatomy. The results are presently being validated in larger independent samples.

PO: Social factors 1

(1-43) **Early modulation of face processing in social anxiety: a spatiotemporal analysis of ERP responses.**

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Attentional biases towards social threat have been consistently evidenced in social anxiety, but the exact involvement of attentional components remains uncertain. As a consequence, this study explored the influence of social anxiety on attentional processing of emotional faces through electrophysiological activity. Twenty-six participants reporting high or low social anxiety performed a spatial orienting task while event-related brain potentials (ERPs) were recorded. Each trial consisted of a pair of faces (one neutral and one emotional face displaying anger, fear, disgust or happiness) presented for 200ms, followed by an arrow presented for 200ms at the location

of one of the faces. Spatio-temporal principal component analysis was conducted on ERPs locked on the onset of the cues (faces) or targets (arrows). Baseline-to-peak analyses were performed on extracted components. High social anxiety participants showed enhanced amplitudes of P100/N100 complex when processing facial cues. In addition, amplitudes of N200 and P200 waves were enhanced in social anxiety. When considering target processing, social anxiety was associated with diminished amplitudes of P100 when targets replaced neutral faces, and with longer response latencies for targets following neutral cues in pairs involving anger. These results suggest that social anxiety may be associated with (1) an increased perceptual vigilance to faces, (2) a modulation of the emotional appraisal stage, and (3) difficulties to disengage from emotional faces to process neutrally-cued targets. These data provide evidence for a facilitated engagement towards facial stimuli followed by impaired disengagement abilities in social anxiety.

(1-44) **Electrophysiological indices of self versus other's voice discrimination**

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Self- and other- representations are crucial to social functioning. The exploration of neural basis of self-representation has focused on recognition of self-face, the most embodied representation of the self. Other forms of self-recognition, such as recognition of one's own voice, have received less research attention despite many electrophysiological and neuroimaging studies demonstrating the existence of specific neurophysiological processes involved in voice processing. The present study examines the neural processes underlying own voice discrimination using electrophysiological methods. Event-related potentials from 64 electrodes were recorded while healthy subjects (n = 17) heard passively an oddball sequence constituted of recorded French vowel /a/ pronounced either by the participant her/himself or by unknown persons. All stimuli were presented so that each stimulus was alternately standard or deviant. The MMN and P3a features (amplitude, latency, and scalp potential and scalp current density topography) evoked by the subject's own voice were significantly different from those evoked by unknown voices. The results indicated an early detection of own voice (pre-MMN to own-voice) and an attentional switch towards "others" i.e. unknown voice (greater P3a amplitude). Moreover own voice discriminative response involved a left inferior frontal component, the activity of which lasted throughout the time course of the discriminative response, which included both MMN and P3a. Our findings therefore provide arguments for automatic attention modulation processes privileging attention toward others' voices rather than one's own voice which is the basis of adapted communication.

(1-45) **Gender differences in multichannel ERPs related to implicit processing of facial attractiveness**

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We aimed at studying the alterations in brain electrical activity due to the level of processing (conscious or not) and to the gender of the viewer in healthy adult volunteers during the assessment of attractiveness of female faces. 128-channel EEG was recorded while our participants (41 female, 45 male) performed two visual tasks. In the first (Implicit) task the stimuli were monochrome photographs of female faces, butterflies and flowers. The instruction was to press button 1 for faces and button 2 for non-face objects. In the second (Explicit) task the stimuli were faces from the first task. The instruction was to press button 1 for a face that was considered attractive by the participant and button 2 for a face that was considered less attractive. The evoked activity elicited by face presentation was averaged for conditions WB (attractive) and WU (non-attractive) in both tasks. Statistical comparison of WB vs. WU conditions was done separately for male and female groups and for two tasks. In the Implicit task (where implicit assessment of facial attractiveness was implied), WB vs. WU differences were located left frontal, central and right posterior for the latencies longer than 200 ms. In both tasks, gender-dependent differences were seen in 70-80 ms and 120-130 ms, and for latencies longer than 200 ms. While in the Explicit task the patterns of WB-WU differences were similar in general in both male and female groups, the influence of facial attractiveness on ERPs in the Implicit task seem to be more gender-dependent.

(1-46) **How do adults with autism spectrum disorders perceive and process bodies of other humans?**

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Autism spectrum disorders (ASD) are often studied with respect to implications of social interaction, but much is still unknown about how adults with ASD perceive and process visual representations of human bodies. To investigate this, we recorded the brain activity of 6 adults with ASD without mental retardation (4m/2f) and 11 control subjects (10m/1f), while they observed still images of human bodies and chairs during an 1.5T fMRI scan. Altogether 20 different body and 20 chair images were presented repeatedly in a block design adopted from Downing et al (2001), localizing the extrastriate body area (EBA). Each stimulus was presented for 300 ms with a 500-ms ISI, in blocks comprising 20 stimuli presented in

pseudorandomized order; 8 body and 8 chair blocks were presented in total. Subjects' task was to press the button whenever they saw an image repeated twice in succession. Statistical analysis at the individual level revealed robust EBA activation in control subjects, but more variable and weaker EBA activation in individuals with ASD. In control group, EBAs were found bilaterally or lateralized to the right hemisphere from 10/11 subjects at FWE-corrected threshold of $p < 0.05$, whereas the same was true for only the 2 females with ASD. The prevalence of EBA differed between groups ($p < 0.05$, independent-samples Mann-Whitney U test). These preliminary findings suggest the possibility of differences in the brain processing of human bodies in ASD, which may also contribute to the processing of more complex social interactions.

(1-47) **Imaging first impressions: Distinct neural processing of verbal and nonverbal social information**

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First impressions profoundly influence our attitudes and behavior towards others. However, little is known about whether and to what degree the cognitive processes that underlie impression formation depend on the domain of the available information about the target person. To investigate the neural bases of the influence of verbal as compared to nonverbal information on interpersonal judgments, we identified brain regions where the BOLD signal parametrically increased with increasing strength of evaluation based on either short text vignettes or mimic and gestural behavior. While for verbal stimuli the increasing strength of subjective evaluation was associated with increased neural activation of precuneus and posterior cingulate cortex (PC/PCC), a similar effect was observed for nonverbal stimuli in the amygdala. These findings support the assumption that qualitatively different cognitive operations underlie person evaluation depending upon the stimulus domain: while the processing of nonverbal person information may be stronger associated with emotional processing as indexed by recruitment of the amygdala, verbal person information engaged the PC/PCC that has been related to social inferential processing.

(1-48) **Probing the ascription of humanness to virtual characters in gaze-based social interaction: A combined eye-tracking and fMRI study**

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In order to investigate 'online' social interaction, we have developed an interactive eye-tracking paradigm allowing participants to engage in gaze-based interaction with a virtual character inside an MRI scanner. In multiple interaction blocks, participants decided whether the character had been controlled by another participant or a computer while the latter was always the case and the other participant a confederate. Each block included five trials in which the character would either follow the participant's gaze to one of two objects or look avert its gaze. The probability of gaze-following varied from zero to five out of five instances in two conditions. In the naive condition, the confederate was introduced as naive to the participant's task and told to look to either one of the two objects following the participant's choice. In the cooperative condition, the confederate was introduced as explicitly helpful and aware of the task. Humanness ascription increased with higher degrees of gaze-following in the naive condition. In the cooperative condition, humanness was also ascribed in cases of high degrees of gaze aversion. Cooperation thus causes a discounting of congruency in favor of contingency as a cue to humanness. FMRI results suggest that these disparate behavioral patterns are due to activation of distinct neural systems sustaining humanness ascription in the two conditions: Naive interaction correlated with increased activity of the posterior cingulate cortex, which plays a pivotal role in impression formation. In contrast, cooperative interaction was accompanied by activation of the rostral medial prefrontal cortex which is implicated in mindreading.

(1-49) **Psychophysiological effect of facial emotion on a face-name associative task: do women and men differ?**

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This preliminary experiment deals with the psychophysiological effect of emotion on cognitive tasks such as face-name associations processing. We also investigate gender differences since previous studies have demonstrated a sexual dimorphism in autonomic activity. 12 young adults (7 females, 5 males) participated. After an encoding phase where participants saw 24 faces associated to names, they were told to decide in the retrieval phase whether the presented associations were correct or not. In the encoding phase, faces could express neutrality, happiness or anger. In order to test the effect on recognition of the emotion seen in encoding, all faces were neutral in the retrieval phase. Autonomic responses – galvanic skin response (GSR) – were recorded during encoding and retrieval phases. The recording methodology respected the

guideline of the Society of Psychophysiological Research (Fowles, Christie, Edelberg, Grings, & Venables, 1981). Amplitude and latency were calculated. Firstly, during the encoding phase, preliminary results show a significant interaction on GSR's amplitude between subject's gender, face's gender and facial expression. Secondly, during the retrieval phase, while all faces are neutral, analyses show a significant effect of the facial expression – seen during the encoding – on GSR's latency: associations made up of neutral faces in encoding phase lead subsequently to longer latencies during the retrieval phase than associations made up of emotional faces – happy or angry. Although subjects sample needs to be completed, these different results are discussed in light with bioevolutionary theories of emotion and gender, and somatic markers hypothesis.

(1-50) **Social interaction depicted by point-lights: searching for early markers of social dysfunctions in Alzheimer's disease**

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Deficits in social cognition are observed in Alzheimer's disease (AD) at very mild stages. They may reflect disabling behavioral troubles, especially social disinvestment. Understanding social interactions requires the ability to accurately interpret conspecifics' actions. We used point-light displays to investigate the understanding of social scenes based on body language in mild AD. We presented 50 point-light animations depicting two actors either engaged in a social interaction (SI) or engaged in different actions without interacting (NSI). The participants were asked the question: "Are the two subjects acting together or alone?". Twenty patients with mild AD were evaluated through cognitive and neuropsychologic testing. Twenty control subjects were matched to the AD subjects. The age range was between 60 and 90 years. While patients with AD were able to understand isolated actions depicted by point-lights, they encountered difficulties in understanding the general concept of social interactions. The general performance strongly differed between the two groups. Patients with AD over classified the NSI as being SI. They were biased toward interpreting the actions of the two actors as being related to each other. In conclusion, patients with AD at mild stages present with abnormal interpretation of social body interactions that may participate to social behavior disorders.

(1-51) **The influence of being imitated on empathy for pain**

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Social-psychological research suggests that being imitated leads to prosocial behaviour and changes the way we experience others (Chartrand & Bargh, 1999). While the positive consequences of being imitated have been demonstrated for relatively complex social behaviour (van Baaren, Holland, Kawakami, & van Knippenberg, 2004), the question arises whether it also influences more basic functions such as observing others in pain. Research indicates that perceiving another person in pain results in pain-related brain activation in the observer (empathy for pain; Singer et al., 2004). The aim of the present study was to investigate whether being imitated can modulate empathy for pain. To this end, we developed an experimental approach combining a simple imitation task with a pain perception task: participants had to carry out finger lifting movements that were either imitated by a previously videotaped hand on screen (imitation block, e.g. subject lifts index finger – hand on screen lifts index finger) or not (non-imitation block, e.g. subject lifts index finger – hand on screen lifts middle finger). At the end of each block, the hand on screen received painful stimulation (e.g. a paper cut to the hand). Subjective reports on own- and other-related pain experiences were higher after being imitated compared to not being imitated. Furthermore, a larger startle blink amplitude (reflecting negative affect) and a larger heart rate deceleration (reflecting an orienting reflex) were also present in the former condition. Thus, we have found evidence with different measures that being imitated enhances affective responses when observing someone else in pain.

PO: Language

(1-52) **About to speak...: Spatio-temporal brain dynamics of word production**

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The cortical regions involved in the different stages of speech production are relatively well-established, but their spatio-temporal dynamics remain poorly understood. We addressed this point by recording electroencephalography (EEG) during a picture naming task, one of the most popular tasks for studying single word production. High spatial resolution of EEG components was obtained by a Laplacian transformation and by using two types of source localization techniques (equivalent dipole and surface minimum norm modeling). Crucially, considering that the core aspect of speech production is not perception but action, we looked at EEG components time-locked to vocal-onset in addition to components time-locked to stimulus presentation. Various salient neural activities were found time-locked to both events. Visual and conceptual processes related to object recognition were reflected by a sequence of activities taking place between 100 and 220 ms after stimulus presentation, presumably stemming from the secondary visual cortices and the occipito-parietal junction, respectively. In parallel,

lexical activation was observed around 100 ms, presumably in the left posterior temporal cortex. At the crossroad between stimulus presentation and vocal onset, an activity which can be linked to word selection was observed over the medial frontal region. Finally, peaking at vocal onset, a left frontal activity was associated with verbal response execution processes. The temporal overlap of some of these components is consistent with the hypothesis of cascaded processing levels. More generally, our detailed description establishes an innovative look at the spatio-temporal dynamics of language production, providing a valuable ground for future investigations of this behavior.

(1-53) **An ERP study of syntactic processing in Spanish young adults**

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Previous studies on event-related potentials of syntactic processing have focused on syntactic violations while reading sentences. Only a few studies have used auditory stimuli, and those have provided inconsistent results. Therefore, the goal of our study is to obtain indices of syntactic violation on ERP when listening sentences. In the present study, a sample of young adults have listened several sentences in Spanish while EEG activity was recorded. Half of the sentences were syntactically correct, whereas the other half presented a syntactic violation (a gender disagreement between the subject and the object of the sentence). After listening the sentence, participants had to indicate whether the sentence was correct or not. The results reveal a larger negativity (LAN) from 300 to 500 ms, followed by a larger positivity from 600 onwards (P600) when the sentence presented syntactic violations, similar to the results obtained by reading tasks in healthy adults. Consequently, the task appears to be adequate for studying syntactic processing in special populations, in our case, patients with Williams syndrome, which appear to be deficient in several aspects of language processing, contrary to the assertions of classical literature.

(1-54) **Brain activity related to categorization and encoding of words**

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Brain activity at the moment of event presentation could be treated as a predictor of memory performance hereafter (Paller, et al, 1987). The purpose of this study was to compare brain activity before and after presentation of words according to the subsequent recall performance. For this aim, a matching task with two words, first, a category name (prime) and, secondly, a target word that may or may not have been a member of the aforementioned category. Thirty-four participants (19–23 years) were asked to judge whether a target word was a member of a category identified by the priming word that preceded it. Then participants were asked to recall the target words presented earlier. Memory test was unexpected by subjects. For words which were recollected, RT was shorter than for words which were forgotten. Subjects remembered more words which were in matching trials than in mismatching trials. An ERP comparison supported our behavioral findings and revealed that LPC amplitude was greater for words which were remembered later than for words which were forgotten. Moreover brain activity preceding presentation of the target word was more negative going for words remembered later than for words which were forgotten. In conclusion, we see that processes that precede the presentation of the target word as well as processes that are active at the moment of categorization affect encoding, as our findings show these processes are dependent on whether the words in a trial are matched or mismatched. Supported by RFH Grant 11-36-00314

(1-55) **EEG-fMRI study of primary mechanisms of speech recognition in patients after stroke**

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Determining the level of speech disorders by combining non-invasive imaging techniques is promising for prognosis of rehabilitation and understanding mechanisms of speech perception in normal and pathological conditions. The aim of the current study was to test the hypothesis of possible impairment of the primary speech perception stage in people with sensory aphasia. For this purpose we used a passive odd ball paradigm with presentation of Russian syllables "ba" as the standard stimulus and "pa" as deviant, aimed to obtain a component of event-related potentials - mismatch negativity (MMN). Paradigm with non-speech stimuli, harmonic tones of the same loudness and duration as speech syllables, was used for a control condition. Both paradigms have been adapted for the simultaneous recording of fMRI and EEG. 25 subjects participated in the study: 15 healthy volunteers and 10 patients with sensory aphasia on the background of general decline in language function after stroke in the left hemisphere of the brain. Analysis of BOLD signal revealed the following areas of cortical activation: Heschli gyrus, parts of the superior temporal gyrus and the angular gyrus. The activation was larger for syllables than for tones in both groups. In patients with aphasia a distribution of the active clusters differed from the control group and depended on size and location of damaged regions. Delayed MMN to both syllables and tones was obtained in patients comparing with the control group. Further long-term investigation of BOLD and MMN responses is needed to

track down cortical mechanisms of speech recovery after stroke.

(1-56) **ERP correlates of processing regular and irregular word stress information in infancy**

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The main challenge for learners during language acquisition is segmentationthe fluent speech into meaningful elements. From early ages prosody has a prominent contribution to segmentation however different language environment can cause different strategiesthat learners would apply. We examine the nature of early stress representation in a language with fixed stress pattern by an electrophysiological experiment (passive odd-ball paradigm measuring ERPs, 33 infants, 400 items, deviant: p=25%) and a behavioral study (go/no go head-turn preference paradigm, 36 infants, 20 items, target: p= 50%) using the same set of stimulus: bi-syllabic Hungarian pseudo-words with regular and irregular stress pattern. We examined two age groups (10 and 6 month-olds) in two conditions, varied by the position of the regularly stressed stimulus (in standard or deviant position). Our ERP results reveal age differences in both conditions, as only 10 month-olds showed mismatch responses to stress violation. In contrast with adults' responses, 10 month-olds produced one late mismatch response in both conditions. Adults, based on their long-term representation, reacted upon the absence of stress producing a specific double mismatch only in the regular condition. Behavioral data also support different stress processing in the two age groups, as only 10 month-olds reacted differently to the words in the regular condition. The irregular condition was confusing for both groups. We conclude that 10 month-olds, contrary to the younger age group, are sensitive to stress information mainly to the stress pattern of their mother tongue.

(1-57) **ERP evidence for pre-lexical processing of word stress information**

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In speech processing, the importance of prosody is often overlooked. One of the prosodic features, word stress, plays a crucial role in the segmentation of the speech stream, and in the process of lexical access. It is a debated issue how stress pattern of words is represented in the human brain, and whether the processing of stress is a lexical or pre-lexical process. In order to tackle these questions, we used a passive oddball paradigm where we contrasted two pseudowords differing in their stress patterns (stress on the first syllable vs. stress on the second syllable, which is not viable in Hungarian) in two different conditions. In the first condition, the pseudoword with the regular stress pattern was the frequently heard standard, and the pseudoword with the irregular stress pattern was the rarely heard deviant. In the second condition, we reversed the standards and deviants. As a result, we found that the pseudoword having an irregular stress pattern elicited two consecutive Mismatch Negativity (MMN) components, similar to our previous results with meaningful words. This suggests that changes in the stress pattern of words and pseudo-words are processed in a similar way, thus implying a processing mechanism that functions independently of the mental lexicon. At the same time, no MMN appeared in the reversed condition, demonstrating that pseudowords with regular and irregular stress pattern are not interchangeable, possibly because the former have a long-term representation, which forms the basis of the MMN.

(1-58) **ERP evidence on past form production in adults and children**

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Few studies have explored morphological processes during language production by means of ERPs. Instead, language production studies have applied paradigms that rely on meta-linguistic judgements. However, these are often difficult to use when exploring special populations such as children. Here, we applied the delayed vocalization paradigm. In this paradigm, participants see a cue that prompts them to silently produce their response before articulating the response out loud at a later point in time. Thus, event-related brain responses can be time-locked to the cue that requests silent production of participants. This allows studying speech production in a natural-like setting with many different populations, as the task is easy to understand and perform. In the present study, we applied the delayed vocalization paradigm to investigate the ERP-correlates associated with the production of English regular and irregular past forms in both adults and 6-to-12-year-old children. The 3rd person present form was used as a control condition as this is the same in both regular and irregular forms. ERP results revealed a more negative-going waveform at frontal and central electrode sites for regular past forms when compared to irregular past forms starting approximately 200ms post silent production cue onset. There was no difference in the present form condition. These results demonstrate that the delayed vocalization paradigm successfully captures differences between regular and irregular past-tense formation in real-time language production.

(1-59) **Nature of the P600 in semantically anomalous sentences: Evidence from ERP source localization**

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Previous event-related potentials studies of sentence

comprehension have usually associated syntactic repair/reanalysis processes with the P600 component. However, the functional significance of the P600 was recently questioned based on the observation of P600 effects in response to the processing of semantically anomalous sentences (e.g. '*The stone which is in the swimming pool is sleeping.' Isel & Shen, 2011). In the present study, we investigated the functional significance of the 'semantic P600'. Using a source localization analysis, we tested three alternative hypotheses concerning the function of the P600: 1) a syntactic function, 2) a semantic function, and 3) an executive function. We assumed that three distinct neuronal generators should reflect each of these functions. While the syntactic generators are expected to be mainly located in the left inferior frontal gyrus, the semantic generators should be observed in the left superior temporal gyrus as well as in the right anterior prefrontal cortex (semantic retrieval); moreover, the generator of executive function (conflict monitoring) should be found in the anterior cingulate cortex (ACC). Critically, we defined a dipole model using six dipoles whose four of them were placed in the three regions of interest corresponding to our hypotheses, namely syntactic, semantic and executive regions. Our data showed the P600 effect was only significant in the ACC and left superior temporal gyrus / right anterior prefrontal cortex. This finding suggests that the P600 might reflect more general mechanisms of conflict monitoring and semantic retrieval rather a 'pure' syntactic processes.

(1-60) **Neural correlates of the unconscious phonological priming: an ERP study.**

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This study investigates unconscious phonological priming in the auditory modalities using event-related brain potentials (ERPs). Two monosyllabic Russian words with the same consonants and different vowels (garden [sa:d] and court [su:d]) were selected for the experiment. The aim was to compare repeated priming and alternative priming effects on ERP components. To ensure unconscious perception prime word was modified in duration (cut out 30% of every sound) and masked by sandwiching between 2 identical tones. The amplitude of the tone was five-times higher than the amplitude of the prime word. The target word (375 ms) was presented after second tone 50 ms later. For the control used trials without prime word (2 tone with a silence between them before the target word). All trials (192) were presented in pseudorandom order. Subjects didn't detect the prime word between tones. The results demonstrated that repeated phonological priming significantly increases the amplitude of the ERP and reduces the latency period in comparison with ERP parameters on isolated word presentation and control trials. And the alternative priming significantly influences the opposite way: reduces amplitude of the ERP and increases the latent period, compared with ERP parameters on isolated word presentation. The significant data were obtained for N70 and P190 ERP components.

(1-61) **Time-course of word production in younger and older speakers: an electrophysiological study.**

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The transformation of an abstract concept into an articulated word is achieved through different encoding processes, which time-course has been investigated with psycholinguistic and neuroimaging paradigms. The estimates of the timing of encoding processes hold for mean production speed, but the overall production time for identical words can vary across speakers from simple to double. In particular it is well known that production latencies increase along the ageing process.A previous research conducted on fast and slow younger adults, showed a production speed modulation on ERPs both on amplitudes and the duration of a stable electrophysiological configuration within a single time-window, from around 200 to 350 ms, presumably associated with the encoding stage of lexical selection (Laganaro, Valente & Perret, 2012).Here we investigated whether longer production latencies in older speakers are accounted for by the same processes as speed variation in younger subjects. We compared ERP correlates during an overt picture naming task between a group of 16 older adults and two subgroups of younger speakers - one with comparable and the other one with faster reaction times.Older adults showed the same sequence of topographical maps as the two younger groups. In relation with the previous study, the same differences in the time window associated with lexical selection were observed between older and younger fast subjects. In addition, the stable early electrophysiological pattern ranging from 140-180 ms, presumably associated with visuo-conceptual processing, also displayed longer duration in older adults.

(1-62) **To speak or not to speak? Language fMRI in children with focal epilepsy using overt and covert speech production**

Croft L.[1], Rankin P.[1], Liegeois F.[1], Chow K.[1], Banks T.[2], Cross H.[2,3], Vargha-Khadem F.[1], & Baldeweg T.[1]

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Objective: We aimed to assess the feasibility of imaging overt (articulated) speech for pre-surgical mapping of expressive language with functional magnetic resonance imaging (fMRI) in paediatric epilepsy patients. Methods: Thirty eight medically intractable symptomatic paediatric epilepsy patients (6-17 years) performed covert (non-articulated) and overt verb generation (VG) task during continuous fMRI scanning. Measures of data qual-

ity (task performance, in-scanner movement and quality ratings) were compared between covert and overt speech conditions. The neural substrates engaged during covert and overt VG were also compared, as were laterality indices in regions of interest in frontal and temporal cortex and fMRI signal strength. Results: In-scanner movement increased during overt VG, but did not reduce data quality; good quality data were found in 50% of patients during covert speech and in 68% during the overt speech condition. Patients performed more poorly inside the scanner, especially younger patients and those with larger brain lesions. Verbal IQ and practise performance related to better fMRI data quality, and there was more movement in younger patients. Similar brain regions were engaged in both conditions with overt speech also involving the dominant premotor cortex. FMRI laterality indices agreed across conditions, despite a trend for reduced values during overt speech. Categorical judgments of language dominance were also equivalent between conditions. Conclusion: Imaging overt speech with fMRI is feasible in paediatric epilepsy patients and valid in the presurgical setting. Importantly, overt paradigms provide the advantage of monitoring performance in the scanner, which appears crucial.

Friday noon

Poster Session 2

PO: Emotions 2

(2-01) **Alexithymia moderates the beneficial influence of arousal on attention: Evidence from the attentional blink**

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Alexithymia is a multifaceted personality construct which encompasses difficulties in identifying and expressing feelings and an externally-oriented cognitive style. The influences of alexithymia and arousal on cognitive processing of emotion are now widely accepted. To test the influence of alexithymia and arousal on attention, participants realized two blocks of attentional blink (AB), once after a baseline (relaxed) session and once after a cycling (arousal) session. Many studies have documented that the second target (T2) of a pair is typically missed when presented within a time window of about 200-500 ms from the first to-be-detected target (AB effect). In this study, the T2 were neutral (e.g., Echo), low arousal (i.e., Emptiness, Sadness) or high arousal (e.g., Passion, Rape) words. Results show that participants reported significantly more T2 after cycling than at baseline, supporting the view that arousing states modify attentional processes. As well, word type moderated attentional capture with high arousing words being reported more so than low arousing words. Adding alexithymia in the model as a continuous variable (TAS-20) substantially decreased the explained variance of these two effects by about 15%. A new analysis of variance separating high versus low alexithymia scorers showed that alexithymia moderated the arousal effects so that cycling was beneficial only for low alexithymia scorers and high alexithymia scorers accurately reported the exact same proportion of high arousal, low arousal and neutral T2 words. These findings support the theoretical assumption that alexithymia may be related to an inability to link emotional arousal responses to symbols like words.

(2-02) **Automatic facial expression processing as function of Alexithymia: An fMRI Study**

Lichev V.[1], Suslow T.[1], Ihme K.[1], Quirin M.[2], Rosenberg N.[1], Sacher J.[3], Villringer A.[3], Rufer M.[4], Grabe H-J.[5], Kersting A.[1], & Lane R.[6]

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The personality trait of alexithymia, which literally means "no words for emotion", has been described as the inability to identify and describe feelings accompanied by an externally oriented cognitive style. Recent fMRI studies suggested that people scoring high on alexithymia have remarkable deficits in the controlled processing of emotional information. The main goal of the present study is to investigate the neurobiological mechanisms underlying automatic emotion processing as function of alexithymia. For that reason an innovative paradigm, combining an affective priming task with the implicit positive affect negative affect test (IPANAT) will be tested. The IPANAT has been shown to be a valid measure of implicit affect by asking subjects to judge to what extent artificial words express different moods. In order to measure alexithymia, we applied a multi method approach combining self-report (Toronto Alexithymia Scale), interview (Toronto Structured Interview for Alexithymia) and performance task (Levels of Emotional Awareness Scale). ROI-based analysis conducted on 25 participants and thresholded at $p = 0.005$ (uncorrected) revealed significantly more brain activation in the emotional (i.e., angry, afraid, happy) than the neutral conditions in the insula, fusiform gyrus, middle frontal gyrus and superior temporal gyrus. Furthermore, decreased brain activation in amygdala, insula and fusiform gyrus as function of emotional awareness (i.e. LEAS) in the angry vs. neutral condition was observed. There were no significant results as a function of the self-report measures. The findings so far speak in favor of the validity if this paradigm. Future steps include the evaluation of behavioral and interview data.

(2-03) **Cerebral correlates of emotional intensity perception in ASD**

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One judges differently the value of a joke if the interlocutor just grins or if he blows a full smile up. Amongst many other examples, this illustrates how crucial to our everyday social interactions is the ability to evaluate with accuracy the intensity of a person's emotional expression. Autism spectrum disorders (ASD) are characterized by a triad of specific deficits including impaired social interactions, lack of communication and stereotypic behaviors. In this study, we investigate their difficulty in processing emotional facial expressions. 11 adults with ASD and 11 age and IQ matched controls participated in a blocked fMRI paradigm. We investigated the cerebral substrates of comparative judgements of intensity of happiness expressed by facial expressions. The putative existence of an emotional distance effect was explored by selecting target pairs made of close or far intensity of facial emotional expression of happiness. Five different distance values were

used. As a control non-emotional condition, subjects had to compare clouds of dots with different numbers of white and black dots. At the behavioral level, our results reveal that ASD and Control subjects have similar performance in the task and show a distance effect for both emotional and neutral stimuli. fMRI results however show that this apparently normal behaviour of ASD subjects is associated with abnormal activation of extrastriate visual areas and amygdala in ASD in the emotional condition, suggesting the use of an alternative cognitive strategy to perform the task.

(2-04) **Do happy words sound happy? A neuroscientific approach on phonoemotionality**

Conrad M.[1,2], Schmidtke D.[2], Recio G.[3], Barber H.[1], & Jacobs A.[2]

[1] *Universidad de La Laguna, Spain* [2] *Freie Universität Berlin, Germany* [3] *Humboldt Universität Berlin, Germany*

An influential theoretical position from the field of linguistics posits an arbitrary relation between the "signified" and the "signifier" (de Saussure). Yet, the observation that the sound of words often seems to relate to their meaning has never ceased to intrigue philosophical minds from Plato to Köhler, leading them to suggest a link between sound and semantics beyond mere symbolism. Based on large-scale lexical emotion databases for 6,000 Spanish and German words we provided empirical evidence for sound-to-meaning correlations in the vocabulary of these languages: specific subsyllabic units tend to occur particularly often in words with specific emotional content - displaying substantial analogies across the two languages. To test whether sublexical phonology triggers affective processing – independently of semantics – we conducted an ERP experiment comprising parallel manipulations of a) "semantic valence" within Spanish words (positive vs. negative vs. neutral) and b) "sound-emotion" within Spanish nonwords – constructed of graphemes occurring typically in either positive vs. negative vs. neutral Spanish words. We obtained significant ERP effects corresponding to an early posterior negativity (starting at 250ms) and a late positive complex (peaking at 550ms) - repeatedly shown to characterize emotion processing during visual word recognition – not only for the manipulation of words' semantic valence, but also – though strongly attenuated – for the manipulation of the hypothetical emotional value of sounds our nonwords were formed of. Thus, our data suggest human language processing to be sensitive to sound-to-meaning correlations with regard to emotion at a sublexical level.

(2-05) **Does emotion regulation by distraction truly regulate emotion? Selective attention effects on LPP amplitudes.**

Uibo H.[1], Uusberg A.[1], Kreegipuu K.[1], & Allik J.[1]

[1] *University of Tartu, Institute of Psychology, Estonia*

The Late Positive Potential (LPP) as an EEG indicator of affective arousal holds great potential for emotion regulation research. Numerous reports exist of LPP amplitudes being diminished by experimental manipulations of reappraisal and distraction strategies. However, these results have often been obtained without applying the same manipulations to neutral stimuli. Thus it cannot be ruled out that the observed LPP attenuation results from non-affective changes in information processing.The present study investigates the effects of distraction on LPP amplitudes while viewing affective as well as neutral stimuli. 79 participants (32 males) viewed affective images (IAPS) from five categories (aversive, negative, neutral, positive and erotic). All categories were presented in affective (making affective evaluations) and distractive (making non-affective evaluations) tasks. The order of tasks was counterbalanced. LPP was reduced significantly in the distraction condition only if it was completed prior to giving affective ratings. This carryover effect suggests that once attention has been drawn to affective content, analysis of emotional meaning will continue on the same level even without explicit task requirements. Crucially, the LPP reduction by distraction was uniform across all stimulus categories. As this manipulation did not reduce the arousal sensitivity of LPP it probably influenced some non-affective processes. This finding might also relate to the relative ineffectiveness of distraction as an emotion regulation strategy.

(2-06) **EEG brain dynamics during processing of static and dynamic facial emotional expression**

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Humans recognize facial emotional expressions (FEEs) better when FEEs are presented dynamically than through static images. Wallraven et al. 2008 propose that humans are sensitive to the natural dynamics of FEEs. Moreover, PET/fMRI studies suggest that differentiated brain networks process static and dynamic FEEs. However, in most cases, dynamic FEEs have been created out of static ones, using linear morphing techniques. Together with the low time resolution of PET/fMRI, such studies fail to capture the modulation of the activated brain networks by the subtle (and highly nonlinear) dynamics of FEEs. Our ongoing study investigates EEG responses to static and dynamic FEEs drawn from an ecologically valid database (Kaulard et al. 2008, Kaulard et al. 2009). "Happy" and "angry" FEEs performed by two male and two female actors are displayed to twenty female participants in an "oddball" experimental paradigm. Blocks of either dynamic or static stimuli that differ in their emotional content ("happy" versus "angry" and reverse) are presented in a pseudorandom order. The task consists of pressing a keyboard button upon appearance of a deviant stimulus. Data analysis focuses on synchrony and nonlinear coupling of sensor as well as source dynamics (as a bridge to PET/fMRI studies), both in the time-frequency and in the phase-space domain, to identify the brain net-

works that emerge and evolve dynamically in each condition. Preliminary results from pilot data analysis confirm the PET/fMRI findings of enhanced and differentiated brain activations for dynamic FEEs compared to static ones.

(2-07) **Emotional information processing in burnout: An oculomotor and electrodermal investigation**

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Background: Burnout is a stress-related, highly prevalent syndrome. However, experimental investigation of emotional processing in burnout is poorly developed. In the present study, attentional distribution – as indexed by oculomotor activity – and physiological arousal – as indexed by electrodermal activity – toward emotional information were examined in burned out and healthy individuals. Method: Participants 'freely' viewed a series of 4-picture slides as their point-of-gaze was monitored using eye-tracking technology and their skin conductance recorded. Each picture matched 1 of 4 emotional categories, labeled as dysphoric, anxiogenic, positive, and neutral. Each slide was displayed during 20 seconds. Results: In healthy participants, the percentages of fixation number and fixation duration were higher on 'positive pictures' than on 'dysphoric pictures', and higher on 'positive pictures' than on 'anxiogenic pictures', whereas visual scanning was not depending on stimulus emotional category in burned out participants. No between-group or within-group difference in pupil diameter or electrodermal activity was detected. Conclusion: This study reveals an equidistribution of attention on emotional information in burnout. Contrary to healthy individuals, burned out individuals do not favour positive information as they process concurrent emotional stimuli. The dysphoric core of the syndrome possibly accounts for this tendency. Indeed, dysphoria has repeatedly been associated with an inclination to view emotionally categorized stimuli presented simultaneously in an unbiased manner. This work highlights the relevance of an experimentally driven investigation of the burnout syndrome.

(2-08) **Exploring differences in conscious and preconscious processing of the emotional content of words**

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Previous work investigating the processing consequences of emotional associations of words has led to conflicting results, with studies suggesting either a processing disadvantage for negative words (Vinson et al., 2011; Estes & Adelman, 2008), an advantage for negative words (Nasrallah et al., 2009) or an overall processing advantage for valenced words (regardless of polarity, Kousta et al., 2009). Previous studies, however, differ along important dimensions, which may be responsible for the reported different results, even for those studies that stringently controlled for other lexical and sublexical differences across stimuli. Two important methodological differences are (a) whether the task directs attention to emotion; (b) whether the task taps into conscious vs. preconscious processing of stimuli. Here, we use a within-subject design to contrast two tasks: lexical decision (i.e., deciding whether a string of letters is a real word in English) for words presented in full view and a location decision (i.e., deciding whether a word is presented above or below a fixation point) for words presented under a continuous flash suppression task (CFS, a variant of binocular rivalry). Hence, both tasks are emotion-irrelevant, but crucially lexical decision taps into conscious processing whereas the CFS paradigm taps into preconscious processing. For highly controlled items and the same subjects, we found that valenced words (regardless of polarity) were processed faster in lexical decision but crucially, under CFS, negative words took longer to emerge from suppression than either positive or neutral words. We interpret these differences as revealing characteristics of subcortical and cortical emotional pathways.

(2-09) **Hypo-retrieval, hyper-suppression and emotional deficit in functional amnesia**

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Functional amnesia (FA) is characterized by an extensive retrograde memory loss in the absence of detectable brain damage. Hypotheses put forward to explain FA involve a global retrieval deficit or a selective inability to explicitly retrieve pre-onset memories. In order to test theses hypotheses, we extensively examined P.P., a patient with FA. In Experiment 1, encoding of post-onset events was monitored in a laboratory setting. P.P.'s performances, taking into account the state of consciousness associated with retrieval, were normal. In Experiment 2, implicit recognition of pre-onset memories was tested using skin conductance responses. Results showed that P.P. responded implicitly to photographs of pre-onset events that were not explicitly recognized. In Experiment 3, designed to assess the patient's ability to suppress newly acquired information, P.P. suppressed more items than controls. In Experiment 4, using video stimuli conveying strong emotions, we explored its emotional responses considering both conscious emotional judgements and automatic psychophysiological responses. Findings demonstrated the presence of an emotional deficit, characterized by a failure to generate appropriate somatic responses to positive and negative stimuli. Additionally, we obtained imaging data showing significant metabolic and structural changes within the white matter of the right prefrontal lobe.In conclusion, our results suggest that FA may result from a combination of "hypo-retrieval" of pre-onset

memories, tentatively due to white matter tract damage, and "hyper-suppression" mechanism, concomitantly preventing the retrieval of pre-onset memories. This study therefore suggests that FA is not limited to a mnemonic impairment, but also involved the processing of emotionally loaded experiences.

(2-10) **Impulsivity and anterior alpha in predicting inter-temporal choices**

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The delay discounting paradigm is an established model of decision-making with implications for trait impulsivity. While the involved anatomical networks have already been identified, the EEG correlates of inter-temporal choices remain elusive. 50 participants made series of choices between two imaginary monetary rewards – a smaller sum available sooner and a larger one available later after a delay of 2, 4 or 10 weeks. In a "hot" condition the smaller reward was available immediately while in a "cold" condition both rewards were delayed by additional 2 weeks. The difference between behavioral preferences defined as areas under discounting curves in the "hot" and "cold" conditions predicted trait impulsivity better that either preference alone. Subtracting the two conditions may thus isolate the specific response to immediacy from the general cognitive processes involved in all inter-temporal choices. Similarly, EEG correlates of immediacy processing were isolated by subtracting response-locked spectral perturbations averaged in individually defined frequency bands collected in the "cold" condition from those recorded in the "hot" condition. Anterior alpha power was found to predict choices of delayed over immediate rewards corroborating recent conceptualizations of alpha power as a reflection of top-down inhibition, probably originating from the prefrontal cortex. Interestingly, Big Five trait Conscientiousness was intermittently related to lower levels of anterior alpha prior to choices of delayed rewards and higher levels prior to choices of immediate rewards. This pattern might suggest that trait impulsivity relates to the efficiency as well as power of inhibitory mechanisms.

(2-11) **Independence of valence and reward in emotional word processing**

Kaltwasser L.[1], Ries S.[2], Sommer W.[1], Knight R.[2], & Willems R.[3]
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Previous electrophysiological work on word processing shows that emotional word content can enhance word processing at all stages from pre-lexical encoding and semantic access, up to contextual integration, evaluation, and memory encoding (for review see Kissler, Assadollahi, & Herbert, 2006). Similarly, reward expectancy has been shown to enhance cognitive processing from the perceptual up to the executive control level (for review see Pessoa & Engelmann, 2010). Here, we investigated how these primary regulators of cognition interact. We studied whether and how the anticipation of reward or loss modulates ERP components related to the processing of emotion and semantic meaning in words. Participants (n = 24) performed a semantic categorization task (concreteness decision) on positive, negative and neutral words, which were preceded by a cue indicating that performance could lead to monetary loss or gain. Reward expectancy modulated ERPs in response to the cue and the P2 in response to the word but did neither interact with valence nor with concreteness. In accordance with previous studies emotional words elicited a LPC and concreteness modulated the N400. Furthermore valence and concreteness interacted in the LPC time window. Emotion-related and reward-related effects occurred in different time windows, did not interact, and showed different topographies (map dissimilarity analysis). This speaks for an independence of reward expectancy and the processing of emotional content of a word. Emotional valence connected to a word leads to a privileged processing that is not affected by short term motivational cues like monetary gain or loss.

(2-12) **Lateralization of Emotions: Evidence from Pupil Size Measurement**

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The way our brain process emotional stimuli has been studies intensively. One of the main questions that is still under debate is the laterality of valance processing. We used pupil size as a measurement of mental effort. Participants discriminated between positive and negative facial expressions. They were asked to respond with their right hand for positive and with their left hand for negative facial expressions, or vice versa.Participants used regular hand position (Experiment 1) or hands crossed (Experiment 2). In both experiments, pupil size was larger when participants had to respond to positive stimuli with their left hand and to negative with their right hand, compared with the opposite mapping (regardless to their hands' position). Our results are in accordance with the valence hypothesis, which postulates that processing positive stimuli involve the left hemisphere and processing negative stimuli involve the right hemisphere.

(2-13) **Making sense of emotion effects in lexical processing**

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Although emotional connotations of words have long been considered irrelevant in most language processing studies, a growing body of evidence now suggests that words' emotional content affects their processing. Words also offer

the opportunity to investigate emotion effects in a highly controlled manner, as we now understand much more about specific lexical, sublexical and semantic characteristics of words which affect their processing. Nonetheless, current lexical processing studies have highly incompatible results despite using exactly the same tasks (e.g. Briesemeister, Kuchinke & Jacobs, 2011; Estes & Adelman, 2009 & ESCAN 2012 talk; Kousta, Vinson & Vigliocco, 2009). First, studies report differences in the direction of effects (overall disadvantage for negative words, vs. advantage for emotional words whether positive or negative). Second there is disagreement about whether emotional effects are continous or discrete. To better understand how these conflicting findings may arise from such similar experiments, we conducted various analyses on a single data set: using different regression models in which valence was categorically vs. continuously defined, and crucially in which we controlled other lexical and semantic variables that were not taken into account in some studies. These analyses clearly show how, once a greater degree of control on lexical and semantic variables is applied, it appears that emotional connotations, whether positive or negative, confer a benefit for lexical processing.

(2-14) **Neural networks of emotion processing of faces and words**

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Although much reading happens in an emotional context, little is known about the relationship between emotions and reading. The existence of emotional valence effects in reading is hotly disputed. Some found emotion effects in reading in occipital regions whereas others found a rather large network of brain activation in parietal, superior temporal and frontal lobes. Almost no studies found specific effects of emotional valence, differences are typically found between emotional and neutral words but not between positive and negative words. In an event-related fMRI experiment with faces and words two questions were addressed: 1. Is there evidence for specific effects of emotional valence on brain activation using multivariate nonlinear pattern classifiers that are potentially more sensitive to detect effects that emerge in partially overlapping brain networks? 2. Is there evidence that basic emotion networks involved in processing emotions in faces are also involved in processing of emotions in words? Participants made emotional valence judgments to happy and sad faces and words. A classical roi analyses showed that only faces activated regions involved in emotion processing, namely the amygdala. A support vector machine (SVM) classifier was then trained on brain activity of group-rois of faces and words. First results revealed that the classifier was able to discriminate between positive and negative faces and positive and negative words using the voxel time series extracted from the amygdala. Thus, the SVM revealed emotion specific effects in the amygdala for faces and words, which were not visible in the classic analyses.

(2-15) **Phasic cross-modal sensory boosting: visual emotion enhances auditory processing**

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Previous studies have proved preferential sensory processing in a threatening context. When something in the environment indicates potential danger, novelty sounds trigger an enhanced brain response and distraction. The sequence and subjacent neural circuit of this modulation however, remain unknown. This study aims at investigating a possible phasic effect of emotional processing on auditory perception at behavioral and electrophysiological levels. Source localization algorithms were performed in order to localize the brain sources of the differential auditory processing. We registered the EEG of 21 young women (64 channels, 512 Hz) while responding to a discrimination task of faces with neutral or frightened expressions (400ms on screen). A complex tone (75ms duration), which the subjects were instructed to ignore, was displayed simultaneously, but with different onset intervals respective to the image. Event-related potential analyses of early auditory components revealed an increased brain response in presence of emotional pictures. Importantly, this effect occurred when the tone followed the picture onset by 50, 100, 150 and 200ms, but not when stimuli onsets were simultaneous. By means of Variable Resolution Electromagnetic Tomography (VARETA) we localized the differential activity in the emotionally negative condition at the superior temporal gyrus (STG), prefrontal and superior parietal areas. These results provide evidence for a phasic, fast operating effect of emotion on cross-modal sensory processing, resulting in a facilitation for emotion on concomitantly presented stimuli at the level of primary sensory cortices, even in another sensory modality and without paying attention.

(2-16) **Preconscious processing of emotion in abstract but not in concrete words**

Vaghi M.[1], Ponari M.[2], Vinson D.[2], Bahrami B.[3], & Vigliocco G.[2]

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Only recently have emotional connotations been taken into account in word processing. A recent proposal suggests that emotion is crucially related to abstract words as the ontological distinction between concrete and abstract concepts reflects the distinction between concepts primarily grounded in our sensory-motor experience (concrete) and those grounded in our internal affective states (abstract), thus suggesting a tighter link between abstract words and emotions. We assessed whether affective associations have differential effects for preconscious processing of abstract and concrete words. By using continuous

flash suppression (a variant of binocular rivalry) to make stimuli invisible, we measured how long does it take for a suppressed stimulus to emerge to consciousness. Subjects responded as soon as becoming aware of the test stimulus by pressing a key to indicate whether the stimulus appeared above or below a fixation point. In Experiment 1, where concreteness was controlled but not manipulated, negative associations slowed down reaction times on the suppressed word, in comparison to strictly matched neutral and positive words. In Experiments 2 and 3, we factorially manipulated concreteness and valence (negative, neutral), finding that only negative abstract words interfered with the task, whereas negative concrete words did not. These results suggest that emotional connotation plays a pivotal role for preconscious processing of abstract, but not concrete, words. Moreover, this evidence extends previous results on preconscious processing of emotional stimuli, such as faces, for which subcortical network involvement has been demonstrated, suggesting that similar mechanisms can account for processing of emotional content of abstract words.

(2-17) **The role of the basal ganglia in rhythmic entrainment and musical emotions**

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This study investigated the neural mechanisms of rhythmic entrainment by musical meter and its modulation by aesthetic appreciation with the use of functional MRI. Rhythmic entrainment has been considered to contribute to emotion induction in response to music (Juslin et al., 2010). Moreover, the basal ganglia have been reported both to be sensitive to musical rhythms and to be recruited during the processing of musical emotions. Therefore we tested whether pleasant music would lead to stronger entrainment effects and asked whether such effects might involve the basal ganglia. We designed an fMRI study where participants (n = 18) listened to piano music while performing a visual speeded response task. The task consisted of detecting visual cues that appeared time locked to either a strong or a weak beat of the musical meter. Each musical piece was presented in both a consonant and a dissonant version. Behavioral results showed a main effect of meter and a main effect of consonance on reaction times but no interaction. fMRI results show a main effect of meter in bilateral caudate nucleus, whereas a main effect of consonance was found in an attentional network including parietal regions as well as motor areas. An interaction between meter and consonance was found in the caudate body. These results show that the basal ganglia (caudate nucleus) are sensitive to subtle differences of rhythmic expectancies. Furthermore, the results suggest that entrainment of perceptual and attentional processes to the musical beat may represent a relatively automatic process, independent of aesthetic appreciation.

(2-18) **Time-frequency EEG differences between patients with depression and healthy controls during the anticipation of neutral and emotional faces**

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In the present study we applied time-frequency analysis to the electrical brain activity elicited by the cue presented before neutral or emotional face in the implicit emotion recognition task. 128-channel EEG was recorded in healthy volunteers (12 female and 7 male) and depressed patients (12 female and 7 male) while they pressed different buttons for human and animal faces. Half of the images were neutral and half were showing aggressive people or animals. The pictures were preceded by the cue (simple abstract pattern, one for each picture category), which meaning was not explained to the participants. Morlet wavelet-transform was performed in 3-45 Hz range for EEG recorded between cue and picture, and analyzed for human faces only: HN (human neutral) and HE (human emotional). The statistical comparison of HE vs. HN resulted into several time-frequency clusters in 10-20Hz, 20-35 Hz, and 33-45Hz. The number of clusters in controls was lesser than in patients. The spectral power was higher during the anticipation of emotional faces for all frequencies, which is consistent with literature sources on real aversive stimuli presentation. In the control group, HE vs HN differences were observed in the right hemisphere, whereas in the patient group the differences were mainly located in the right anterior and left posterior scalp regions. It looks like the differences in the induced activity in patients and controls during the neutral vs. emotional face expectation display patterns of brain areas similar to those observed in our slow wave (CNV) analysis of the same data.

(2-19) **Unconscious emotional stimuli effect: EEG study**

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It is well known about interconnection between human behavior and emotions. Positive or negative emotional state of a human could be provoked by acoustical emotional stimuli. The purpose of the study is to discover whether it is possible to produce some emotional state and to reflect in EEG frontal asymmetry and motor response by unconscious emotional stimuli.We used infant's emotional vocalizations (laugh and cry) as stimuli. They were masked by brown noise and presented to the left ear. Changing and non-changing tones were presented by headphones to

the right ear. Unconscious perception of emotional stimuli was achieved by distraction participant's attention from the left ear with the aid of a task of experiment. Participants got the instruction to press a button, when they noticed a changing tone and to do mental arithmetic all kind of tones separately. There are significant decrease of the motor reaction latency and increase of the strength and the duration at the response under the unconscious negative stimulus. The frontal asymmetry rate significantly changes to infant's emotional vocalizations in comparison with a baseline EEG before stimuli. Also there is reliable frontal asymmetry change to negative stimuli as compared with positive ones.

(2-20) **Valence specific effects of right vs. left prefrontal cTBS on late emotion sensitive ERPs**

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Emotionally arousing stimuli obtain selective and prioritized processing. This is reflected in two emotion sensitive components: the "early posterior negativity" (EPN) and the "late positive complex" (LPC). Basic research suggests that the dorsolatereal prefrontal cortext (DLPFC) contributes to emotional stimulus categorization (Cacioppo et al., 1993; Kensinger and Corkin, 2003). In order to investigate the causal influence of lateralized prefrontal structures on emotion-related neural networks and processes (Davidson, 1992), left vs. right DLFPC activity was selectively reduced by means of inhibitory continuous theta burst stimulation (cTBS, Huang et al., 2005). After the stimulation protocol, participants passively viewed positive, neutral, and negative German nouns while EEG was recorded. We hypothesized the stimulation site to differentially influence valence specific ERPs. We found a main effect of arousal in the EPN-time interval (200-300ms, posterior electrodes, cf. Kissler et al. (2007)) and in the LPC time interval (440 – 520ms, fronto-parietal electrodes), irrespective of the word's valence. In the LPC time interval we further observed a main effect of stimulation and an interaction of stimulation*emotion. In line with Davidson (1992), this interaction uncovered a differential influence of the stimulation site on negative compared to positive words: Left frontal stimulation led to enhanced activity in response to negative stimuli whereas right frontal stimulation caused enhanced amplitudes in response to positive stimuli. Overall, prefrontal stimulation mainly influenced rather late processing stages (LPC) that have previously been linked with attentional capture, evaluation, and memory encoding (Kissler et al., 2009).

(2-21) **When Suppressing Your Emotions Is Good: Emotion Regulation Affects Attentional Selection in Working Memory**

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The ability to control attention has been suggested to be a major determinant for individual differences in working memory (Kane, Bleckley, Conway, & Engle, 2001; Vogel, McCollough, & Machizawa, 2005). However, experiments investigating differences in the interaction of attention and WM used exclusively neutral (non-emotional) stimulus material. Here, we investigated the influence of emotional content on attentional selection within WM. Furthermore, we examined to what extend emotion related personality traits contribute to the efficacy of attentional selection in working memory. Using an emotional modification of a retro-cueing paradigm (Griffin & Nobre, 2003), 34 participants were presented with six words, that could have been negative or neutral, and were asked to remember them for a following recognition test. After 2 seconds, a cue was presented. In half of the trials, the cue retrospectively indicated the subjects to selectively attend to only one word out of the six; in the rest of the trials, the cue instructed participants to keep maintaining all the six words in memory. On the group level, there was no evidence that attentional selection is attenuated for negative stimulus material. However, we found a significant correlation with selection efficacy for negative stimuli and the ability to suppress emotions as assessed with the Emotion Regulation Questionnaire (Gross & John, 2003). In contrast, trait anxiety was not correlated with task performance. There were no correlations with any subscale of the questionnaires when stimuli were neutral. This study demonstrates the influence of individual emotion regulation abilities on WM performance for emotional material.

PO: Executive functions 2

(2-22) **Brain activity differentiates subjects with high and low dream recall frequencies during both sleep and wakefulness : ERPs and PET studies**

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Dreaming is still a mystery of human cognition. In the fifties, dreaming was associated with rapid eye movement (REM) sleep (Dement & Kleitman 1957; Sastre & Jouvet 1979) but this hypothesis which cannot explain all the characteristics of dream reports has been challenged (Solms 1997; Nir & Tononi 2010). We used event-related potentials (ERPs) and positron emission tomography (PET) during wakefulness and sleep, to measure brain activity in subjects who report dreams

frequently (Dreamers, D) versus rarely (Non-Dreamers, ND). During EPRs data acquisition, participants (18 D and 18 ND) passively listened to sounds while they were either watching a silent movie or sleeping at night. PET data were acquired in the afternoon while participants (21 D and 20 ND) were resting (wakefulness) or sleeping (N2, N3 and REM sleep). ERPs results revealed that the primary steps of auditory processing (N1 and MMN) match in Dreamers and Non-Dreamers. However, latter responses, reflecting higher cognitive processing, dramatically differ in the two groups during pre-sleep wakefulness and during sleep. In the PET study, D vs ND contrast showed rCBF increases in TPJ during REM sleep, N3, and wakefulness, and in MPFC during REM sleep and wakefulness. This study reveals for the first time functional neuroanatomical correlates of the ability to recall dreams in healthy subjects and argue in favor of the forebrain "dream-on" hypothesis (Solms 2000). Results of the two studies support the hypothesis that high/low dream recall frequency is associated with particular cerebral functional organisation independent of the state of vigilance

(2-23) **Decreasing beliefs of intentional control affects neurocognitive markers of motor control**

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Motor control is a fundamental aspect of human behaviour, as it allows shaping our actions according to environmental demands. An important characteristic of motor control is the sensitivity to actions' consequences. For instance, performance errors can be detected in order to improve future performance. Reducing beliefs of intentional control - that is whether or not we can intentionally control our own actions - has important consequences for social behaviour, since it is known to lead people to go for more impulsive and automatic actions. In addition, it has been shown that it can affect brain correlates of intentional action preparation. The next question is then whether deceasing beliefs of intentional control can affect motor control processes. Here we show that decreasing beliefs of intentional control affects behavioural markers of motor control. More specifically, our results show that the post-error slowing - a behavioural indicator of motor control - is reduced when people are induced to disbelieve in intentional control. In a second study, high resolution EEG allowed to study the impact of belief manipulation on electrophysiological components related to motor control (response activation and inhibition, errors related components etc...). Taken together, the findings suggest that reducing beliefs of intentional control have an impact on motor control mechanisms.

(2-24) **Division of labor in action control: roles of (pre)supplementary and primary motor areas in Humans**

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The (pre)supplementary motor areas (SMA/preSMA) are often assumed to be involved in movement planning. However, recent studies suggested that the SMA/preSMA have a role in the conflict resolution between motor actions plans (Ullsperger 2001, Nachev et al. 2007) and in action switching (Isoda and Hikosaka 2007). Additionally the roles of the primary motor cortices (M1s), formally restricted to response execution, are nowadays broadened to other control mechanisms like for instance error prevention (Vidal et al., 2011). Thanks to source localization (distributed and dipolar), we have studied the respective roles of these two areas in action control in two sets of data in which participants were performing conflict tasks (Simon and Eriksen flanker tasks). Distributed source localization (SSLOFO) allowed to extract the generators of the corresponding EEG activities, and to seed the position of the equivalent dipoles used to extract a precise time course of those areas. The results show a division of labor between the SMA/preSMA and the MIs in context-dependent adaptation: both the activation of the correct response and the inhibition of the incorrect one were larger for response switch, but were not sensitive to current compatibility. By contrast, the (pre)supplementary motor area was more active incompatible trials, and all the more in action switch.

(2-25) **Electrophysiological differences in the processing of task-irrelevant vs. task-relevant emotional words**

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Cognition and emotion are intricately intertwined, because individuals process external stimuli in the context of their motivational and behavioural significance. Event-related brain potentials (ERPs) offer millisecond information and can contribute to the understanding of the modulation of cognitive processes by emotions. We recorded brain electrical activity from thirty-six middle aged healthy women when they performed two tasks in which the emotional valence of the stimuli was irrelevant (task 1) vs. relevant (task 2) for the performance. In task 1, we presented 3 blocks of words (60 negative words, 60 neutral and 60 positive), with the same emotional content in each block, and participants were asked to respond to the colour of the words (red, blue or green), with no mention to their emotional content. In task 2, the same words were presented randomly, and participants had to press a button assessing the emotional valence of the words, while ignoring their colour. Reaction times data revealed that participants were slower in responding to negative stimuli. In the first task, negative words were also associated with enhanced P300 latencies. Altogether, the results indicate

a longer processing time and thus a stronger interference of irrelevant task information when processing threatening words. In the second task, we could not confirm a greater interference of negative content in any of the ERPs indices considered. Only neutral words were associated with a delayed and extended N200 component, suggesting that the categorization according to the emotional valence is more difficult for neutral than for positive and negative words.

(2-26) **Is inhibition impaired in ADHD adults?**

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Several theoretical models suggest that the core deficit in children with attention deficit hyperactivity disorder (ADHD) relies in response inhibition. However, research about the persistence of this deficit in adulthood is lacking.This has been studied by comparing performances obtained by ADHD adults and control subjects in a Simon reaction time (RT) task. The inhibition of inappropriate responses elicited by irrelevant information was evaluated through 1/the analysis of RT distribution (particularly the slope of the delta plots) and 2/ the analysis of partial EMG (electromyographic) errors.The analysis of mean RT indicated a larger Simon effect in adults with ADHD suggesting a higher sensitivity of these patients to the automatic activation produced by the non relevant stimulus. But the analysis of the RT distribution as well as the one of the partial EMG errors revealed that the ability to suppress the automatic response remains intact in these patients.

(2-27) **Prepare for the expected: the effect of predictions on proactive attentional control in conflict and task-switching experiments**

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In a series of studies, we aimed at investigating how predictions steer attentional control. In a first task-switching experiment, participants were asked to predict the upcoming task in one of three conditions varying in the amount of task repetitions (25%, 50% and 75%). In line with previous studies (Monsell & Mizon, 2006), the switch cost was attenuated as the switch probability rate increased. Our data suggest that this is caused by a diminished expectancy for the task to repeat, as participants' task repetition prediction rate dropped from 71% over 61% to 49% with increasing switch probability in the three conditions. As the switch cost was strongly reduced when participants expected a task alternation, the reduced switch cost in conditions with decreased task repetitions can thus be explained in terms of decreased repetition expectancy. In a similar vein, a second study explored how expectations about the next trial influenced the congruency effect by asking participants to predict the upcoming congruency level in a Stroop task. Even though congruency level repetition probability was set at 50%, participants displayed a congruency level repetition bias (68%). Moreover, behavioural adjustments (i.e., a Gratton effect) were only found when participants predicted a congruency level repetition. A currently ongoing EEG study was set up to elucidate the neural mechanisms underlying these prediction-driven adjustments in cognitive control. Taken together, these studies point out that repetition expectancy is a variable that should be given more attention in current theorizing and modelling of cognitive control.

(2-28) **Sleep deprivation affects the sensitivity of reactive control: An ERP analysis**

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Failing to respond correctly in a timely fashion to a stimulus, is a hallmark of sleep deprived (SD) state. Response accuracy under speed-stress relies in particular on reactive control (ability to detect and correct errors). The "Error Negativity" (or "Error-Related Negativity") is an event-related potential starting just after electromyographic onset and peaking just after error in reaction time (RT) tasks. It is widely considered as an index of reactive control. Different research groups investigated the effect of SD on Ne and the impact of sleep deprivation on reactive control is inconclusive. After Laplacian transformation, this negativity can also be observed for partial errors and for correct responses. The amplitude of this negativity is maximal for errors, minimal for correct responses and intermediate for partial errors. This gradation which depends on response correctness reflects the sensitivity of reactive control. SD was expected to reduce the sensitivity of reactive control and the gradation of Ne as a function of response correctness was predicted to reduce. This was tested in a Simon task which is known to be particularly error- and partial error-prone. We recorded RT, error rate electromyographic and electroencephalographic activity of subjects completing the task either after sleep deprivation (26 hours of wakefulness) or after a normal night of sleep. Results showed that the gradation from correct responses to partial errors, and from partial errors to errors was decreased after SD. In conclusion, reactive control had a weaker sensitivity to performance after a night of sleep deprivation.

(2-29) **The N-40: an electrophysiological marker of decision-making**

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After Laplacian transformation, a fronto-central phasic negative wave develops, before the build-up of the motor command, over the medial frontal cortex (including supplementary motor areas). It peaks about 40 ms

before electromyographical onset and was then called "N-40". The N-40 is present when a response choice has to be performed and absent when no choice is required. Therefore, the N-40 has been assumed to be related to decisional processes. It is classically considered that stimulus-response (S-R) mapping affects decisional processes: the decision being more complex for incongruent than for congruent mapping. In the present study, we examined the sensitivity of the N-40 to the demands put on the decisional processes Therefore, subjects performed in a choice RT task where S-R mapping (congruent vs. incongruent) was manipulated Results revealed, a congruence effect on the N-40: it was larger on incongruent (more demanding) than on congruent (less demanding) S-R associations. This argument strengthens the idea that the N-40 reflects decision processes. As such it can be used to clarify the mechanisms underlying decision-making.

(2-30) **What make us aware of our (partial) errors? EMG and EEG experiments**

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In conflicting situations, incorrect responses tend to be activated. Subjects consciously and reliably detect suprathreshold activations leading to error commission (>90%). However, electromyographic recording in such tasks reveal that most of the incorrect activations remain subtreshold. In such trials, called partial errors, the subliminal activations have been interrupted and corrected, revealing the involvement of cognitive control processes. The question as to whether those subliminal incorrect activations are consciously perceived remains an important open issue since it has been argued that cognitive control processes require conscious experience.Awareness of incorrect response activation was assessed by asking the participants, after every trial, to report how confident they were to have activated the incorrect response. Signal Detection Theory was used to characterize subject detection performance. Results indicate that subjects were only able to detect few partial errors, but reported such detection only when they were certain.Furthermore, we used logistic regression's based methods to try to predict subject detection, and to identify the behavioral and electromyographic parameters allowing such detection.This classification, allows to analyzed separately detected and undetected partial errors on EEG experiments, with emphasis on two different error potentials, namely error negativity and error positivity

PO: Perception 2

(2-31) **Individual differences in multichannel ERPs related to polymorphisms in COMT and BDNF genes**

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We aimed at studying variability in the electrical brain activity elicited by the warning stimulus in visual categorization tasks and its possible correlations with the BDNF (Val66Met) and COMT (Val158Met) polymorphisms. In the first task, the instruction was to press different buttons for human and animal faces. Half of the images in either group were neutral and half were showing aggressive people or animals. In the second task, the instruction was to press different buttons for human faces (attractive or non-attractive female face) and for non-face objects (butterfly or flower). In both tasks each picture was preceded by the CUE - simple pattern, unique for each category of pictures, which meaning was not explained to the participants. 128-channel EEG was recorded in 93 volunteers. Response elicited by the CUE and the following slow wave (CNV) were analyzed. From the group of Val/Val carriers of BDNF gene, and, separately, from Val/Met carriers of BDNF gene, we selected Val/Val and Met/Met carriers of COMT gene; this gave as 4 genotypes. Category-related ERP differences were observed, implying the association of the CUE and picture category. However, the differences were clear and robust only in the group "Met/Met for COMT and Val/Val for BDNF". This group had the largest P220 and N600 components in the posterior regions, compared to other groups. However, the group "Val/Val for COMT and Val/Met for BDNF" also had large P220 and P430 components. This effect of gene combination may explain controversial reports on one-gene-one-component correlations (e.g. P300 and COMT).

(2-32) **Influence of eye dominance on hand reaction time and on interhemispheric transfer time**

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The dominant eye is the one we unconsciously choose when we have to align a target in peripersonal space with a more distant point. Previous works showed that visual stimulation of this dominant eye (DE) leads to a faster and greater activation in the ipsilateral hemisphere (e.g. Shima et al. 2010; Neuroreport 21(12), 817-21). Here we first tested whether this could have consequences in visuo-motor processes through a simple hand pointing task. Right and left handers with right or left DE participated in the study. We observed shorter reaction times (RT) for the hand controlateral to the DE compared to those for the ipsilateral hand only in left handers. In right handers, the left hand always showed the shorter RT, which is consistent with a right hemispheric specialization for spatial attention. Secondly, we are currently assessing the influence of DE on interhemispheric transfer time (IHTT). We use a simple Poffenberger paradigm with central button press in reaction to lateralized target appearance. EEG recordings are used to precisely evaluate the IHTT (e.g. Rugg et al. 1984; Neuropsychologia

22(2), 215-25). Preliminary analyses of EEG data in right handers tend to show that IHTT values are higher in subjects with left DE compared to those with right DE. All these data converge to suggest that the influence of the DE needs to be precisely evaluated in visuo-motor and interhemispheric transfer processes.

(2-33) **Is there a relationship between left perceptual bias and oculomotor bias when looking at faces?**

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Previous studies demonstrated a left perceptual bias while looking at faces presented centrally. Participants who are required to perform a forced-choice judgment task on chimeric faces (i.e. faces composed of left and right hemi-faces differing in gender, age, emotion, etc.) use the information from the right hemi-face presented in their left visual field to take their decision. Such bias is consistent with right hemisphere dominance for face processing and has been sometimes associated with a left oculomotor bias, i.e more and longer fixations on the right hemi-face. Here, we examined whether the perceptual bias depends on the face position in the visual field, and whether it is linked to the oculomotor exploration of the face. In a series of experiments, we recorded eye movements during a gender judgment task, using chimeric faces presented centrally or parafoveally into the right, the left, the upper or the lower hemifield. Participants had to judge the gender of the face, by remaining fixated on the center of the screen or after executing up to three saccades on faces, a mask being displayed after the number of desired saccades. Preliminary results suggest that the left perceptual bias did not depend on the face position but increased with the number of saccades. We did not find a systematic left oculomotor bias, rather it depends upon the position of the face. No apparent link between oculomotor and perceptual biases was found, the left perceptual bias being not systematically coupled to saccades toward the left side of faces.

(2-34) **It's Burning Cold! Visual and Tactile Events Become Thermal Concepts**

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Following the theory of the Perceptual Symbol System (Barsalou, 1999), the present study examined the role of visual and tactile modalities in the creation of conceptual thermal schemas. Hot, cold and thermal grill illusion (TGI) tactile sensations were examined, in addition to visuals conveying hot and cold scenes. TGI sensations (e.g., burning cold) are produced by alternating hot and cold tactile stimuli. Tactile sensations were presented via a thermoelectric tactile display (TTD; Oron-Gilad, Salzer, & Ronen, 2008; patent pending PCT/IL2008/000928), mounted on participants' left forearm. Two experiments were conducted. In the first, participants were asked to attend to the visual modality while ignoring the tactile stimulations. Participants were instructed to press, using their right hand fingers, keyboard keys labeled with thermal sensations (e.g., hot, cold). In the second, instructions were the opposite. Two asymmetries were found: only cold tactile stimuli affected responses to visuals, and visuals did not affect tactile conceptions. In light of these results, we suggested that tactile experiences are required for the creation of thermal concepts, whereas visual experiences are not. Moreover, direct touch is mandatory for the creation of cold but not for hot thermal concepts (heat transfer account).

(2-35) **Itsy Bitsy Spider? Individual Differences Modulate Mental Representation of Size**

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Previous studies have shown that different personality traits and psychopathologies are characterized by cognitive biases of attentional and memory processes. Several studies also showed that bias in size perception characterizes different psychopathologies such as obsessive compulsive disorder (OCD) and anorexia nervosa. Nonetheless, these studies examined bias in estimation of the physical size of a specific stimulus. There is almost no data regarding bias in conceptual size (or mental representation) of stimuli. In this study we examined whether mental representation of a spider's size is modulated by individual differences in fear of spiders. Students who reported an extremely high or extremely low fear of spiders (according to a screening questionnaire) were recruited for the study. Participants rated the relative conceptual size of different pictures (birds, butterflies and spiders) on a visual analogue scale (VAS) ranging from a fly picture (conceptually small) to a lamb picture (conceptually large). The physical sizes of all the pictures were equal. Results show that people who reported high levels of fear of spiders had a biased size representation of spiders, but not of other stimuli. These findings imply that bias in conceptual size may be a core factor in psychopathologies such as specific phobias. We suggest that the relationship between emotional processing and size representation is modulated by the relevance of a specific stimulus to the individual.

(2-36) **Multisensory brain sites for kinesthesia: an fMRI study**

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To perceive one's own body movements, the CNS uses multiple sensory information derived from several modalities including vision, touch, and muscle proprioception. All these sources of information have to be efficiently

merged together to form a coherent percept. In this study we used functional magnetic resonance imaging (fMRI) to investigate where multisensory integration processing takes place in the human brain. For this purpose, illusory sensations of clockwise rotations of the right hand were induced by stimulating three sensory channels either separately or simultaneously: Muscle Proprioception was activated using a pneumatic vibrator applied to the pollicis longus muscle; Touch was activated by an amagnetic disk scrolling under the subject's hand, and Vision was stimulated using a movie of a background rotating under the subject's hand. Outside the scanner, kinesthetic illusions were copied by the subjects and the associated motor responses in wrist muscles were recorded. Psychophysical and electromyographic data recorded on 14 subjects show that the three unimodal stimulation induced similar perceptual and motor responses and that bi- and tri-modal stimulation improved velocity and latency of kinesthetic perceptions. Preliminary fMRI results on 3 subjects suggest that the sensorimotor network classically associated with a kinesthetic illusion is activated regardless of the sensory modality through which such illusion was evoked. A group analysis performed on the 14 subjects should permit to further elucidate whether heteromodal brain regions are specifically dedicated to multisensory integration and/or whether a mere co-activation of the unimodal brain networks can account for multisensory interactions.

(2-37) **Perception of Human Movement executed under Microgravity: an fMRI study.**

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The human motion (HM) relies on Earth's gravity and there is evidence that this component is internalized in the vestibular cortex. The aim of the present study was to delineate brain regions participating in both the perception and the integration of the gravity vector during the observation of HM performed with or without the Earth's gravity. Subjects who had never been exposed to microgravity watched point-light movies of HM executed with or without the Earth's gravity (recorded during parabolic flights). Participants had to categorize movies based on the presence or absence of gravity in HM. Functional imaging results showed the recruitment of the right anterior insula and the left inferior frontal gyrus when the subjects watched HM executed without gravity. The inverse contrast shows an activation of the bilateral middle occipital gyrus (higher in the right hemisphere than the left) when the subjects watched HM executed with gravity. The results suggest that the perception of HM executed without gravity implies a larger effort made by the subject to understand the actions, and needs a projection of the body image (internal representation of the body from perceptual and cognitive processes) within a reconstructed environment (based on the subject' sensorimotor experience). On the other hand, the perception of HM executed with gravity relies on the body schema (internal representation of the body from sensorimotor afferences). Further analysis with a group of experts of microgravity will be performed to investigate the role of the acquired sensorimotor skills in the perception of HM.

(2-38) **Relation between electrophysiological correlates of affective conditioning and the discriminability and detectability of stimuli in metacontrast masking**

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In a conditioning study pairing simple grating stimuli with affective pictures, Stolarova, Keil and Moratti (2006) found a more negative C1 component, an early visual inflection in EEG, peaking at 65-90 ms, for negatively conditioned gratings compared to neutral ones. We expand these results by examining the relationship between the emotional effect and the stimulus visibility by combining two paradigms - affective conditioning and metacontrast masking. We study the interplay of the affective value of a stimulus and its visibility by manipulating the latter in several consecutive steps. One of two grating stimuli of different orientation was combined with an aversive auditory startle in a trace conditioning paradigm. This grating thereby acquired a negative emotional valence, the other was to remain neutral. Before, during and after conditioning, we obtained metacontrast masking functions of the two gratings by varying the stimulus onset asynchrony (SOA) between target and mask. Simultaneously, MEG and EEG were recorded. On a behavioral level we found a dissociation between detection and discrimination performance from short to longer SOAs: At short SOAs, subjects reliably perceive the presence of a target stimulus, yet fail to identify it. With increasing SOA, the discrimination improves while detection performance deteriorates. These effects occur independently of the affective value of the target stimulus.We discuss which neural correlates of affective perception co-vary with the degree of stimulus detactability and/or the degree of stimulus discriminability.

PO: Cognitive and Affective Disorders 2

(2-39) **A Meta-Analysis of Cognitive Outcome following Coronary Artery Bypass Surgery: Time for a New Consensus?**

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Coronary artery bypass surgery ('CABG') is the established treatment for complex coronary artery disease not amenable to percutaneous coronary intervention (PCI). There is a widely held belief that cognitive decline may present post-operatively and may persist in the longer term. A consensus statement of core neuropsychological tests was published in 1995 with the intention of guiding investigation into this issue. Approximately fifteen years later, we have carried out a meta-analysis evaluating the evidence for cognitive decline post-CABG in those studies that have applied the consensus statement test battery. Twenty-eight published studies, accumulating data from up to 2,043 patients undergoing CABG, met our inclusion criteria. Results were examined at 'very early' (less than 2 weeks), 'early' (3 months) and 'late' (6-12 months) time periods post-operatively. Two of the four core tests revealed an initial very early decrease in psychomotor speed that was not present at subsequent testing; measures of memory and executive function did not show decline at any time point. In fact the omnibus data suggest subtle improvement in function relative to pre-operative baseline testing. This is contrary to the more negative interpretation of results of some individual publications included in our review which may reflect poor outcomes in a few patients and/or methodological issues. Based on our data, we make suggestions for further research into cognitive outcome after CABG, thus aiming to extend and help modernize the work of the original consensus statement group.

(2-40) **Auditory evoked potentials reveal normal mismatch processes but abnormal attention orienting in migraine patients**

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The pathophysiology of migraine is incompletely understood, but a number of electrophysiological studies suggest changes in cortical excitability. Most event-related potential (ERP) studies converged on abnormal habituation patterns in migraine patients between attacks. In the auditory modality, habituation pattern depends on the paradigm used in studies. We studied habituation and mismatch processes, using a classical auditory habituation paradigm. In 22 patients suffering from menstrually-related migraine and in 20 age-matched control subjects, auditory ERPs were recorded in 3 sessions: in the middle of the menstrual cycle, before menses, and during menses. In 12 patients, a migraine attack occurred during one of the peri-menses sessions. In each session, 200 trains of tone-bursts with an average of 10 stimuli per train were presented, including 2 duration deviants in each train. In response to the first stimuli of the trains, migraineurs exhibited in all sessions a larger orienting component of N1 than matched controls and in the interictal session a larger P3a, which normalized during attacks. They also showed a robust residual orienting component in response to all subsequent (standard and deviant) stimuli inside the trains. In contrast, the MMN response to deviants showed no difference between the two groups, with a normal decrease in response to a second deviant immediately following the first one. Moreover, in apparent contrast with previous results, we detected no habituation deficit in migraine patients. These results show exacerbated attention orienting to any new incoming stimulus in migraine patients, but normal mismatch and habituation processes.

(2-41) **Cerebral effects of binge drinking: Respective influences of global alcohol intake and consumption pattern.**

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Objective: Binge drinking is a major health concern, but its cerebral correlates are still largely unexplored. We aimed at exploring (1) the cognitive step at which these deficits appear and (2) the respective influence of global alcohol intake and specific binge-drinking consumption pattern on this deficit.Methods: On the basis of a screening phase (593 students), 80 participants were selected and distributed in four groups (control non-drinkers, daily drinkers, low and high binge drinkers). Event-related potentials (ERPs) were recorded while performing a simple visual oddball task.Results: Binge drinking was associated with massive ERP impairments, starting at the perceptive level (P100/N100 and N170/P2) and spreading through the attentional (N2b/P3a) and decisional (P3b) ones. Moreover, these deficits were linked with global alcohol intake and also with the specific binge-drinking consumption pattern.Conclusions: Binge drinkers presented early and global ERP deficits, affecting basic and high-level cognitive stages. Moreover, we showed that binge drinking is deleterious for the brain because of alcohol consumption per se, and also because of its specific consumption pattern.Significance: The present results show that binge-drinking habits lead to striking brain consequences, particularly because of the repeated alternation between intense intoxications and withdrawal episodes.

(2-42) **Different clinical subtypes of behavioural variant Fronto-Temporal Dementia: a comparison of two single cases**

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The symptoms of the behavioural variant FTD (bvFTD) can be misdiagnosed as late onset schizophrenia or other psychotic disorders. Besides, cognitive and behavioural symptoms may be influenced by the differential involvement of the right versus the left hemisphere. We report two single cases with different presentation and course, who were first interpreted as psychiatric disorders, but later diagnosed as bvFTD. The first patient's onset was characterized by dramatic personality and behavioural changes consisting of "positive symptoms": hypomania, compulsiveness, loss of insight and impaired social interaction. Ten years after onset, apathy and inertia were his prominent symptoms. Behavioural disturbances also included unreasonable jealousy about his wife, craving for food, tendency to confabulate over his past. The second patient presented mainly "negative symptoms" with increasing apathy and loss of interests, irrational fears and some memory difficulties, symptoms which were attributed to depression due to her past divorce. By the time she was referred for neurological assessment apathy and loss of care for herself had become extremely severe, though sometimes associated with hyperactivity, compulsive behaviours and wandering. Craving for chocolate was also reported. A rapidly progressive course eventually led to florid delusions and hallucinations. Neuroimaging data and neuropsychological assessment provided evidence of prominent involvement of the right hemisphere in the first case, compared to bilateral frontal atrophy in the second one. Our data, though limited to single cases, support the hypothesis that right-sided involvement is associated with socially inappropriate behaviour as early presentation.

(2-43) **Emotion and cognitive flexibility in ASD: a behavioural and fMRI study**

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Patients with Autism Spectrum Disorder (ASD) display difficulties in changing strategy during daily activities or adapting their perspective, especially during social interactions. However despite number of evidence of deficits in both socio-emotional processing and cognitive flexibility in ASD, the interactive effects of difficulties in these two domains remain unexplored. Our aim is to investigate this interaction by assessing behavioural and brain correlates of cognitive flexibility when applied to emotional stimuli. Thirteen adults with ASD and 15 age-matched controls participated in an event-related fMRI paradigm using an emotional version of the Wisconsin Card Sorting Task (WCST). The cards presented were surrounded by a coloured frame and represented emotional faces. Participants have to match cards on one of three possible dimensions according to a non spoken rule: frame colour, face identity or facial emotion. Behavioural results revealed that compared to controls, patients succeeded in fewer categories, committed more perseverative errors when switching to Emotion matching, and displayed longer RT for Emotion and Identity conditions. fMRI results showed activity in the neural network typically recruited during WCST in both groups. However switching to a new rule lead to larger brain activity in ASD than controls in the anterior cingulate cortex, striatum, cerebellum and the frontal and orbito-frontal regions, together with lower activity in the temporal poles. Results are discussed according to the sorting rule.Findings are consistent with the difficulties in processing socio-emotional stimuli in ASD and suggest that cognitive flexibility abilities are modulated by the nature of the information to be processed

(2-44) **N-acetyl aspartate and glutamate levels of the anterior cingulate predict symptom severity in schizophrenia: a magnetic resonance spectroscopy (1H-MRS) study**

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The anterior cingulate cortex (ACC) is important for executive functioning, and in schizophrenia, alterations of the neuronal marker N-acetyl aspartate (NAA) and the neurotransmitter glutamate are repeatedly found in this region. However, less is known about the functional consequences of these changes. Using proton magnetic resonance spectroscopy (1H-MRS), NAA and glutamate were measured bilaterally in the ACC of 19 schizophrenia patients and 17 healthy controls. Schizophrenia patients were assessed with the Positive and Negative Syndrome Scale (PANSS) and analysed according to the five factor model (Negative, Positive, Cognitive/Disorganized, Excitation and Depression symptoms). Spearman's Rank correlations revealed a negative correlation between right ACC glutamate and negative symptoms (r=-0.51, p=0.02), while right ACC NAA correlated with cognitive/disorganized symptoms (r=0.48, p=0.04). Also, schizophrenia patients showed significantly lower levels of glutamate in the left hemisphere (p=0.01) and lacked the interhemispheric glutamatergic correlation found in healthy controls (r=0.65, p=0.004). The present results show that while left ACC glutamate is lower in the schizophrenia group, the degree of negative symptoms is related to glutamate in the right hemisphere. The lack of an interhemispheric glutamatergic correlation in schizophrenia also points towards an interhemispheric imbalance as part of the negative symptom pathology. Additionally, increased NAA levels in this cognitive region together with the commonly found NAA reduction in other brain regions, appear to interfere with cognitive processes

and result in disorganized cognition. Our results indicate that the perturbation of metabolites such as glutamate and NAA influences normal brain functioning and contributes to the clinical manifestation of schizophrenia.

(2-45) **Reward activity in satiated overweight women is decreased during unbiased viewing but increased when imagining taste: an event-related fMRI study**

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This fMRI study tested the hypothesis that reward-related brain activity is stronger in overweight (n=14) than in healthy-weight (n=15) participants in response to high-calorie palatable food pictures. This brain activity was measured while participants received two types of attention instructions: unbiased viewing (no prior instructions) vs. taste imagination. We expected the difference between overweight and healthy-weight participants to be most pronounced with unbiased viewing, assuming that especially overweight participants would spontaneously be more inclined to pay attention to food palatability. Stimuli included pictures of palatable (e.g., chocolate, strawberries) and less palatable (e.g., herring, radishes) high-calorie and low-calorie foods, presented in an event-related design. A similar pattern of activation, reflected in a body-mass-index × condition interaction, was observed in 14 brain areas involved in food reward processing (main areas: amygdalae, ventral tegmentum, and areas in the orbitofrontal and anterior cingulate cortex). During taste imagination, activation was stronger in overweight participants than in healthy-weight participants, reflecting the relatively higher reward induced by high-calorie palatable foods. Unexpectedly, during unbiased viewing the opposite pattern was observed: a weaker activation in overweight participants than in healthy-weight participants, which may be interpreted as avoidance behavior by the overweight participants when they are not required to focus on the taste of food. These results indicate a large difference in reward area activation between healthy-weight and overweight people. The activation pattern in overweight people may possibly represent the ambivalence between avoidance of (in the unbiased viewing condition) and desire for (in the taste imagination condition) high-calorie palatable food stimuli.

PO: Social factors 2

(2-46) **Attention Training Toward and Away from Threat in Social Phobia: Effects on Subjective, Behavioral, and Physiological Measures of Anxiety**

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Social phobics exhibit an attentional bias for threat in probe detection and probe discrimination paradigms. Attention training programs, in which probes always replace nonthreatening cues, reduce attentional bias for threat and self-reported social anxiety. However, researchers have seldom included behavioral measures of anxiety reduction (e.g., behavioral approach task, speech performance), and have never taken physiological measures of anxiety reduction. In the present study, we trained individuals with generalized social phobia (n = 57) to attend to threat cues (attend-to-threat), to attend to positive cues (attend-to-positive), or to alternately attend to both (control condition). We assessed not only self-reported social anxiety, but also behavioral (i.e., speech performance in front of a video-camera) and physiological measures (i.e., change in skin conductance reactivity to the onset of a slide instructing participants that they would have to give an impromptu 2-min speech in front of video-camera) of social anxiety. Participants trained to attend to nonthreatening cues demonstrated significantly greater reductions in self-reported, behavioral, and physiological measures of anxiety than did participants from the attend-to-threat and control conditions.

(2-47) **Neurobiological mechanisms of social influence**

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Humans often change their beliefs or behavior due to the behavior or opinions of others. We explored, with the use of various neuroimaging methods (fMRI, TMS, ERPs), whether social conformity is based on a general performance-monitoring mechanism. We tested the hypothesis that conflicts with a normative group opinion evoke activity of the posterior medial frontal cortex often associated with performance monitoring and subsequent adjustment of behavior. Using fMRI we showed that conflicts with group opinion triggered a neuronal response in the medial frontal cortex. The amplitude of this conflict-related signal predicted subsequent conforming behavioral adjustments. We also demonstrated that the transient downregulation of the posterior medial frontal cortex by theta-burst transcranial magnetic stimulation reduced conformity. Finally, we tested the hypothesis that conflicts with a normative group opinion evoke a feedback-related negativity (FRN) often associated with performance monitoring and subsequent adjustment of behavior. Indeed, a mismatch between individual and group opinions triggered a frontocentral negative deflection with the maximum at 200 ms, similar to FRN. Overall a conflict with a normative group opinion

triggered a cascade of neuronal responses: from an earlier FRN response reflecting a conflict with the normative opinion to a later ERP component (peaking at 380 ms) reflecting a long-lasting conforming behavioral adjustment. In general, our results support the hypothesis that some forms of social influence are mediated by activity of the posterior medial frontal cortex as a part of the general performance-monitoring circuitry.

(2-48) **Perceptual and motivational influences on facial processing in social phobia : An ERP investigation.**

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Social anxiety disorder (SAD) has been characterized by attentional biases towards social threat, including threatening faces. Recent studies have demonstrated early modulations of cognitive processing when patients high in social anxiety process emotional facial cues. To test whether perceptual and/or motivational factors may be involved in this emotion bias, event-related potentials (ERPs) were recorded while 18 SAD and 18 control participants performed an adapted emotional Stroop paradigm. First, they named the color of individual rectangles (control task). Second, they had to identify the emotional expression of faces displaying anger, happiness and neutrality (explicit emotional task). Third, they had to name the color of the frame surrounding the same facial stimuli (implicit emotional task). Stimuli included upright and inverted faces to explore the effects of perceptual changes on facial processing, while motivational factors were explored by comparing performance on the three tasks. Results showed a clear enlargement of P1 amplitude among SAD participants, as compared to controls. However, this enhancement was consistent over the three tasks, and did not interact with task type or facial inversion. These results provide electrophysiological support for a general amplification of early visual processes in social phobia, without the additional role of perceptual and motivational factors. Importantly, the P1 amplification observed in the control task rules out theories supporting a specificity of cognitive biases for facial stimuli in social anxiety, and suggests a general hypervigilance to incoming stimuli.

(2-49) **Real-time Processing of Social and Mechanical Events in Adults with Asperger Syndrome**

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Reduced empathy and social reciprocity that is consistent with a general lack of understanding others' intentions is a core characteristic of Asperger Syndrome (AS). Deficits in a theory of mind (ToM) and a generalized ability to integrate information (weak central coherence, WCC) have been proposed as causal explanations of the social impairments observed in individuals with AS. In real life situations the ability to integrate information as events unfold allows individuals to infer an appropriate response. In social scenarios ToM can be used to identify the most appropriate response, while knowledge of the physical world can be used to anticipate mechanical events. To examine expectancy for observed events in real-time we presented AS and control participants with videos constructed to represent different social or mechanical scenarios while measuring their EEG. Participants judged the final frame of a video sequence as either congruent or incongruent with the preceding scenario. The N400 was studied as an index of the degree to which participants were able to integrate the congruent and incongruent final event of the scenarios. We hypothesized that a deficit in ToM would be reflected by a smaller N400 effect for social scenarios (incongruent-congruent). In contrast a deficit in WCC would be reflected by a smaller N400 effect for social and mechanical events. Preliminary results showed a reduced N400 effect for both mechanical and social events in AS participants compared with controls. These results support a theory of weak central coherence for the online processing of events.

(2-50) **Trust all, love a few: Neural correlates of social interactions with personally familiar others**

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When people interact with other people they have all sorts of expectations about others' intentions guiding their social decisions in everyday life. In this study we investigated the neural correlates of trust related social decision-making in which participants interacted with personally familiar peers from their classroom. In this fMRI study participants (current N=11, mean age = 20.5 years) played a repetitive Trust Game as the first player with three interaction partners: a friend (i.e., a liked peer), an antagonist (i.e., a disliked peer), and an anonymous peer they met on the day of the experiment (a confederate). Although amounts of trust displayed by the participants towards the three different interaction partners were similar on average, there were differences in mentalizing and reward-related brain regions activated during the interactions. Preliminary findings show higher activation in posterior superior temporal sulcus, tempoparietal junction and the dorsolateral prefrontal cortex for the antagonist compared to the anonymous peer, suggesting increased mentalizing and attention to coupling one's decision with the expected behavior of the antagonist. Further, interactions with the friend were associated with higher activation in caudate nucleus and the orbitofrontal cortex, possibly reflecting the rewarding nature of interacting with friends. We also found higher activation in the right temporal pole and the dorsal anterior cingulate cortex when

not trusting compared to trusting the antagonist which might reflect the coupling of negative emotions with perceptions about the antagonist. The findings highlight the moderating role of interaction partners in activating various 'social brain' regions.

(2-51) **When in doubt, let's avoid ! General avoidance of faces, postures and neutral objects in social anxiety.**

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Numerous studies have highlighted the role of attentional biases towards facial stimuli in social phobia. Paradoxically, although body postures may represent cues indicating social threat, the cognitive processing of human bodies in social anxiety has not yet been investigated. Therefore, the purpose of the present study was to compare the neural processing of happy, angry and neutral faces, bodies (in postures typical of neutrality, anger or happiness) and neutral objects (vases or chairs), in 16 participants reporting social phobia and 16 healthy participants. To this aim, an attention-shifting paradigm was used in which faces, bodies or objects were cues presented at fixation for 600ms. Participants had to stare at these cues and then identify a target appearing randomly for 50ms at four possible locations. The behavioural data show that highly socially anxious participants were slower to respond to targets, regardless of which stimulus category they belonged to. These longer reaction times in socially anxious participants were correlated with diminished P1 amplitudes for all cues. These results suggest that the slower response latencies in highly socially anxious participants might result from an attempt to avoid processing the cues, as indicated by the reduced P1 amplitude. Moreover, the extent of this pattern (which was observable for not only facial and postural stimuli, but also for common objects), disconfirms the theory of specific cognitive biases for emotional or social stimuli in social anxiety. Rather, it may suggest the deployment of a global avoidance strategy in performing tasks involving social stimuli.

PO: Development/Aging

(2-52) **A longitudinal study on adolescent cognitive control development**

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Cognitive control is one crucial human ability that develops throughout childhood reaching a mature level not until early adulthood. A network, comprising the anterior cingulate cortex and the dorsolateral prefrontal cortex as relay stations, is meant to orchestrate the sequencing of conflicting information processing. In the present study we focussed on the development of cognitive control within an adolescent sample of 50 healthy subjects (26 females). Participants were investigated at the age of 14 and 16 with an interference-switching paradigm during fMRI. The task included task switching trials (vs. task repetition trials) and incongruent trials (vs. congruent trials). Behavioural data revealed that i) reaction time and ii) error rate decrease over time, iii) subjects - independent of age - are slower in task switch trials relative to task repetition trials and in incongruent trials relative to congruent trials. Imaging data analyses, however, did only show mild changes in neural activation over the 2-year period. The most prominent changes ($p< 0.001$, uncorrected, threshold T=3.11, 15 contiguous voxel) occurred in right middle temporal gyrus (BA21) and right medial frontal gyrus (BA10). To our knowledge, our study is one out of a few investigations analyzing adolescent cognitive control abilities in a longitudinal within-subject design. Counter-intuitively, we could not unveil differences in terms of fundamental changes in neural activation patterns in cognitive control key areas between adolescents aged 14 and 16, even though this period is meant to play a pivotal role in the development of prefrontal cortex functions. More in-depth analyses are certainly necessary.

(2-53) **Age-related changes in working memory: Compensatory brain processes and cardiovascular costs**

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Older people are assumed to be impaired in neuronal processes sub-serving maintenance of relevant information in working memory (WM) and compensate for these deficits by recruitment frontal mechanisms supporting early processing and cardiovascular mobilisation. Fifty younger (20-35 years) and 45 older (50-65 years) employees with flexible and repetitive work requirements had to perform visual 0-back and 2-back tasks. The age-related performance decline under high WM load was accompanied by longer N2 and P3b latencies of the event-related potentials while the P3b was reduced and more frontally distributed in older relative to younger employees. In contrast, older employees demonstrated the increase of early ERP components (N1 and P2) as well as a greater sympathetic and lower parasympathetic reactivity to WM load than younger employees. The P3b positively correlated with parasympathetic tone and negatively with sympathetic tone. Lowered WM performance and repetitive work requirements were associated with prolonged P3b latency. The results suggest that older employees have deficits in monitoring and sequencing of incoming stimuli in WM that may lead to less distinctive target/non-target representations and complicate the target categorization process. The recruitment of frontal mechanisms appears to partially compensate for age-related performance decline by allocation of processing resources to perceptual gating and focussed attention as well as by on-task effort associated with enhanced cardiovascular costs.

(2-54) **Age-Related Differences in the Contributions of Emotional Arousal and Positive Valence to Memory Encoding**

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Older adults tend to remember more positive information than young adults, consistent with "the positivity effect", and neuroimaging has revealed age-related differences in the encoding of emotional valence. However, it remains unclear whether there are age-related differences in the contribution of arousal to memory encoding. In the current study we investigated emotional memory encoding in a group of 23 young and 23 older healthy women who underwent fMRI as they viewed images which were positive or neutral in valence, and which varied in arousal. Using a parametric modulation approach, we examined how the BOLD signal varied with increasing subjective levels of valence and arousal for images which were remembered versus forgotten several days later. Although both groups showed a behavioural enhancement of memory by arousal, only the young group showed an increase in the arousal-dependent BOLD signal during successful memory encoding, in the right superior frontal gyrus and the left cerebellum. We found no evidence of a positivity bias in the older group, who did not remember more positive images; however the young group did recall more positive images correctly. Compared to the older group, the young group showed greater enhancement of the memory-related BOLD signal in the left amygdala and the left cerebellum, consistent with the positivity bias in their behavioural performance. These results suggest that in our paradigm, both emotional arousal and positive valence more strongly enhanced the memory-related BOLD signal in the young adults. They suggest that ageing is not always associated with a positivity bias in memory.

(2-55) **Dissociation between numerosity and duration processing in aging and early Parkinson disease**

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Numerosity and duration processing were shown to be underlain by a single representational mechanism, namely an accumulator, and to rely on a common cerebral network located principally in areas around the right intraparietal sulcus. Several neuropsychological studies have reported impairments of temporal estimation in patients with Parkinson disease (PD; e.g., Pastor et al., 1992), whereas non-symbolic numerical estimation has never been explored in this population. Moreover, aging seems to be a factor influencing performance in both numerical and temporal estimation, as declining performance with age was reported in duration production tasks (e.g., Baudouin et al., 2006) and in counting or arithmetical tasks (e.g., Li et al., 2010; Duverne & Lemaire, 2005). However, the effect of aging on non-symbolic numerical comparison capacities has never been investigated.Here, we investigated for the first time both numerical and temporal estimation abilities in three groups of participants: healthy young adults, healthy old adults and non-demented PD patients, who had to compare either the numerosity of flashed dot sequences or the duration of single dot displays. First, the results demonstrate an effect of aging on duration comparison, healthy old participants making more errors than young participants. Secondly, performance of PD patients on this duration task was worse than the one of the healthy old group. Importantly, no difference was found between the three groups for numerosity comparison. This dissociation suggests the existence of distinct mechanisms and/or representations for temporal and numerosity processing, and support the idea that partly independent systems underlie the processing of these magnitudes.

(2-56) **Electrophysiological correlates of the effect of age on mental arithmetic performance**

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Introduction: According to the findings of current cognitive aging research a decline of activation of brain networks during the execution of various types of tasks can be observed in the elderly. In the present study linear and nonlinear computational techniques were used to quantify changes of EEG-synchronization during mental arithmetic. Region-, and frequency specific EEG-synchronization changes were expected to accompany task performance requiring working memory processing, and that these will be different in young and elderly subjects. Methods: A group of elderly (N=20, mean age: 65.4 yrs) and young (N=20, mean age: 22.45 yrs) subjects were studied. The subjects performed a subtraction task in which decision making was required with respect to the result (correct/incorrect), signalled by appropriate button pressing. The EEG was recorded by 33 electrodes. The 2048 ms long epochs before button pressing were analysed by calculating linear-nonlinear EEG-synchronization and graph theoretical indices in different frequency bands, and behavioural (RT, number of errors) measures. Results: Increased synchrony of the slow frequency bands and characteristic patterns of graph theoretical measures were found to be associated with task execution, which changes were more conspicuous in the young. Behavioural2 performance was worse (marginally significant) in the elderly. Conclusions: The more robust changes of synchronization features and better performance in the young probably correspond to a more optimal neural network organization especially regarding long-distance integrative activity associated with efficient working memory processes.

(2-57) **Impact of intrauterine growth restriction**

(IUGR) on a Go/No-go task's performances at 6 years of age: an fMRI study

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Introduction: Neuropsychological studies showed that children born preterm, and more specifically those with IUGR, exhibit difficulties in inhibition of prepotent responses. Functional Magnetic Resonance Imaging (fMRI) studies confirmed those difficulties in prematurity (e.g. Nosarti et al., 2006) but little is known considering IUGR at a neuronal level. This research aims to study the impact of IUGR on the brain networks involved during a Go/No-go task in children.Method: Twenty 6-year-old children born preterm performed a Go/No-go task while fMRI data were collected. The performances of 10 children (GA: 30.73 weeks) with IUGR (IUGR group) were compared to 10 children (GA: 29.37 weeks) with normal birth weight (control group). Analyses of successful trials were performed with SPM5 ($p < .005$ uncorrected), after normalization to a paediatric template (created with the Template-o-Matic toolbox, Wilke et al., 2008).Results: Behavioural differences between groups did not reach significance. However, at a neuronal level, the comparison between groups showed that the IUGR group exhibited significant greater bilateral activation in the precuneus, posterior cingulate cortex and supplementary motor area for both go trials (responses) and no-go trials (inhibition). The control group showed significant greater activation in the right superior and middle temporal gyri and the right insular cortex during go trials.Discussion: IUGR children showed stronger activations than control preterm children in areas known to be specifically involved in motor control, attention and response selection, suggesting the need of more brain resources to execute or inhibit responses which might be due to a less mature pattern of activation.

(2-58) **Implicit Sequence Learning In Developmental Dyslexia: New Evidence From A Probabilistic Sequence Learning Task**

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Implicit learning underlies the acquisition of various critical skills, including reading. Previous research has reported that certain implicit learning tasks are impaired while others are spared in developmental dyslexia (e.g., Pothos & Kirk, 2004; Vicari et al. 2005; Howard et al. 2006; Russeler et al. 2006). In the present study, we used the Alternating Serial Reaction Time (ASRT) paradigm (Howard & Howard, 1997; Nemeth et al., 2010) to assess implicit probabilistic sequence learning in both children (18 dyslexic and 20 normally-developing 12-year-olds), and adults (15 dyslexic and 22 normal 20-year olds). The ANOVA revealed sequence-specific learning ($p < 0.001$), as well as general skill learning ($p < 0.001$). The two groups (dyslexic and control) did not differ either in overall sequence-specific or in general skill learning, regardless of the age group (all p's > 0.34). However, dyslexic children were generally slower compared to the normally-developing children ($p = 0.015$), though this difference disappeared in the adult groups ($p = 0.71$). Results are discussed with regard to previous findings. In particular, it is suggested that the mixed pattern of results of implicit sequence learning in dyslexia can be accounted for by the type of the sequence, the explicitness of the stimuli, and the nature of the task demands.

(2-59) **Learning process of an artificial co-ordination in a bimanual load-lifting task in adolescents: acquisition of a new sensori-motor representation.**

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Anticipation is necessary for the efficiency of action. In postural control, anticipation is expressed by the anticipatory postural adjustments (APAs), which compensate in advance for the destabilizing effects of action. During ontogenesis, the process underlying the acquisition of APAs implies the transformation of feedback postural corrections into a feedforward control associated with voluntary movements. The aim of this experiment was to test the capacity of adolescents to develop anticipation during a new co-ordination in a bimanual load-lifting task. We studied the learning process of an artificial co-ordination by means of a procedure of double unloading in two groups of adolescents (11-13 versus 14-16 years of age) and a group of adults. Elbow-joint rotation measurements and EMG recordings were used to assess the improvement of the forearm stabilization through six learning sessions. Kinematics results reported a difference between adolescents and young adults in learning dynamics, but also in the final level of performance. In adults, the muscular pattern underlying the learning processes was characterized by an inhibition of the muscular flexors, with a latency that gradually appeared before unloading with training experience. In adolescents, preliminary results showed that this timing adjustment required additional learning sessions to become efficient. In conclusion, the mechanisms underlying the acquisition of a new sensorimotor representation, which rely on the transformation of a feedback correction into a feed-forward control, are still maturing during adolescence. Adolescence might therefore constitute a late transient period in the developmental process.

(2-60) **The Development of Attentional Control of Auditory Perception from Middle to Late Childhood and Comparisons to Healthy Aging**

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Conversational situations confront listeners with a wealth of competing auditory inputs; the listeners thus need to selectively focus on relevant information, particularly when the perceptual saliency of the competing irrelevant auditory inputs is high. We used an intensity-attention-modulated dichotic listening paradigm to study age-related differences in such selective attention mechanisms between 24 younger (7 to 8 years) and 24 older children (11 to 12 years). The children were instructed to either attend to the right- or left-ear ear stimulus and perceptual saliency was manipulated by stepwisely decreasing the loudness of either the left- or right-ear stimulus. Attentional control demands were higher in conditions when attentional focus and perceptual saliency favored opposing ears than in conditions without such conflict. The results showed that older children were able to focus on auditory inputs from either ear, overcoming the effects of perceptual saliency, while younger children showed deficits in the high demand situation. Direct comparisons with data from a recently published study of 24 younger (23-35 years) and 25 older (65-76 years) adults (Passow et al., in press; Psychology and Aging) suggest that although younger children and older adults show similar levels of performance, different factors were involved. The younger children's performance was characterized by selective difficulties in attentional control, whereas older adults' performance deficits additionally reflect an exaggerated reliance on perceptual saliency. We conclude that auditory attentional control improves considerably from middle to late childhood, and that auditory attention deficits in healthy aging cannot be reduced to a simple reversal of childhood improvements.

PO: Methods

(2-61) **Estimation of the Individual Evoked Potential by Wavelet filtering and Bootstrap method**

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A new method to improve the signal-to-noise ratio of single evoked potentials (EP) measurements is presented, in which, contrary to already existent methods, no a priori assumptions about the signal characteristics are necessary. This method is based on the wavelet filtering combined with the bootstrap method.In a first step, several sweeps are recorded. Each sweep is decomposed in L detail levels, from D1 to DL and an approximation level AL. In a second step, the mean values of the coefficients across trials are calculated, for each instants. For each level, the empirical distribution of coefficients is estimated by a random permutation of horizontal row of coefficients matrix. One then computes the marginal mean value for each permutation of the matrix. The empirical distribution of the mean of the coefficients is obtained and from there, one computes the inferior and the superior thresholds correspondent to a limit confidence set to 0.05. One applies a thresholding on the coefficients of each original detail matrix. Only the coefficients which are out of this confidence interval will be kept, while others are set to zero. Once thresholding has been applied on the coefficients of each detail matrix from D1 to DL, one can compute the inverse wavelet transform, and then obtain the denoised signal. The performance of the method is evaluated with simulation and the method is applied to real data.

(2-62) **Making a network from fMRI data: Always a small-world with correlations**

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Connectivity measures of large-scale networks of the brain can reveal many interesting features like which brains are efficient and therefore lead to high IQ. These results often rely on a network constructed from time series of functional magnetic resonance imaging (fMRI). A network is obtained from pairwise correlations between regions (or voxels) and a connection between two regions is set if the absolute correlation is higher than a chosen threshold. From this network average pathlength, degree distribution, small-worldness, and other measures can be computed. In this presentation we will show that using pairwise correlations to determine the network nearly always results in a small-world, even if the underlying network is not a small-world. The obvious reason is that using correlations to determine connections yields many spurious connections. Spurious connections can be avoided by using partial correlations. In large-scale networks, however, the partial correlations are difficult to obtain. We compare three different methods to determine the partial correlation network. Partial correlations partially solve the issue: when hubs are present in the network any method fails to be highly accurate.

(2-63) **Modeling of trial-to-trial temporal heterogeneity in electrophysiological signals using the**

mixed- effects model: application to the classification of errors and correct trials

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EEG and MEG normally require averaging across repetitions to obtain reliable results. This prevents single-trial analysis and classification. Furthermore, inter-trial variability, which may contain meaningful information, is lost. Here we propose a method that is both descriptive and discriminant using Mixed-Effects Models (MEM) to statistically model multi-sensor EEG signals and classify single-trial events. For a fixed subject, this parametric modeling allows decomposing trials into two distinct but complementary parts: a general trend defined over all trials of its class membership, plus an individual random effect that models the temporal deviation of the current trial from the common tendency (Huang et al. 2008). To make the problem more tractable with high density data, we reduced spatial and temporal data dimensionality in a discriminant fashion to classify errors and correct trials in a RT task. First, a linear discriminant analysis permits to identify the most discriminating electrode linear combinations, onto which the signals are projected. Second, a discrete wavelet transform is performed on time courses, followed by a selection of the most relevant wavelet coefficients. Dimension reduction leads to an optimization of the modeling through a synthesis of the EEG signal from the most relevant information. The classification of the EEG single-trial between two classes can be then achieved using a likelihood ratio test.The method was tested on a problem of error-negativities detection in a cognitive task. On six subjects, the proposed method equals or outperforms the Mahalanobis distance-based classifier, with a smaller dataset to train the MEM classifier.

(2-64) **To assessing the functional and metabolic states of nerve cells (a new approach)**

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At the cellular level, the functional shifts are obviously accompanied by the metabolic shifts that relate to neurons vital functions (activity), with a bad or good FS induced respectively by a bad or good metabolic (vital) state (Murik, 2003). Besides, it is not clear how to distinguish a good metabolic (vital) and FS of a nerve cell from a bad metabolic (vital) and FS of it. According to our approach, the level of polarization of nerve cells (i.e. resting potential) is an integral indicator of the metabolic (vital) and FS of nerve tissue cells. This approach implies that the most suitable electrophysiological macroelectrode method for assessing the metabolic (vital) and FS of nerve tissue of the human brain is a simultaneous recording of the EEG and direct current (DC) potential (Murik, 2004; Murik, Shapkin 2004). Many investigators consider the DC potential as neuronal origin that reflects membrane polarization and EEG as an indicator of neural activity. When taken in combination, these two parameters (DC potential and EEG) can be a basis for the precise differentiation between various metabolic and FS of the nerve tissue cells. Our previous animal experiments (Murik, Shapkin 2004; Murik, 2008) showed that the bad metabolic and FS of the depolarising excitation type emerged in the nervous tissue of neocortex during relatively mild ischemia and the negative emotional excitement in the development of fear motivation. Recent human experiments evidenced that this kind of metabolic and FS there is during hyperventilation probe (frequent deep one-minute long breathing) in the neocortex too.

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