25th Annual Conference of the Australasian Society for Psychophysiology

CONFERENCE PROGRAM

Hosted by the School of Psychology and Faculty of Science and Information Technology, University of Newcastle

University of Newcastle, Sydney Campus
December 2 - 4, 2015
# ASP2015 Schedule at a Glance

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<th>Wednesday 2nd December 2015</th>
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<td><strong>8:30 – 9:15</strong></td>
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<tr>
<td><em>Welcome Address</em></td>
<td><em>Session 1</em></td>
<td><em>Session 1</em></td>
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<td><em>Professor Eileen McLaughlin</em></td>
<td><em>Oral Presentations</em></td>
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<td><strong>9:30 – 10:30</strong></td>
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<td>Session 1</td>
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<td>Session 2</td>
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<td><strong>12:45 – 1:30</strong></td>
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<td>Lunch – Level 2 Reception</td>
<td>Lunch – Level 2 Reception</td>
<td>ASP Annual General Meeting</td>
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<td>UoN Sydney</td>
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<td><em>Afternoon Tea and Poster</em></td>
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<td><strong>3:30 – 4:30</strong></td>
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<td>Taronga Zoo</td>
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<td><strong>4:30 – 6:30</strong></td>
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<td>and Poster Session 1</td>
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Welcome to ASP2015!

On behalf of the ASP2015 organising committee we warmly welcome all delegates to the 25th Annual Conference of the Australasian Society for Psychophysiology.

The 3 day conference features a range of fascinating keynote speakers, scientific and poster sessions as well as social events. The conference brings together researchers from psychology, psychiatry, and neuroscience, with a focus on relationships between the brain and behaviour. For all conference information please refer to the following sections of this Program Handbook.

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ASP2015 Organising Committee

Bill Budd (Convenor) - University of Newcastle
Justin Timora - University of Newcastle
Erin Byrne - University of Newcastle
Megan Wright - University of Newcastle
Kaine Griffith - University of Newcastle
Bob Barry - University of Wollongong
Jacqueline Rushby - University of New South Wales
Jason Bruggemann - University of New South Wales

Michelle Kelly - University of Newcastle
Michael Cook - University of Newcastle
Oliver Watkeys - University of Newcastle
Emma Woods - University of Newcastle
Jack Wilson - University of Newcastle
Diana Karamacoska - University of Wollongong
Frances De Blasio - University of Wollongong
Janette Smith – NDARC/UNSW
BrainSight NIRS
For fNIRS, TMS-NIRS, EEG-NIRS & MEG-NIRS

- 8, 16, 32 or 64 channel system
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- Combined neuronavigation
- Integrated proximity detectors
- Accurate electrode and optode localisation

Interested to know more? Visit us at the booth
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Venue Information and Map

Venue and Times
ASP2015 will be held on Level 2 of the University of Newcastle’s Sydney Campus, 55 Elizabeth Street Sydney NSW commencing 9:00am on Wednesday December 2\textsuperscript{nd} 2015 and concluding 1.30 pm Friday December 4\textsuperscript{th} December.

**TRAIN** - Martin Place and Wynyard train stations are in close proximity. Visit the 131500 Transport Infoline for timetable information (www.131500.com.au).


**CAR** - There is no campus parking available. The closest Parking Station is at 60 Elizabeth Street (http://goo.gl/bkr9s9).

**FERRY** – Circular Quay Ferry terminal is about 15 mins walk from UoN Sydney. See ASP2015 website for more travel information.

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Free Wireless Internet Access
Connect your wireless enabled device to the ‘UON\_Conference’ wireless network.

Enter this access code: 4
**B-Alert X-Series Comparison**

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<td>3EEG + 1</td>
<td>9EEG + 1</td>
<td>20EEG + 4</td>
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<td>SD Card</td>
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<td>Battery Life</td>
<td>6hrs/16hrs</td>
<td>8+ hrs</td>
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**Popular Applications**

- Brain-Computer Interfaces (BCI)
- EEG-Based Metrics
- Consumer Neuroscience
- Team Neurodynamics
- Accelerated Learning
- EEG Biomarkers
- LORETA Brain Imaging

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**B-Alert X4**

For first-time and experienced EEG researchers alike, B-Alert X4 is a practical solution for quickly implementing psychophysiological assessment to real-world studies.

**B-Alert X10**

The premiere solution for BCI and consumer neuroscience studies, B-Alert X10 delivers several validated EEG-based Metrics and automated analysis tools to balance functionality with simplicity.

**B-Alert X24**

Across applications such as developing EEG-based biomarkers and neurorehabilitation, B-Alert X24 offers a unique combination of power, flexibility, and comfort.
Registration and Delegate Information

Registration
The registration desk will open from 8:30am each day and is located in the Foyer on Level 2.

Name Badges
Please wear your name badge at all times at the venue to facilitate interactions with other delegates and to verify your access to the campus and entitlement to refreshments. Please be aware that ASP2015 delegate access is restricted to Level 2 of the UoN Sydney campus and that classes or exams maybe underway in areas not colour-coded on the venue map on the preceding page.

Refreshments and Lunch
Morning teas will be provided on Wednesday, Thursday and Friday, afternoon teas on Wednesday and Thursday and lunch will be provided on all three days. The cost is included in your registration.

Welcome Event
Drinks and canapés will be served during the poster session from 4:30 to 6.30 pm Wednesday 2nd December. The cost is included in your registration.

Trade Displays
Symbiotics and BMedical both have exhibitions in the Foyer on Level 2 throughout the conference and we encourage you to visit them and thank them for their support of ASP2015!

Information for Presenters:
Oral: The lecture theatre contains a Windows PC, document viewer, and laptop connection facilities. Please notify the registration desk on arrival at the conference if alternative audio visual equipment is required. Powerpoint presentations should be loaded using a USB memory stick. The maximum speaking time for each presentation is 10 minutes with an additional 5 minutes for questions. The session chair will warn you as you approach this time limit.

Speakers should ensure that their equipment needs are met and that their presentation slides are loaded no later than 15 mins before the start of their session.

Posters: The poster sessions will be held from 4:30 to 6:30pm Wednesday 2nd December and from 2:30 to 3:30pm on Thursday 3rd December. Posters should be left at the registration desk when registering or before the end of lunch on Wednesday 2nd December. Posters will remain in place for the duration of the conference and may be taken down after morning tea on Friday the 4th December. Poster size should be A0 (841 mm x 1189 mm) in either portrait or landscape orientation.

Delegate Assistance and Advice:
Should you need any assistance or advice during the conference please visit the registration desk or speak to any of our conference volunteers who can be identified by the ‘red dot’ on their name badge.
Since 2001, NEUROSPEC AG has always been determined to supply its customers with only the most best and high-end products available on the neurophysiology and neuropsychology markets.

Throughout the years, NEUROSPEC AG has gained trust in manufacturers all around the world and has carefully considered those for our customers.

**BIOSEMI ACTIVETWO**

BIOSEMI - bringing EEG and ERP to a new level with the original Active Electrode and ActiveTwo EEG Amplifier. Configurable with up to 256 + 16 + 8 channels EEG and EXG!

Starting at: AUD 39,990.00

**G.TEC G.NAUTILUS**

Fully wireless 8/16/32/64 EEG system, comes with either dry or wet, active electrodes and up to 8 hours of continuous signal recording and high definition EEG processing with the Matlab Simulink Blocksets.

Starting at: AUD 16,500.00

**SHIMADZU LABNIRS**

Next-Generation Optical Brain-Function Imaging with true laser technology for best quality NIRS data. Designed to acquire fNIRS data in combination with your Biosemi ActiveTwo EEG system.

fNIRS bundles starting at: AUD 180,000.00

**BESA RESEARCH / STATS / MRI**

BESA - the leading innovators in digital EEG, MEG, MRI and statistical analysis software for research and clinical applications. High versatile and user-friendly interface for EEG signal and source analysis.

Starting at: AUD 6,758.00
Conference Dinner

The conference dinner will be held at the Harbour View Restaurant (Bradley’s Head Road Mosman NSW Ph 9969 2400) from 7-11pm on Thursday 3rd December. A buffet dinner and all drinks are included in the ticket price.

The restaurant is located within the Taronga Center at Taronga Zoo. As the Zoo closes at 5:00pm, ASP2015 delegates attending the Conference Dinner must enter via the Taronga Centre entrance and WILL NOT be permitted entry via the Zoo Main Entrance (see map below).

Getting There

CAR Parking is available in the Taronga Zoo car park with 90 minutes complimentary parking and an all-day flat rate of $17.00 per vehicle payable upon departure.

BUS #247 departs Wynyard Station every half an hour until late in the evening and drops guests off at the Taronga Zoo Main Entrance. - Stand A (Carrington St).

FERRY A great way to get there from ASP2015 is to take a ferry from Wharf 2 at Circular Quay Ferry Terminal to Taronga Zoo and enjoy the spectacular sunset over Sydney Harbour before dinner. The ferry service to Taronga Zoo departs every half hour from Circular Quay and takes approx 20 mins. A bus will meet every ferry that docks at Taronga Zoo Ferry Wharf to take take passengers to the Taronga Centre. A Ferry leaves Circular Quay at 6:05pm and arrives at Taronga Zoo at 6:31pm.

Getting Home

Delegates are advised to purchase a combined ferry and bus ticket as no ferries stop at Taronga Zoo wharf after 8:00PM and so you will need to take a bus back to the city if you are travelling by Ferry. A 247 bus leaves the Zoo Main Entrance at 10:26pm and arrives at Wynyard Station, York St, Stand M at 11:00pm.
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- **Excel in multimodal neuroimaging with its ability to combine various types of image data with functional data including EEG, MEG, MRI, CT, fMRI, PET and SPECT.**

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Tel: +61 3 8420 7300, Fax: +61 3 8420 7399
Keynote Speakers


Dr Eric Vanman
Eric is a Senior Lecturer in the School of Psychology at the University of Queensland Australia. His research interests include the social neuroscience of emotion and intergroup prejudice, and his studies have incorporated several kinds of psychophysiological and neuroimaging methods. Dr. Vanman is perhaps best known for his research on racial prejudice, in which participants’ facial EMG activity (i.e., activation of frowning and smiling muscles, in the absence of detectable facial displays of emotion) has been found to be related to prejudice and discriminatory behaviour. His work on unconscious bias displayed via psychophysiological measures was among a few early studies that laid the groundwork for research on implicit measures that has dominated this research area in recent years.

Keynote 2: Using Evoked Brain Rhythms to Investigate the Role of Brain Functional Connectivity in Cognition.

Professor Richard Silberstein
Professor Richard Silberstein holds a Ph.D. from the University of Melbourne in Neurophysiology and a BSc (Hon) majoring in Physics from Monash University. He was the head of the Dept. of Physics at Swinburne University (1985 – 1995) and the foundation director of the Brain Science Institute at Swinburne University (1996 – 2002). He is an Honorary Senior Principal Research Fellow at the Howard Florey Institute of Medical Physiology and serves on the Executive Board of the International Society for Brain Electromagnetic Topography and the Pan Pacific Conference for Brain Topography as well as the Editorial Board of Brain Topography. Professor Silberstein has over 30 years of neuroscience research experience and is the originator of SST brain imaging technology. He has published over 180 papers in the form of conferences presentations, journal articles and book chapters and is an invited or keynote speaker at various international scientific meetings.


Dr Juanita Todd
Juanita is a Senior Lecturer in the School of Psychology in the University of Newcastle. Having trained as a Clinical Psychologist she maintains a longstanding interest in how we create our experience – in how perception and cognition are constrained and defined by neural processes and individual differences therein. Her research utilizes multiple measures (clinical, neuropsychological, psychophysical, psychophysiological, pharma-cological and neuroimaging) to explore relationships between experience, ability and brain function. Her main research foci include understanding how brain function differs in those affected by Schizophrenia and investigating the degree to which the brain distorts information in representations of the world around us.

Keynote 4: The Psychophysiology of Sport and Exercise.

Associate Professor David Neumann
David is an Associate Professor in the School of Applied Psychology at Griffith University. He is a psychophysiologist and uses a combination of behavioural, self-report and physiological measures in his research. He has research expertise in exercise and sport psychology, particularly in regards to the application of attentional focus strategies to enhance performance and enjoyment and has conducted research in collaboration with sporting organisations such as the Queensland Academy of Sport, Queensland Bulls, and national league teams. He also conducts research on emotion and empathy in sporting or clinical contexts and has an interest in higher education research, particularly in enhancing the teaching of statistics.
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—Dr. Joel Anstrom, Penn State University

Learn more: mathworks.com/matlab-campus-wide
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<th>Time</th>
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<tr>
<td>08:30-09:15</td>
<td>Registration – Level 2 UoN Sydney</td>
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<td>09:15-09:30</td>
<td>Welcome Address Pro Vice Chancellor University of Newcastle</td>
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<td>Professor Eileen McLaughlin</td>
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<td>09:30-10:30</td>
<td>Session 1 – Oral Presentations</td>
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<td>Chair – Bill Budd</td>
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<td>Rosalind Hutchings</td>
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<td>Where and when to look: Understanding emotional face perception in frontotemporal dementia.</td>
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<td>Kelly A. Kershaw</td>
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<td>Neural correlates of impaired vocal emotion perception: New insights from principal component analysis.</td>
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<td>Leah S. Sharman</td>
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<td>The social function of tears in crying.</td>
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<td>Jason M. Bruggemann</td>
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<td>Empathy in young people: Change in patterns of eye gaze and brain activity with the manipulation of visual attention to emotional faces.</td>
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<td>10:30-11:00</td>
<td>Morning Tea</td>
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<td>Chair – Bill Budd</td>
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<td>Dr Eric Vanman</td>
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<td>Trust, schadenfreude, guilt and the shapes of rocks on a New Hampshire farm.</td>
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<td>12:00-12:45</td>
<td>Lunch – Level 2 reception UoN Sydney</td>
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<td>12:45-14:00</td>
<td>Session 3 – Oral Presentations</td>
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<td>Chair – Stuart Johnstone</td>
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<td>Danielle Mathersul</td>
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<td>Neural reactivity to monetary gain and loss in depression and anxiety.</td>
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<td>Alison Woods</td>
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<td>Phasic arousal during gambling: A comparison of younger and older adults.</td>
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<td>Michelle Maiuolo</td>
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<td>Electromyographic evidence for the valence of electronic gambling responses in young and older adults.</td>
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<td>Shannon S. Bosshard</td>
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<td>Evaluative conditioning of liked and disliked brands.</td>
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<td>David Camfield</td>
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<td>Can human classical conditioning paradigms affect early facial processing? Modulation of the N170 and N250 in response to conditioning with aversive imagery and acoustic startle, findings from studies of healthy and depressed participants.</td>
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<td>14:00-14:30</td>
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<td>Chair – Jason Bruggemann</td>
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<td>Prof. Richard Silberstein</td>
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<td>Using evoked brain rhythms to investigate the role of brain functional connectivity in cognition.</td>
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<td>15:30-16:30</td>
<td>Session 5 – Oral Presentations</td>
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<td>Cheng Xiaoqin</td>
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<td>Modulation of time perception by eye movements.</td>
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<td>Justin Timora</td>
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<td>Investigating the influence of cross-modal temporal correspondence on EEG entrainment: A comparison between children and adults.</td>
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<td>Dr Roland Csuhaj and Agnieszka Iwasi</td>
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<td>Symbiotic Sponsor Presentation</td>
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<td>Emma Kornfeld</td>
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<td>The effect of attention on the loudness dependence of the auditory evoked potential in individuals with depression and healthy controls.</td>
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<td>Jesse Bourke</td>
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<td>Bradley Jack</td>
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<td>Matthew Gerathy</td>
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<td>Katherine Osborne-Crowley</td>
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<td>10:15-10:45</td>
<td>Morning Tea</td>
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<td>Dr Juanita Todd</td>
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<td>Richard Silberstein</td>
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<td>Natalie Goulter</td>
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<td>Hiroshi Nittono</td>
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<td>12:45-13:30</td>
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<td>Session 4 – Oral Presentations</td>
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<td>Robert Barry</td>
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<td>Jack Fogarty</td>
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<td>Diana Karamacoska</td>
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<td>Frances De Blasio</td>
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<td>Ostracism and physiological arousal following traumatic brain injury –</td>
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<td>“It might hurt but that doesn’t mean I will do anything about it”.</td>
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<td>Impaired mu suppression to negative affect in traumatic brain injured</td>
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<td>Left is for language? Evidence for reduced cerebral lateralization in</td>
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3. Diffusion tensor imaging in traumatic brain injury to examine pathological links with social awareness
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    1University of Social Sciences and Humanities, Poland
    2Polish Academy of Science, Poland
    3University of California, San Diego, USA

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    Diana Karamacoska1* and Robert J. Barry1
    1School of Psychology, University of Wollongong, Australia
13. The man behind the mask: The effect of visual masks on event-related potentials elicited in response to emotional faces
Emma J. Kornfeld1*, Samantha K. Allen1, Jacqueline A. Rushby1 and Skye McDonald1
1University of New South Wales, School of Psychology, Australia

14. Mindfulness meditation and paying attention to the heart: Preliminary findings regarding improvements in interoception after 10-days intensive Vipassana meditation
Jonathan R. Krygier1*, James A. Heathers1, Andrew H. Kemp1 and Maree J. Abbott1
1Psychology, The University of Sydney, Australia
2Department of Cardiology and Intensive Therapy, Poznań University of Medical Sciences, Poland

15. ERP differences between violence, erotic, pleasant, unpleasant and neutral images
Sajeev Kunaharan1 and Peter Walla1.2.3*
1School of Psychology, Centre for Translational Neuroscience and Mental Health Research, University of Newcastle, Australia
2Department of Psychology, Webster Vienna Private University, Austria
3Faculty of Psychology, Vienna University, Austria

16. Age-related differences in physiological responding to simulated electronic gambling
Tarren Leon1, Phoebe E. Bailey1*, Michelle Maiuolo1, Güten Benedek2 and Craig Gonsalvez1
1School of Social Sciences and Psychology, Western Sydney University, Australia
2School of Psychology, University of Hagen, Germany

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1University of Wollongong, Australia

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1School of Social Sciences and Psychology, Western Sydney University, Australia

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1The University of Newcastle, Australia
2Institute of Cognitive Neuroscience and Psychology, Hungary
3University of Tasmania, Australia

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Christopher Sufani1*, Frances M. De Blasio1, Skye McDonald1 and Jacqueline A. Rushby1
1University of New South Wales, Australia

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Mary Grace T. Valentin et al
Faculty of Pharmacy, University of Santo Tomas, Philippines

23. Distinct developmental changes in auditory and somatosensory N1 ERP enhancements at rapid stimulus intervals
Megan A. Wright1, Justin R. Timora1, Bryan Paton2, 3. 4. 5. and Timothy W. Budd1*
1Psychology, The University of Newcastle, Australia, Australia
2ARC Centre of Excellence for Integrative Brain Function, Australia
3Monash Biomedical Imaging, Monash University, Australia
4School of Psychological Sciences, Monash University, Australia
5Philosophy & Cognition Lab, SOPHIS, Monash University, Australia
Abstracts of the 25th Annual Conference of the Australasian Psychophysiology Society
The dark triad of personality traits, diurnal cortisol variations and sleep-wake cycles
Bronte M. Atkinson1*, Susan Thomas1* and Francesca Fernandez-Enright1
1University of Wollongong, Australia

There is growing interest in examining dark personality traits, to better explain malevolent and self-serving behaviour patterns commonly observed in clinical and non-clinical settings. Recently, taxonomies of dark personalities have been developed, along with psychometric tools to measure and delineate between traits including psychopathy, Machiavellianism and narcissism. The extent to which these constructs are distinct or overlapping remains controversial. Psychophysiological research can improve understanding of biological mechanisms contributing to personality that may help to evaluate taxonomies. This study investigated diurnal variations in salivary cortisol (on waking, cortisol awakening response, and at bedtime, over two days) and their relationship to personality traits (Short Dark Triad Scale and IPIP Mini), psychopathology (Depression, Anxiety and Stress Scale; DASS) and quality of life (WHOQOL-BREF) in a non-clinical sample (N = 45, 26 females, 19 males, 18-59 years). Dark personality traits correlated with low bedtime cortisol, reduced sleep, depression and poorer quality of life. Hierarchical linear regressions analyses indicated that bedtime cortisol levels significantly accounted for variance in Psychopathy (F(1,39) = 5.55, p = .02, R2=.52, B=-1.81, 95% CI [-3.37,-.26]), β=-.33, sr2=.10) and reduced sleep uniquely accounted for variance Machiavellianism (F(2,40) = 5.99, p=.01, R2=.48, B=1.01, 95% CI [.16,.20], β=.34, sr2=.11). These data provide preliminary evidence that supports the cortisol hypoarousal hypothesis of Psychopathy and has identified a link between Machiavellianism, sleep-wake cycles, and chronotype. The hypoarousal hypothesis of Psychopathy contends that the hypothalamic-pituitary-adrenal axis is unresponsive to the stress of social engagement. Machiavellianism was predicted by longer days with evidence for an evening chronotype. These findings indicated that the Dark Triad traits have different underlying biological mechanisms that require further exploration.

Optimising detection of ERP Go/NoGo condition effects with separate PCAs
Robert J. Barry1*, Frances M. De Blasio1, Jack S. Fogarty1 and Diana Karamacoska1
1School of Psychology, University of Wollongong, Australia

Aims: To better understand the cognitive processes involved in an equiprobable Go/NoGo task, we have been using temporal Principle Components Analysis (PCA) to identify the ERP components involved. Go and NoGo ERPs are commonly analysed together in one PCA, resulting in a series of components differing between the conditions in amplitude and/or topography, but not latency. While providing a good approximation to the early ERP components (e.g., N1), it is not optimal for the later components (e.g., P3), which may differ substantially in latency between Go and NoGo. This study aimed to optimise the separation of Go and NoGo effects in the ERP components. Method: Undergraduate students (N = 28) received 600 50 ms tone stimuli at 60 dB SPL across four blocks. Half were at 1000 Hz, half at 1500 Hz, and SOA was 1100 ms. The target tone required a button-press response, and was balanced between blocks and subjects. After EOG correction, ERPs were obtained for correct Go and NoGo responses. The usual Combined PCA was carried out with all Go and NoGo ERP inputs, and compared with results of Separate PCAs based on either the Go or NoGo ERPs. Results: Components obtained from the Combined and Separate PCAs were broadly similar, providing support for our previous findings and the sequential processing schema proposed for this paradigm. As expected, the Separate PCAs generated latency differences for components in each processing chain. These components were a good match for the late Go/NoGo ERP peaks. Also, better-defined and larger early components were obtained, fitting the stages in our hypothetical processing schema. Conclusion: Overall, the Separate PCAs yielded a better partitioning of the ERP variance associated with the Go and NoGo conditions than those from the Combined PCA. Use of this approach should be considered in future investigations of condition effects.
Evaluative conditioning of liked and disliked brands
Shannon S. Bosshard¹ and Peter Walla¹, ², ³*
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³Psychology, Vienna University, Austria

Can advertising change our attitudes towards our most liked and disliked brands? Marketing literature suggests that well-established brand attitudes are resistant to the effects of advertising. In addition, learning experts, quoting conditioning literature, have suggested that changing attitudes towards well-established brands is extremely difficult. However, we know that our attitudes towards brands are entirely learned and can change without us ever coming into contact with the brand. These contradictory findings provide support for the notion that the tools currently employed to assess consumer attitudes are ineffective. Assuming that this is the case, the current study employed an online survey to create individual brand lists. Subsequent sessions saw participants enter the lab and re-rate these visually presented brand names. Simultaneously, brain activity in response to the brands was collected via electroencephalography (EEG). After collecting participants’ implicit and explicit ratings towards each of the brands, they underwent conditioning where liked brands were conditioned negatively and disliked brands were conditioned positively using affective sounds. Although results obtained via self-report are in line with previous findings and suggest our conscious attitudes do not change, EEG proved to be adequately sensitive to detect the effects of conditioning. As a result of conditioning, disliked brands elicited a more positive going waveform than liked brands at parietal sites beginning at 1000ms and remaining until 1800ms. Similarly, activity at frontal sites was also seen to be larger for disliked brands than liked brands. These effects began at 400ms and remained until 800ms. In summary, our study demonstrates that objective methods such as the EEG are able to get access to levels of neural processing that highlight significant evaluative conditioning effects. While those processing levels do not influence any conscious attitude aspects, it may well be that other influences occur, which have to be investigated in future studies.

Determinants of variation in rapid temporal processing ability: How do behaviour, function, and structure relate?
Jesse Bourke¹* and Juanita Todd¹
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Effective processing of rapid temporal cues in sound is essential for accurate perception of auditory stimuli, particularly for speech (Zatorre & Gandour, 2008). Poor rapid temporal processing (RTP) ability has been widely linked with disorders of speech and language processing (e.g., Cardy, Flagg, Roberts, Brian, & Roberts, 2005; Farmer & Klein, 1995). Todd, Finch, Smith, Budd, and Schall (2011) demonstrated that pre-attentive psychophysiological processing of RTP cues typically produces a right ear-advantage, depending on the individual’s behavioural ability to consciously discriminate RTP cues. A mismatch negativity (MMN) paradigm and gap detection threshold task (GDT) was used to measure behaviour and function respectively. Although neuroanatomical substrates of these effects have not yet been established, leftward structural lateralisations of the planum temporale (PT) may be a potential determinant (Elmer, Hänggi, Meyer, & Jäncke, 2013; Griffiths & Warren, 2002). In the present study we extended Todd et al.’s study by comparing behavioural and functional indices of RTP, with measures of the PT using structural MRI. Preliminary results have shown significant correlation of left-hemisphere PT surface area with RTP ability for stimuli presented to the right ear. Furthermore, more pronounced leftward laterality of the PT was correlated with larger MMN elicited to gap-deviants presented to the right-ear. Behavioural and structural measures were shown to be significant covariates for MMN at these frontal sites, but not for an observed polarity inversion at the mastoids. Overall, these findings affirm that the PT are a neuroanatomical substrate of the relationship between behavioural and functional RTP.

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Empathy in young people: Change in patterns of eye gaze and brain activity with the manipulation of visual attention to emotional faces

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Background and aims: Understanding the emotional state of others is fundamental to effective social interaction and the development of empathy. Critical information is conveyed via the eyes, and reduced attention to the eyes is associated with poorer emotion recognition and empathic deficits in individuals with disorders affecting social cognition such as autism or some types of conduct problems. Deliberately redirecting attention to the eyes may be a way of improving behaviour. However, the effects of directing attention on brain activity during emotional processing has not been studied previously. Our aim was to determine whether manipulation of visual attention in youths affects their eye gaze patterns and brain responses to expression of emotions in others.

Method: Eighteen typically developing male youths aged 8-16 performed an implicit facial emotion processing task while viewing different facial expressions (fearful, neutral, happy), presented in three separate blocks under three different instructions: undirected, eye-gaze and mouth-gaze. Eye tracking (dwell time) and functional-MRI data were acquired concurrently as measures of visual attention and brain response, respectively.

Results: Eye tracking indicated that the youths attended more to the eyes than the mouth in the undirected condition. Redirecting attention to the eyes and mouth significantly increased attention to these areas. Compared to undirected, directing attention to the fearful eyes also produced a greater increase in attention than neutral eyes. Attention directed to eyes elicited greater brain activity in frontal regions than undirected attention. Conclusions: The undirected eye gaze patterns indicate natural orienting to eyes in healthy youths, which can be effectively altered with instruction. Directing attention to fearful eyes engaged attention relatively longer than neutral, consistent with the threat value of fearful faces. These data also demonstrate that manipulation of visual attention modulates activity in frontal regions, perhaps reflecting greater engagement of executive function due to attentional demands. Understanding attentional manipulation effects in a healthy sample will inform ongoing work addressing potentially perturbed response patterns in a conduct problem cohort.

Can human classical conditioning paradigms affect early facial processing? Modulation of the N170 and N250 in response to conditioning with aversive imagery and acoustic startle, findings from studies of healthy and depressed participants

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Recent studies have suggested that classical conditioning may be capable of modulating early sensory processing in the human brain. In 2014 pilot EEG data was collected from our laboratory using a sample of 24 undergraduate students (M = 21.07 years, SD = 3.38 years) whilst they completed a conditioning paradigm in which faces from the NIMSTIM database were paired with one of five unconditioned stimulus groups: (i) aversive imagery, (ii) aversive imagery with acoustic startle probe, (iii) acoustic startle probe by itself, (iv) pleasant imagery, and (v) neutral (control) imagery. N170 amplitude was significantly enhanced following conditioning using the aversive imagery as well as the acoustic startle probe by itself (but not in combination). In a follow-up study during 2015, EEG data was again collected using a sample of 19 participants experiencing a current major depressive episode, according to DSM-IV criteria, as well as 21 non-depressed control participants (M=26.21, SD = 8.93). NIMSTIM faces were paired with one of three unconditioned stimulus groups: (i) aversive imagery, (ii) pleasant imagery, or (iii) neutral imagery. In this follow-up study a different pattern of results was found whereby N170 and N250 amplitudes were increased to a greater extent for conditioning with emotional imagery (pleasant and aversive) in comparison to neutral imagery, however no main effect for depression status was found. The implications of the program of research are discussed, with a focus on the relative importance of emotional valence versus arousal in the selection of conditioning stimuli for the modulation of ERP components related to facial processing.

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Does plain cigarette packaging make cigarettes taste bad? A combined psychophysiological and evaluative conditioning study

Michael J. Cook¹, Oliver Watkeys¹, Aaron S. Wong¹, Tony Kemp¹, Justin R. Timora¹ and Timothy W. Budd¹*
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The aim of the present study was to determine whether plain cigarette packaging (PCP) can alter the perceived pleasantness of an odour using a combination of evaluative conditioning and psychophysiological techniques. The motivation derives from consumer reports and recent research indicating PCP may reduce perceived pleasantness of tobacco smoke among smokers. Using an evaluative conditioning paradigm, 52 participants rated the pleasantness of six odours before and after a paired odour-image conditioning phase while skin conductance was continuously acquired. During the conditioning phase each odour was simultaneously presented with one of five different cigarette pack types where participants were instructed to rate the pleasantness of computer displayed cigarette pack images. The five pack types were: Fully-Branded-Packs; Plain-Packs or one of three digitally altered Plain-Packs, where the original graphic health warning image (GHW) was replaced with either a Pleasant, Unpleasant or Neutral image (IAPS; International Affective Picture System). A sixth odour-image condition served as a control where the odour and pack image pairing was randomised. Presentation software (NBS) was used to deliver odours via a liquid dilution Olfactometer, to synchronise and sequence image presentation and record participant ratings. It was predicted that if PCP decreases odour pleasantness then post-conditioning odour ratings would be reduced relative to pre-conditioning ratings for odours paired with plain cigarette packets but not fully-branded packets. Further, it was predicted that the post-conditioning SCR for odours paired with a positive or negatively valenced plain cigarette packets would be increased but not odours paired with Neutral images or the Control condition. The results revealed significant differences in ratings and SCR for positive, negative and GHW cigarette packs, however no significant differences were observed for post-conditioning relative to pre-conditioning SCR and odour ratings. This failure to demonstrate evaluative conditioning of odours by PCP is discussed in terms of potential limitations of the present design and future research.

Diffusion tensor imaging in traumatic brain injury to examine pathological links with social awareness

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¹School of Psychology, University of New South Wales, Australia

Background: Severe traumatic brain injury (TBI) is highly heterogeneous across sufferers. Despite this, TBI patients commonly develop diffuse axonal injury as a result from the neuronal degeneration after injury, which can extend deep into the brain to the corpus callosum (CC). Additionally, TBI patients suffer chronic social and emotional deficits resulting from injury. The present study examined the relationship between directional diffusivity of the white matter tracts within regions of the CC, measured by Fractional anisotropy (FA), and social cognition, measured by The Awareness of Social Inference Test (TASIT), in TBI. Method: Diffusion MRI scans were obtained from 17 participants with moderate to severe TBI and 17 matched controls. Participants were administered the TASIT and scores were calculated for emotion evaluation and social inference. Deterministic DTI was performed to obtain FA values from three regions of the CC: genu, body and splenium. TASIT scores and FA values were compared between groups and cc regions. FA values were correlated with TASIT scores. Results: TBI participants scored significantly lower in both emotion evaluation and social inference compared to controls. TBI participants had significantly lower FA values overall, however within both groups, FA values were highest in the splenium and lowest in the genu. Higher scores on the TASIT were related to higher FA values across all regions of the CC except the genu. Conclusions: Overall, TBI participants had lower directional diffusivity of white matter within the CC, indexed by FA, as well as deficits in emotion evaluation and social inference. Emotion evaluation and social inference were both highly related to white matter quality in the CC body and splenium. 

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**Binge drinking inducement and its effect on behavioural inhibition in young adults**

Katie I. Dalton1*, Janette L. Smith1, Meryem Joseph1 and Jacqueline A. Rushby1

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**Aims:** Heavy drinkers exhibit reduced behavioural control, however the direct effects of alcohol binging on inhibition are not know, particularly in the developing young adult brain. The current study aimed to examine changes, pre to post binge drinking inducement, in stop-signal reaction time (SSRT) and ERP components, P3, N2, and ERN amplitude. The relationship between behavioural inhibition and impulsivity was also examined to provide insight into the development of addictive alcohol consumption. **Method:** At two sessions three months apart, participants with no history of binge drinking, aged 17-25, had EEG recorded while performing the stop-signal task (SST), and completed questionnaires measuring drinking habits and impulsivity levels. During the time between test sessions, participants who had consumed four or more standard drinks on one occasion by second session were classed as Bingers and all others as Non-bingers. **Results:** Bingers had significantly slower SSRT compared to Non-bingers, both before and after binge drinking inducement. P3 and N2 amplitude showed no change and was not different between groups, however ERN amplitude was more negative for Non-bingers at both sessions. Bingers on average had significantly higher levels of impulsivity but only a weak relationship existed between impulsivity levels and inhibition measures. **Conclusions:** Deficits in SSRT and ERN amplitude appeared to be present prior to any binge drinking suggesting behavioural inhibition deficits may lead to risky drinking behaviours. P3 and N2 amplitude results at session two indicated binge drinking did not directly affect these indices of inhibition. Lastly, participants that began to binge drink were more impulsive which may provide support for addiction models.

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**The distraction paradigm: Equating difficulty is difficult**

Karlye Damaso1*, Alexander I. Provost1, Pat Michie1, Scott Brown1, Ulrich Schall1and Juanita Todd1

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The distraction paradigm (Schröger, 1996, 1997) provides an empirical test of how the elicitation of mismatch negativity (MMN) impacts upon the attentional resources available to perform a behavioural task. In these paradigms a task-irrelevant sound sequence that contains MMN eliciting characteristics is superimposed on a behavioural task that occupies the focus of attention. The subsequent impact MMN has on attentional resources results in robust behavioural effects — increased reaction times and error rates. These behavioural effects can be muted by increasing task difficulty. That is, under increased task difficulty, increases in RT and error rates that typically follow MMN do not occur (Berti et al., 2004; Berti & Schröger, 2003). Broader cognitive literature suggests that the level of difficulty experienced in a given task can differ within and between individuals (Lavie, 2005). These differences can impact on task performance at an individual and group level (Lavie, 2005), introducing noise and clouding effects. To address this, tasks can be designed with inbuilt algorithms that equate difficulty within and between participants. To date, distraction paradigm research has not utilised difficulty-calibrated tasks. We aimed to create a distraction paradigm task with an inbuilt calibration feature that would equate task difficulty within and between participants. We used a novel auditory-visual distraction paradigm task with the task irrelevant sound sequence consisting of a duration deviant MMN sequence, and a visual inspection time behavioural task. Visual inspection time duration was varied within and between participants so that task difficulty would be calibrated at ~85% accuracy. Despite the elicitation of a distinct MMN, no behavioural effects were observed — increases in RT and error rates that typically follow MMN did not occur. We discuss reasons why our attempt to create a task with an inbuilt calibration feature may have been unsuccessful in this variation of an auditory-visual distraction paradigm task.

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Prestimulus low frequency EEG affects processing outcomes in the equiprobable Go/NoGo task in healthy ageing

Frances M. De Blasio1* and Robert J. Barry1
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Prestimulus brain states have a significant impact on task-related processing outcomes, although little is known about the specific nature of these complex effects, or how consistent they are across the lifespan. Improved methodology is utilised to extend and clarify the pattern and nature of these relationships in the auditory equiprobable Go/NoGo paradigm, with a focus on the contributions in the lower frequency bands in young and well-functioning older adults. Prestimulus amplitudes in delta (0.5–3.5 Hz) and theta (4.0–7.5 Hz) were used to selectively sort and average the accepted Go and NoGo epochs, generating 10 sets of Go/NoGo ERPs and Go RT data for lower to higher prestimulus levels in each EEG band. ERP component amplitudes were quantified using Principal Components Analysis, and seven components were assessed: P1, N1-1, Processing Negativity (PN), P2/N2b, P3, Slow Wave (SW), and Late Positivity (LP). The pattern of prestimulus EEG band level effects was somewhat consistent with, and extends, prior work in this paradigm. Delta again generally modulated ERP component positivity, but theta produced fewer stimulus-specific effects. These effects differed topographically between the young and older adults in selected components for each sorting band. Prestimulus theta level inversely modulated Go RT variability across the young and older groups. The pattern of results is interpreted in the context of a recent sequential processing schema developed in this simple task, providing significant insight into the prestimulus brain state effects on processing outcomes, and how these change in healthy ageing.

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ERPs differentiate happy from angry facial processing

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Our daily lives are filled with affective stimuli, yet our processing of these stimuli remains unresolved. This is also of particular interest given the distinct affective deficits in some clinical populations. The Orienting Reflex (OR), an automatic response directing attention to innocuous stimuli, provides a framework within which this processing can be further assessed. Here we compare the cognitive processing of happy and angry facial expressions using a visual dishabituation paradigm with black and white face stimuli. Forty healthy undergraduate participants viewed 15 trains of eight stimuli. The first six stimuli in each train were presented with a consistent emotion, the seventh stimuli expressed the alternate emotion (change/deviant trial), and the last stimulus was presented with the original emotion. Half the participants received the Happy-Angry-Happy (HAH) task, and half the Angry-Happy-Angry (AHA) task. Event related potentials were derived from artifact free trials and subjected to separate principal components analysis (PCA) for each group (HAH, AHA). Four components were assessed for response decrement (trials 1-6), response recovery (trials 6 vs. 7), and dishabituation (trials 6 vs. 8): N2b, P3a, P3b, and the classic Slow Wave (SW). N2b failed to show a significant decrement in either group but showed response recovery to the change trial in the HAH group, and dishabituation in both groups (HAH, AHA). Four components were assessed for response decrement (trials 1-6), response recovery (trials 6 vs. 7), and dishabituation (trials 6 vs. 8): N2b, P3a, P3b, and the classic Slow Wave (SW). N2b failed to show a significant decrement in either group but showed response recovery to the change trial in the HAH group, and dishabituation in both groups (HAH, AHA). P3a showed response recovery in the HAH group, and response decrement, recovery, and dishabituation in the AHA group. P3b only showed response decrement, and this was seen in both groups. Finally, the SW showed response decrement, recovery, and dishabituation in the HAH group, but only response decrement and recovery in the AHA group. Interestingly, many of these results were topographic in nature. The pattern of results indicates interesting differences between the processing of happy and angry facial expressions, and will be interpreted from an OR perspective.

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Does primacy bias occur in mismatch negativity (MMN) to spatial deviants?
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The auditory system is sensitive to the relative probabilities of sounds, using regularities in sound sequences to form predictions about future sounds. The mismatch negativity (MMN) is an evoked-potential component elicited in response to any unexpected change in the auditory environment and therefore reflects error in predictions. MMN amplitude is proportional to the “confidence” in an existing prediction, being largest to deviations of stable patterns which are most unexpected. However using a multi-timescale paradigm we have demonstrated that it is not solely determined by local probability statistics, with the initial context in which a sound is encountered having a lasting impact on the perception of that sound in future contexts – a “primacy bias”. In this paradigm two tones alternate in the role of standard ($p = .875$) and deviant ($p = .125$) every 2.4 minutes in the stable condition and 0.8 minutes in the unstable condition. Primacy bias is observed with the expected stability effect of MMN being larger for stable than unstable sequences only evident when tones are in the roles in which they were initially encountered. Whilst this effect has been reliably observed when tones deviate on pitch and duration, this study is the first to test primacy bias in spatial deviance. Using interaural level difference to localise sounds to the left and right of space we demonstrate that this primacy bias is evident through two characteristic bias patterns: (1) suppression of MMN amplitude to the initial standard as a later deviant in the first half of blocks after tones change roles, with growth into the second half; and (2) larger MMN in stable than unstable sequences in the first half of blocks for the initial deviant only. These results provide further support for primacy bias as an order-driven effect which generalises across deviance types, including spatial location.

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Clarifying the functionality of the young adult equiprobable Go/NoGo N2 and P3 within a sequential processing schema
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This study continues the development of Barry and De Blasio’s (2013, 2015) sequential processing schema, which uses Event-Related Potential (ERP) components to chart the series of mental functions required to complete an equiprobable auditory Go/NoGo task. Whilst it has been considered that NoGo stimuli in this task do not require effortful processing, a recent study found an active inhibitory role for the NoGo N2b component in children (Barry & De Blasio, 2015). This indicates that children require active control for a successful NoGo non-response, suggesting that some elements of the schema need to be clarified in young adults. In light of this, the present study investigated the functionality of the NoGo N2b in young adults in this task, along with other components of the processing schema, specifically, NoGo P3a, Go N2c and Go P3b. For this purpose, ERP data was acquired from 40 right-handed and healthy young adults ($M = 19.2$ years) completing this task. Combined and Separate temporal PCAs were then conducted on successful Go/NoGo trials to identify optimal representations of their ERP components, which were then analysed in relation to Go/NoGo performance. NoGo performance was measured via commission error rates, whilst Go performance was measured via omission errors, mean reaction time (RT), and within-subject RT variability. Consistent with the findings in children, the young adult N2b correlated with NoGo performance. Moreover, P3a showed a similar relationship, suggesting that N2b and P3a reflect inhibitory processing on successful NoGo trials. Additionally, N2c and P3b were related to RT variability and mean RT respectively, confirming them as response-related components within the Go processing chain. This study contributes to the further development of the sequential processing schema, providing evidence that NoGo stimuli require active processing in young adults, and confirming the effortful response-related processing of Go stimuli.

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Does sequence foreknowledge or concurrent task affect first-impression bias in mismatch negativity?

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The auditory system accumulates evidence about regularity across varying timescales to model predictions about subsequent sound. The evoked-potential component mismatch-negativity (MMN) is elicited upon detection of any pattern-deviation and reflects a ‘prediction-error’. MMN amplitude is proportional to ‘confidence’ in underlying predictions; MMN is largest when patterns are very stable.

Using a ‘multi-timescale’ paradigm, we have consistently demonstrated that MMN amplitude does not faithfully reflect sequence stability but instead succumbs to a ‘first-impression bias’ that is coupled to initial tone roles. In the paradigm participants hear two-tone sequences in which tones alternate roles of standard \((p = .875)\) and deviant \((p = .125)\). In stable sequences, roles alternate every 2.4min (480 tones per block; 420-standard, 60-deviant). In unstable sequences, roles alternate every 0.8min (160 tones per block; 140-standard, 20-deviant). The first-impression bias refers to the observation that only MMN in the first stimulus configuration show the expected stability-modulation \((\text{stable} > \text{unstable})\). To date all multi-timescale paradigms have been presented while participants have no knowledge of the sequence structure and watch a silent movie. In this study, we attempted to disrupt the bias by modifying engagement of higher-level brain areas in monitoring longer-term patterns thought to underpin it. The primacy bias pattern did not occur when participants performed a demanding concurrent N-Back task (study-1) or were first informed about the sequence structure (study-2) before watching a silent movie. Our results are interpreted as evidence that engagement of higher-order brain areas is required to make predictions about patterning over longer timescales.

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Do first-impression bias effects in mismatch negativity (MMN) diminish with repeated exposure to sound sequences?

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The ability of the auditory system to detect patterning in sound sequences enables the system to predict the most likely characteristics of sound in the environment whilst remaining sensitive to sounds that deviate from predictions. If a sound deviates from an active ‘prediction model’, an evoked-potential component called mismatch-negativity (MMN) is elicited. MMN reflects a prediction-error when a discrepancy between inferred and actual sound properties occurs and is thought to be confidence-weighted where the higher the confidence (i.e. when patterns are stable), the larger the MMN following pattern violation. Using the ‘multi-timescale’ paradigm, we have consistently shown that MMN is susceptible to order-driven bias dependent on initial tone roles. In this study we show that the bias remains even with repeated exposure to sound sequences. Participants heard four occurrences of either stable or unstable sequences over headphones. Both sequences contained 60ms and 30ms tones that alternated the role of standard \((p = .875)\) and deviant \((p = .125)\). In stable sequences, tone roles alternated every 2.4min (480 tones per block; 420 standard tones, 60 deviant tones). In unstable sequences, tone roles alternated every 0.8min (160 tones per block; 140 standard tones, 20 deviant tones). Results were consistent with a confidence-weighted first-impression bias: More confident predictions for stimulus configurations matching the one first encountered than the reversed one. Remarkably, first-deviant MMN remained large while second-deviant MMN reduced with repeated presentation. Rather than diminishing, the primacy bias pattern appears to intensify with repeated sequence encounters.

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Error-monitoring during complex probabilistic association learning in adults with ADHD
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The behavioural and neural abnormalities experienced by children with Attention Deficit/Hyperactivity Disorder (ADHD) are well documented. However, whether these differences in attentional allocation, associative learning and reward processing continue into adulthood is not as well understood. For the current study, the behavioural and neural performance of adults with ADHD were compared with that of matched controls on a heavily utilised and complex probabilistic association learning (PAL) task. Each group of participants completed two blocks of the task, in which the cue-outcome associations were reversed between blocks. Continuous electroencephalogram (EEG) recordings were made throughout task completion. Epochs were created for event-related potential (ERP) examination at two stages of learning, one locked to stimulus presentations and the other to feedback presentations. Adults with ADHD displayed deficits in early but not late PAL rate compared to controls. However, there was no difference found between groups when compared on overall performance of the task. Analysis of ERP examinations in stimulus epochs revealed reduced frontal P2 amplitudes in the clinical group in response to cue presentations. This finding was significant only during early PAL. Feedback epochs showed that both groups displayed significantly larger feedback related negativity (FRN) amplitudes to correct rather than incorrect feedback. Additionally, the ADHD group demonstrated decreased FRN and slow negative wave amplitudes compared to controls. Behavioural disparities between groups were interpreted to arise from attentional deficits in early visual processing, a decreased ability to encode error context and diminished motivation levels in adults with ADHD. Overall the results suggest that attentional and error-monitoring deficits persist in adult ADHD but may not effect behavioural performance given significant learning opportunities. Additionally, FRN findings suggest current thinking as to the function of the component may require some revision.

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Affective startle potentiation differentiates primary and secondary variants of juvenile psychopathy
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Background: Individuals with psychopathic traits demonstrate an attenuated emotional response to aversive stimuli. However, recent evidence suggests heterogeneity in emotional reactivity among individuals with psychopathic or callous-unemotional (CU) traits, the emotional detachment dimension of psychopathy. We hypothesize that primary variants of psychopathy will respond with blunted affect to negatively valenced stimuli, whereas individuals marked with histories of childhood trauma/maltreatment exposure, known as secondary variants, will display heightened emotional reactivity. To test this hypothesis, the present study examined fear-potentiated startle between psychopathy variants while viewing aversive, pleasant, and neutral scenes. Method: 238 incarcerated adolescent (M age = 16.8, SD = 1.11 years) boys completed a picture-startle paradigm and self-report questionnaires assessing CU traits, antisocial-aggressive behavior, and maltreatment. Results: Latent profile analyses identified four classes; primary variants (high CU traits, high aggression, low maltreatment; n = 46), secondary variants (high CU traits, high aggression, high maltreatment; n = 42), and two nonpsychopathic groups differentiated on maltreatment experience (n = 148). Findings from an ANOVA comparing identified groups on startle amplitude difference scores (i.e., aversive-neutral) suggested a main effect for group, F (3,196) = 8.91, p < .001, η2 = .12. Primary variants of juvenile psychopathy displayed reduced startle potentiation to aversive images (threat and victim scenes), whereas secondary variants distinguished by high levels of childhood maltreatment did not. Conclusions: Findings add to a rapidly growing body of literature supporting the possibility of multiple developmental pathways to psychopathy (i.e., equifinality), and extend it by finding support for divergent potential biomarkers between primary and secondary psychopathy variants.

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The absence of cross-modal forward facilitation of the auditory and somatosensory N1 ERP peaks at intervals less than 300 milliseconds reveals a dissociation with simultaneous and temporal order judgement task performance

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Multisensory integration (MSI) refers to a neural process whereby sensory information from separate modalities is combined to form a unified multimodal percept. Perceptual studies using the Simultaneity Judgment (SJT) and Temporal Order Judgement (TOJ) tasks indicate that MSI occurs over a brief 300 millisecond interval or temporal window of multisensory integration (TWMI). The aim of the present research was to determine whether forward facilitation of the N1 ERP peak observed for within-modality repetitions of auditory and tactile stimulation at intervals less than 300 milliseconds is also evident for cross-modal repetitions of auditory and tactile stimuli. Further, we examined whether the temporal pattern of cross-modal N1 forward facilitation was consistent with the TWMI as measured by SJT and TOJ performance. To achieve this 43 participants were presented with binaural auditory or bilateral tactile stimuli at random stimulus onset asynchronies (SOA) between 50 and 650 ms during a 64 channel EEG recording. The EEG was epoched and sub averaged according to within (AA, TT) and across (TA, AT) modality stimulus sequence (T=tactile, A=auditory) and SOA range (6 x 100 ms SOA ranges between 50 and 650 ms). SJT and TOJ performance was also measured using the same stimuli and SOA ranges as used for the EEG recording. Using a 2(modality) X 2(sequence) x 6(SOA) analysis design the results replicated prior ERP research where both the auditory and somatosensory ERPs showed forward facilitation of the N1 peak at SOAs less than 300 ms. Similarly, SJT and TOJ performance for the same participants showed the expected MSI effects at SOAs below 300 ms. However no cross-modal N1 forward facilitation was obtained for either auditory or somatosensory ERPs. The results are discussed in terms of the potential limitations when interpreting SJT and TOJ performance as a measure of temporal integration of sensory information.

Cross-modal symbolic processing can elicit either an N400 or an N2

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A new cross-modal symbolic paradigm was used to elicit electroencephalographic (EEG) activity related to semantic incongruence. 25 undergraduate students viewed pairings of visual lexical cues (e.g. ‘DOG’) with matched (50% of trials) or mismatched (50%) auditory non-lexical stimuli (animal vocalizations; e.g. sound of a dog woofing or a cat meowing). In one condition, many different pairs of matched/mismatched stimuli were shown, whereas in a second condition only two pairs of stimuli were used so as to reduce the need for semantic processing. A typical N400-like pattern of incongruence-related activity was evident in the condition using many stimuli, whereas the incongruence-related activity in the two-stimuli condition was confined to differential N2-like posterior activity. A supplementary analysis excluded stimulus characteristics as the source of this differential activity. The observation that a single individual performing a fixed task can demonstrate either a protracted N400-like pattern of activity or a more temporally focused N2-like pattern of activity in response to the same stimulus, raises important questions as to their origins and relatedness of these two components.

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Left is for language? Evidence for reduced cerebral lateralization in adolescents with Down syndrome

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Ever since reports by Broca and Wernicke, the left hemisphere has been associated with language function. Individuals with Down syndrome show disproportionate difficulties with language relative to their non-verbal ability and indirect evidence for reduced cerebral lateralisation in this group has been reported (e.g., weaker hand preference and weaker right-ear advantage on dichotic listening tasks). Here we report the results of a study with 25 adolescents with Down syndrome and two control groups: one matched on chronological age, and another, younger, control group matched on language ability, where we directly measured task induced changes in blood flow velocity to the left and right hemisphere. We used functional transcranial Doppler ultrasound to assess cerebral lateralisation during both a language task and a visuospatial memory task allowing us to address the following questions: 1) Is cerebral lateralisation for language function reduced in people with Down syndrome, and if yes, 2) Is reduced cerebral lateralisation in this group specific to language? Finally, participants also completed several handedness tasks and associations between handedness and lateralisation for language in adolescents with Down syndrome, or lack thereof, will be discussed. At the group level, adolescents with Down syndrome showed less lateralisation to the left hemisphere on the language task, compared to both control groups. Within the group of adolescents with Down syndrome, neither amount, nor direction of lateralisation for language was associated with language ability or hand preference. Reduced lateralisation in this group was not specific to language, as reduced lateralisation to the right hemisphere was observed for visuospatial memory.

ERP correlates of prospective memory and cognitive control during dual-task and abrupt task switch processing

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This study replicates and extends on the work of Bisiacchi et al., (2009) who applied a within-subjects design to explore electrophysiological correlates of prospective memory (PM) during dual-task (DT) and task-switch (TS) processing. Bisiacchi recorded an anterior N200 in their TS condition linked to the suppression of ongoing-task responses when presented with PM cues. Conversely, they found a more anteriorly distributed late-parietal complex (LPC, 400-700ms) during their DT condition linked to post-retrieval monitoring and the parallel processing of ongoing-task and PM stimuli. This present study applied a between-subjects design that randomly assigned seventy-five participants to either a TS, DT, or an additional baseline group who were unaware of the PM conditions. Slower reaction times and lower accuracy scores were recorded by both PM groups relative to the control-group, suggesting that the experimental conditions elicited a PM interference effect. Like Bisiacchi, greater N300 mean amplitudes were recorded at posterior electrode sites for PM cues compared the ongoing task, and these components did not differ between PM conditions, suggesting that similar target detection processes were enlisted. Significant LPC’s were also recorded during the presentation of PM cues at central-posterior and right hemispheric electrode sites between 400 and 1000ms in contrast to ongoing-task trials. However, in contrast to Bisiacchi et al., the amplitude of this component was greater during TS processing at both time windows compared to the DT. Finally, this study did not replicate the N200 Bisiacchi recorded at anterior-central electrodes, suggesting that inhibitory control processing was not associated with this component in this version of the paradigm. The results of this study highlight the differential effect that a within or between-subjects design can have on ERP’s measurements. Different neural generators appear to support PM, and are brought online at different times depending on task design.

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Where and when to look: Understanding emotional face perception in frontotemporal dementia

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Faces offer an incredible wealth of information for social interactions. Emerging evidence suggests that some clinical groups (e.g., autism) who show impaired emotion recognition do not attend appropriately to parts of the face that display emotion (e.g., the eyes). The behavioural-variant of frontotemporal dementia (bvFTD) is a younger-onset dementia syndrome affecting the frontal and/or temporal lobes. Clinically, this disorder is characterised by changes in social behaviour and personality. Existing evidence has shown that bvFTD patients have deficits in labelling facial expressions. Whether inappropriate facial scanning patterns contribute to impaired facial expression recognition in bvFTD is unknown. Here, we employed remote eye-tracking to investigate whether bvFTD patients show different patterns of facial scanning compared to healthy controls. Seventeen bvFTD participants and 17 healthy controls were presented with 8 fearful, 8 happy and 8 neutral faces over 9 blocks (3 blocks per emotion) with 72 trials in total. Eye-tracking data were recorded while participants passively viewed each face for 3 seconds. Analyses revealed that bvFTD patients spent a significantly longer dwell time on the whole face ($F(1,32) = 18.25, p < 0.001$) and on the eyes ($F(1,32) = 5.39, p = 0.05$) compared to healthy, age-matched controls. Dwell time on the mouth did not differ between groups ($F(1,32) = 0.004, p < 0.95$). These results indicate that despite looking at the ‘right’ areas of the face, bvFTD patients appear unable to interpret emotional cues when decoding facial expressions. Our results provide impetus for further investigation into where a breakdown may be occurring in face and emotion processing in bvFTD.

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Self-generated sounds enhance the mismatch negativity: Evidence from the equiprobable paradigm

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The human brain makes predictions about upcoming auditory input in at least two ways. First, it predicts sensations from actions that produce them: self-generated sounds typically elicit smaller neural responses than when the same sounds are externally-generated. Second, it predicts sensations based on past experience: regular, predictable sounds—standards, elicit smaller neural responses than irregular, unpredictable sounds—deviants: the mismatch negativity (MMN). We searched for a MMN from self-generated sounds. In the motor-auditory (MA) condition, 19 participants voluntarily pressed a button every 533–1067 ms. A tone was delivered binaurally through headphones immediately after the button press. In some MA blocks, we used an oddball sequence in which the probability of a deviant tone among standards was $p = 0.17$; in other MA blocks, we used an equiprobable sequence in which six different tones—controls, were played with equal probability ($p = 0.17$). We also included the auditory-only (A) condition, in which participants passively listened to the tones generated by them in the MA condition, and the motor-only (M) condition, in which participants pressed the button but no sound was delivered. We assessed MMN by comparing event-related potentials (ERPs) to deviants and self-generation effects by comparing ERPs to sounds from the MA condition, corrected for motor contribution from the M condition, to those of the same sounds from the A condition. We found MMN at fronto-central electrodes from 150–250 ms, with self-generated stimuli yielding a bigger MMN than externally-generated stimuli. This finding was primarily driven by the fact that self-generated deviants were more negative than externally-generated deviants, presumably because self-generated deviants violated two predictions: action and past experience, whereas externally-generated deviants violated one: past experience. We conclude that the predictive mechanisms underlying action and past experience are independent.

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A randomised control investigation of combined cognitive and neurofeedback training for children with AD/HD

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Objectives: There is increasing evidence that working memory and inhibitory control training can lead to behavioural improvement in children with Attention-Deficit/Hyperactivity Disorder (AD/HD). State-regulation theories of AD/HD suggest that an inability to adjust energetic state level, and consequent executive functioning issues, are at the core of the disorder. Accordingly, the present study examined the efficacy of a combined cognitive and neurofeedback training program for children with AD/HD using a randomised control design.

Methods: The final sample consisted of 80 children aged 7-12 years, 40 in the training and 40 in the waitlist (WL) condition. Training consisted of cognitive and neurofeedback tasks and took place in the children’s home, with participants required to complete between 20 and 25 sessions over a 6-8 week period. Outcomes examined included questionnaires assessing AD/HD symptom severity and frequency, performance on a digit span and counting span task, and EEG topography and power during several basic EEG tasks including resting eyes-open and eyes-closed.

Results: Compared to the WL condition, children in the training condition showed significant reductions in AD/HD symptoms overall and specifically for the hyperactivity/impulsivity symptom of AD/HD. EEG power showed typical AD/HD topographical differences at Time 1, while post-training there was evidence of a directional trend towards EEG normalisation for children in the training condition.

Conclusions: Overall the results provide support for the efficacy of a combined cognitive and neurofeedback training program for children with AD/HD.

Between emotions – Modulation of event related potentials as an early stage indicator of processing fluency

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Aims: In this study we investigated the brain underpinnings of social judgments that are based on processing ease (fluency). Behaviourally, we tested the hypothesis that the ease of facial expression processing enhances trust judgments. We based this hypothesis on the previous findings that highly fluent stimuli elicit more positive affect and are evaluated more positively, as compared to disfluent stimuli. Physiologically, we examined the temporal and spatial characteristics of ERP components associated with face processing. This can inform about the processing stages at which perception, fluency and evaluation effects occur.

Method: We tested thirty-one healthy participants (11 males, age range 19-29, M = 22.2, SD = 2.5). We presented emotional facial expressions and manipulated processing difficulty by varying the degree of emotional ambiguity and participants’ task. Presented faces exhibited either clear emotional states (pure anger or happiness) or morphed expressions gradually changing from one to another. In the control condition participants assessed the gender of presented faces—an easy task for all expressions. In the experimental condition, participants categorized the facial expressions into happy or angry. This makes processing of “pure” expressions easy, but mixed expression difficult. Afterwards, in both conditions, we collected trustworthiness ratings. During entire procedure we recorded EEG signal.

Results: Behavioural results indicate that categorization of ambiguous stimuli (morphed expressions) causes processing disfluency, as revealed in longer reaction times. Moreover, consistent with processing fluency, “pure/fluent” faces received more positive ratings in emotion categorization condition, as compared to gender categorization condition. Physiologically, we found that ambiguous faces caused smaller P1 amplitude comparing to clear facial expressions. Also at N170 potential we found the difference in processing of mixed faces, between emotion and gender condition.

Conclusion: Altogether these findings suggest that categorization of ambiguous stimuli (morphed expressions) causes processing disfluency, as revealed in longer reaction times. Moreover, consistent with processing fluency, “pure/fluent” faces received more positive ratings in emotion categorization condition, as compared to gender categorization condition. Physiologically, we found that ambiguous faces caused smaller P1 amplitude comparing to clear facial expressions. Also at N170 potential we found the difference in processing of mixed faces, between emotion and gender condition. With smaller amplitude of N170 potential for mixed faces in emotion condition compared to gender condition. We suggest that these differences observed in Event Related Potentials impact the stimuli evaluation processes as well as social judgments observed in behavioural data.

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Cortical activation effects on cognitive processes

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Electroencephalographic (EEG) activity affects stimulus-response processes marked by event-related potentials (ERPs) and reaction times (RTs), but a comprehensive understanding of these relationships within a cued Continuous Performance Test (CPT) has yet to be achieved. This study examined EEG activation from within the task (measured as the EEG difference in the pre-cue [PC] and pre-imperative [PI] periods) and from a task-related perspective (examined as the change in EEG from a resting eyes-open [EO] state to the PC period within the task) to determine performance effects in 60 participants completing a cued CPT. A series of numbers were presented where participants pressed a button to the designated Go, 9, but only when cued by 1, and refrained from responding to any cued NoGos. EEG activity in the delta to beta bandwidths was extracted via FFTs from the EO, PC, and PI periods. Imperative Go/NoGo ERPs were submitted to Principal Components Analyses, with the following components identified: CNV, N2, P3, and Slow Wave (SW). Mean Go RTs were also measured. Scalp regions of maximal changing EEG amplitude were identified and used as predictors to determine the effects of within-task and task-related activation on ERPs and RTs. Increases in within-task delta activation were directly linked to CNV peak amplitudes, and also contributed to faster RTs, and the NoGo SW negativity. Within-task reductions of alpha predicted NoGo P3 amplitude. A broadband reduction in activity levels was apparent in task-related activation that produced similar ERP relations. Delta and alpha levels were predictive of Go P3 positivity, but larger reductions in delta and theta led to greater NoGo P3 amplitude and SW negativity. The distinct characteristics of within-task and task-related cortical activation thus play a modulatory role in cognitive processes related to response execution and inhibition that affect overall task performance.

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Low frequency EEG and performance accuracy in cued contexts

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Event-related potentials (ERPs) and reaction times (RTs) to stimuli are greatly enhanced when cued. Reductions in electroencephalographic (EEG) activity in the cue-stimulus interval have been reported, but few studies have examined these in relation to stimulus-response processes. Delta, theta, alpha, and beta levels occurring immediately prior to cued stimuli were assessed here to determine their effects on post-stimulus ERPs and RTs. Continuous EEGs were recorded (N = 60) during a cued Continuous Performance Test where numbers were visually presented and a button press was required to the Go (9) when preceded by the cue (1). Cued numbers between 0 and 8 were considered as NoGos and were not to be responded to. ERPs for the cued Go/NoGos that were correctly responded to were separated using Principal Components Analyses (PCA). The maximal sites of activity were identified for the four EEG band levels in the 500 ms proceeding Go and NoGo stimuli and for ERP component amplitudes; these were then correlated. RTs were also correlated with EEG levels. EEG activity was found to be dominant across the midline, and the following PCA components were analysed: Go N2c and P3b, and NoGo N2b, P3a, and Slow Wave. A weak negative correlation with prestimulus beta levels was observed for the Go P3b, with no effects for RTs. Greater prestimulus delta and beta levels were associated with enhanced NoGo N2b amplitudes, and more theta activity was weakly linked to larger P3a positivity. These results suggest that EEG at maximal sites as a determining state measure may be suboptimal in cued contexts, and alternate measures, such as the EEG change from cue to the stimulus, should be considered. However, the contributions of delta and theta activity to cognitively controlled aspects of NoGo stimulus processing extend prior findings assessing post-stimulus band activity, and overall performance accuracy.

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Ostracism and physiological arousal following traumatic brain injury – “It might hurt but that doesn’t mean I will do anything about it”

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People with traumatic brain injury (TBI) have impoverished self-reported and physiological responses to socially relevant stimuli. This study examined the psychological and physiological effects of ostracism in 21 adults with TBI and 17 matched control participants using the Cyberball paradigm. Cyberball is a computerised task in which participants play a game of catch and throw with three other (pseudo) participants. The game is manipulated so that in the inclusion condition the real participant is included fairly in the game, while in the ostracism condition they are excluded from the game following the first few throws. Skin conductance levels (SCLs) were measured throughout the game as a proxy for social stress. Results showed that people with TBI were cognitively aware that they were being ostracised, however, that their self-reported emotional experience to social exclusion was different to that of the control group \(F(1, 35) = 4.10, p = 0.05, \eta^2 = 0.11\).

Differences in SCLs between groups and between conditions did not reach significance, nor did they correlate with behavioural responses. These findings will be discussed with regards to the consequences of dissociation between psychological and physiological measures and the implications for motivating behaviours associated with social reintegration.

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Neural correlates of impaired vocal emotion perception: New insights from principal component analysis

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Thousands of Australians suffer from a severe traumatic brain injury (TBI) each year, resulting in chronic interpersonal dysfunction and a reliance on government services. Individuals who have sustained a severe TBI predominantly experience impairments in vocal and facial recognition of emotion. Through a principal component analysis (PCA) of event related potentials (ERPs) the present study aimed to examine whether TBI impairments in prosodic processing are due to perceptual or cognitive deficits in light of Schirmer and Kotz's (2006) model.

Electroencephalography (EEG) was recorded from 19 adults with severe TBI and 19 demographically matched healthy controls while they completed a same-different emotional prosody word pair task. Participants were required to indicate with a button press if word 2 was spoken in the same (i.e., angry-angry, happy-happy, neutral-neutral) or different (i.e., angry-happy, happy-angry) emotional prosody as word 1. ERPs to word 1 and word 2 were derived for trials with correct responding, and their amplitudes were quantified in separate PCAs for each group (TBI, control) and word (1, 2). ERP and behavioural measures were assessed in relation to prosodic valence (positive/happy vs. negative/angry), emotional tone (neutral vs. emotional), and word pair congruence (same vs. different). Across the groups poorer behavioural performance was seen in the happy than angry, neutral than emotional, and different than same word pairs. Interestingly, TBI performance was poorer than controls only in the word pair congruence analysis. The PCAs revealed some difference in the ERP component sequence between word 1 and 2, and also between the controls and TBIs. Furthermore, these components were differentially modulated by prosodic valence, emotional tone, and word pair congruence. The complex pattern of results has implications for Schirmer and Kotz’s (2006) prosodic processing model and provides significant insight into the processing of vocal emotion.

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Inter-individual responses to experimental muscle pain: Baseline anxiety ratings and attitudes to pain do not determine the direction of the sympathetic response to tonic muscle pain in humans

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Sustained experimental muscle pain has been shown to bring about inter-individual differences in the cardiovascular responses, which are consistent over time (Fazalbhoy et al., 2012, 2014). Intramuscular infusion of hypertonic saline, causing pain lasting ~60 minutes results in a sustained increase in muscle sympathetic nerve activity (MSNA), blood pressure, and heart rate in certain people, while evoking a decrease in these parameters in others (Fazalbhoy et al., 2012). What brings about this divergence is unknown. Here we aimed to identify whether anxiety levels and attitudes to pain could be responsible for these divergent responses. Psychological parameters were assessed prior to the induction of pain using the State and Trait Anxiety Inventory (STAI), Pain Vigilance and Awareness Questionnaire (PVAQ), Pain Catastrophising Scale (PCS), and Pain Anxiety Symptoms Scale (PASS). PCS was also evaluated for the pain pertaining to the experiment. MSNA was recorded from the common peroneal nerve, during a 45-minute intramuscular infusion of hypertonic saline solution in the tibialis anterior of 68 awake human subjects. Fourty-one subjects showed an increase in MSNA amplitude, while 27 showed a decrease. Neither of the measured psychological parameters showed significant differences between the increasing and the decreasing groups. These results suggest that our measured psychological levels do not influence the direction of the sympathetic response to long-lasting experimental muscle pain in healthy human subjects.

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The man behind the mask: The effect of visual masks on event-related potentials elicited in response to emotional faces

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Aims: Facial expressions are an integral part of communication, and the processing of such stimuli has been shown to occur as early as 50ms. Event-related potentials (ERPs) allow great insight into understanding the time course of face processing and what factors may affect this processing. The current study investigated whether masking briefly presented emotional facial expressions influenced the ERPs elicited in response to these expressions. Method: 17 university students (8 male) viewed a series of angry and happy faces that were presented for either 30ms or 125ms and then masked by either a neutral face or a scrambled image. Allocation to neutral face mask and pixel mask conditions was counterbalanced. P100, N170, P200, N250 and LPP ERPs were examined at PO7 and PO8. Results: Amplitudes for all components were larger at PO8 compared to PO7, and larger for the pixel mask condition compared to the neutral face. Duration of presentation only showed a significant effect in the pixel mask condition, such that the angry faces presented for a short amount of time elicited a larger N170 and N250 than other faces at PO7. At PO8 the happy faces elicited significantly larger P2 amplitudes than angry, while the happy and angry faces presented at the shorter duration elicited a larger N250 than faces presented for longer durations. Conclusion: The findings indicate that the processing of emotional stimuli can occur at a subconscious level, even when masked by non-emotional stimuli. Understanding such rapid processing is key to interpreting the deficits in emotion processing that underlie many psychiatric disorders.

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The effect of attention on the loudness dependence of the auditory evoked potential in individuals with depression and healthy controls
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Aims: The loudness dependence of the auditory evoked potential (LDAEP) has been proposed as a non-invasive measure of serotonin function, showing promise as a potential electrophysiological marker for psychiatric conditions with chronic serotonergic dysfunction. To date there has been little work on the effect of attention on the LDAEP and less on this effect in individuals with depression. Thus the current study sought to further explore the link.
Method: 17 individuals with depression and 17 age- and gender-matched healthy controls completed two tasks: in one, they were asked to listen to tones and press a button when they heard a longer tone (active condition), and in the other they were asked to watch a video and not respond to the tones (passive condition). Order of these tasks was counterbalanced. Changes in the slope of N1/P2 at increasing intensities (60, 70, 80, 90 and 100 dB) were examined at Cz. Results: Analyses indicated that the slope of N1/P2 increased with increasing intensity for both conditions in both groups. For controls the slope of N1/P2 was significantly steeper for the active condition but not the passive, particularly at higher intensities, however this was not seen in individuals with depression. The N1/P2 slope for the passive condition differentiated between the control and depressed group only at the lowest intensities (60 and 70 dB), whereas for the active condition there were significant differences at both low (70 dB) and high (100 dB) intensities.
Conclusion: The results of the current study support previous findings, and further suggest that asking participants to actively attend to LDAEP stimuli may complement the traditional LDAEP techniques as a method of distinguishing between individuals with and without depression.
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Mindfulness meditation and paying attention to the heart: Preliminary findings regarding improvements in interoception after 10-days intensive Vipassana meditation
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Interoception - a self-perception of physiological activity often indexed by the ability to accurately determine one’s own heart rate without taking a pulse - is increasingly being regarded as important for understanding emotion. Individual differences in interoceptive awareness have been linked to increased emotional reactivity (Herbert et al., 2007) and ability to regulate emotions (Füstös et al., 2012), but also greater trait-anxiety (Pollatos et al., 2007) and pain sensitivity (Pollatos et al., 2012). Interoception and ways to modify interoceptive awareness remain poorly understood. This study investigated the ability of Vipassana meditation - concerned with awareness of bodily sensations and mental states – to improve interoceptive awareness. As part of a larger study into the physiological effects of Vipassana meditation, 57 participants without formal training in meditation who had signed up for an intensive 10-day silent Vipassana meditation retreat were tested twice approximately a fortnight apart; either before and after the retreat (Novice group: 42 participants); or twice before the retreat (Control group: 15 participants). At each testing session, participants attempted a standard heart beat detection task. Interoceptive awareness was significantly improved in the Novice group after the Vipassana retreat ($F(1, 41) = 7.01, p = .011, \eta^2 = .146$). This is not likely to be a simple practice effect, since no such change was observed in the Control group ($F(1, 41) = 0.54, p = .478, \eta^2 = .043$), nor was there a change in anxiety ratings for either group ($p > .05$). In conclusion, despite some recent findings to the contrary, meditative practices may have the ability not only to improve self-perceived interoceptive sensitivity, but also objectively measured interoceptive awareness.
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ERP differences between violence, erotic, pleasant, unpleasant and neutral images
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Introduction: There have been many concerns made about the non-conscious impact of exposure to violence and pornography. In our modern society where access to these stimuli is ubiquitous, the desire to investigate whether these concerns are apt is paramount. In the present Electroencephalography (EEG) study, baseline brain activity measures related to violent, erotic, pleasant, unpleasant and neutral images were taken, analysed and are shown. This forms the basis for further EEG measures related to those images after controlled exposure to violence and pornography. Methods: Fifty two male University students were recruited into the study where they were fitted with EEG recording equipment and asked to view and rate emotion inducing IAPS images of above mentioned categories. Images were presented on a screen and were categorised into 1 of the 5 categories. Participants were asked to view and rate each image based on degrees of pleasantness and arousal. EEG recordings were taken and processed and resulting ERPs were analysed. Results: Baseline EEG effects showed that viewing violent and unpleasant images elicited similar ERP curves, as does viewing pleasant and neutral stimuli. Erotic stimuli as predicted showed the biggest difference between each of the image categories. Conclusion: Results indicate that even without priming there are ERP effects, which are discernible between each category. “Violent” and “Unpleasant” stimuli as predicted showed very similar ERP curves and also as predicted, “Erotic” images elicited the most varied response.

Electroencephalographic markers of subjective cognitive performance: Implications towards electrophysiological prediction of early cognitive decline
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Background: Our cognitive skills are the means through which we perceive and interact with our environment and everything it contains. As such adequate cognitive performance is vital to our everyday functioning and life. Because of this, declines in cognitive performance or cognitive impairment can have repercussions that can affect both our occupational and personal lives. Currently, identifying cognitive impairment is mostly limited to retrospective medical audits using subjective tools; however the dynamic nature of brain activity and electroencephalography may prove to be a more effective alternative. Methods: Data recorded from 21 nurses (14 Females, aged 32.67 ± 8.58 years) and 21 healthy adult controls (14 females, aged 34.76 ± 9.15 years) was analysed in the current study. Brain activity was recorded with a 32-lead electroencephalogram which was measured for both a resting baseline phase and during an active phase involving cognitive processing using the neuropsychological Stroop test. The cognitive performance of each participant was also assessed using the Mini-Mental State Exam (MMSE) and the Cognistat assessment tools. Results: Numerous electroencephalographic variables (both baseline and changes from baseline to active phase) such as delta, theta, alpha, beta and gamma activity were significantly associated to both global and domain specific cognitive performance derived from the MMSE and Cognistat (p < 0.05). Subsequent multiple regression analysis yielded initial predictive models identifying individual EEG variables that were the strongest predictors of the different cognitive variable such as global cognition, memory and spatial construction. Conclusions: The study tentatively demonstrates that the dynamic nature of brain activity may allow prediction of not only global cognitive performance, but also domain specific performance in cognitive domains such as memory and spatial construction. The current predictor models can be further developed using hybridisation, and/or more advanced analysis such as Support Vector Machines and Neural Network that may enhance predictive capabilities.

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Age-related differences in physiological responding to simulated electronic gambling

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Older adults aged 65 years or more are increasingly spending their time and money playing electronic gambling machines (EGMs). Consistent with the age-related positivity effect, the current study predicted that older adults would respond more positively than young adults to wins and fake wins (i.e., losses disguised as wins) during simulated EGM play. Autonomic measures of positivity are particularly important as they could help to explain older adults’ attraction to gambling. In the current study, young (n = 19; age range 18-35 years) and older adults (n = 26; age range 66-84 years) were given 1000 credits (i.e., $10) to bet with (10 credits per bet). They completed two blocks of 80 bets each that consisted of 15% wins (60 credits), 15% fake wins (5 credits), and 70% losses. A 5.5 s epoch (1.5 s pre- to 4 s post-outcome) of skin conductance response (SCR) and heart rate (HR) was analyzed. We found that HR increases did not differentiate outcome type, and were greater for young than older adults. Averaged across age group, SCR was greater for wins than losses, but did not differentiate losses and fake wins. This may be because the additional positive feedback that accompanies a fake win in commercial EGMs was removed from the current simulated version. The age groups also did not differ in self-reported enjoyment or excitement. Although the age-related positivity effect has previously been demonstrated in behavioral and neural data, there was no evidence for this effect in the current study, and the results do not support the notion that age-related positivity contributes to the maintenance of gambling. Rather, during EGM play, older adults experienced hypoarousal.

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Intensity and trial effects for simple auditory stimuli in a dishabituation paradigm

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Aim: We examined the influence of novelty and intensity in the rarely used auditory dishabituation paradigm. Stimulus-response (S-R) patterns were examined for autonomic and central measures and quantitatively compared to the phasic skin conductance response (SCR) –the OR benchmark. Differing patterns consistent with Preliminary Process Theory (PPT) were sought. Method: Sixteen undergraduates experienced twelve 1000 Hz tones (60/80 dB, 50 ms with 15 ms rise/fall times) presented with random ISIs (45 to 70 s), and no task requirements. Subjects were counterbalanced according to the starting tone intensity. The first 10 standard trials were of one intensity, followed by a change trial at the other intensity (recovery), and a subsequent dishabituation trial at the initial tone. The SCR, Evoked Cardiac Response (ECR), Respiratory Pause (RP), Peripheral Vasoconstriction (PVC), and single-trial ERPs from 19 sites, were collected. EOG-corrected ERP data were submitted to a temporal Principle Components Analysis (PCA). Novelty was assessed via trial decrement, and intensity via the group × trials interaction at recovery. Results: SCR displayed decrement, recovery (trials and group × trials), and dishabituation. Three S-R patterns emerged based on the SCR S-R pattern, correlation analysis, and temporal PCA groupings. Pattern 1 (novelty and intensity insensitivity): HR, P1, PN, and P2. Pattern 2 (no decrement but intensity sensitivity): PVC, Na, N1-1, and P3a. Pattern 3 (novelty and intensity sensitivity): SCR, RP, P3b, HabP3, IntP3, and SW. Conclusions: The S-R patterns of the autonomic measures were generally consistent with previous findings. Each pattern contained both autonomic and ERP measures. Various ERP components failed to differ from the hallmark S-R pattern of the OR. Fractionation of responses was found for both autonomic and central measures, and their patterns were consistent with PPT.

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Do top-down processes influence involuntary attention in the elderly?
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To efficiently process target sounds in an environment that consists of targets and non-targets requires that the irrelevant non-target sounds be ignored. Irrelevant sounds can however interfere with task performance because they involuntary capture attention (auditory distraction). In younger adults, such interference can be reduced by top-down executive control, i.e., by paying extra attention to the task. The extent to which elderly adults can employ such a mechanism is not yet known. To answer this, we recorded event-related potentials from older and young adults during an auditory-visual distraction task. The participants performed either a simple visual classification task or an n-back working memory version. Concurrently, they were exposed to either a standard tone (600 Hz; 80%) or various novel environmental sounds (20%). The auditory distraction caused by the novel sounds was compared for young and older adults as a function of type of classification task performed. The results showed that: 1. The distractor sounds in the higher cognitive load visual task (n back) had a greater effect on elderly participants in terms of reaction times (slower) and error rates (higher). 2. Nevertheless, the older adults exhibited a larger attenuation of the P3a response (a neural indicator of auditory distraction) than young adults. 3. The MMN (an index of change detection) was also greater in the elderly. These results suggest the elderly pay more attention to the difficult n back task than young adults and this greater allocation of resources to the task results in a weaker response to the distracting sound (hence a smaller distraction effect at the neural level). Furthermore, this concentration of resources on guarding against distraction may compromise response execution, leading to slower, more error prone responses.

Electromyographic evidence for the valence of electronic gambling responses in young and older adults
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Older adults report significantly higher gambling frequencies compared with gamblers in Australia, and electronic gambling machines generate the second-highest gambling revenue. Age-related increases in EGM play may be partly attributable to the age-related positivity effect whereby attention is greater for positive (win) relative to negative (loss) information as we age. Facial electromyography (EMG) of the zygomaticus (cheek) and corrugator (brow) muscle regions was used to measure positive and negative responding, respectively. Young (n = 20; age range 18-35 years) and older adults (n = 26; age range 65-85 years) were given 1000 credits ($10) to bet with in a simulated electronic game, and each bet cost 10 credits. After every win (50 credits) and fake win (5 credits), participants were forced to choose red or black to double their win or lose it. There were 40 such double-or-nothing features and the probability of winning was 50%. EMG was continuously recorded and analyzed as percentage change in activity every 1 s from a 2 s baseline to 6 s post-outcome. Both age groups responded with a greater increase in zygomaticus activity to losses than wins, and this muscle activity increased in response to wins only for the younger adults. Averaged across age group, corrugator activity initially relaxed below baseline for both wins and losses, and then increased back to baseline for wins followed by losses. Interestingly, inspection of video recordings of the participants revealed that the increased smiling and relaxed brow to losses was associated with an emotion that might be described as ‘disappointed smiling’, while the similar muscle pattern indexed positive affect in response to wins. However, cheek activity to wins was only evident among the young adults. Therefore, older adults seem less disappointed by a loss and less positive about a win, perhaps reflecting improved emotion regulation with age rather than an age-related positivity effect.

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Autonomic responses to electronic gambling wins and losses of equivalent magnitude

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Previous electronic gambling machine (EGM) studies have measured phasic heart rate (HR) and skin conductance responses (SCRs) to show that wins are more arousing than losses. However, it is unclear if this is because wins are typically of larger magnitude and reduced frequency relative to losses, or if participants are responding specifically to the financial gain. The current study therefore examined whether win and loss outcomes of the same magnitude and frequency would generate HR and SCRs relative to baseline, and whether the magnitude of these responses would differ as a function of the event type (win, loss). As an exploratory aim, we assessed whether there are age differences in autonomic responding to EGM outcomes. Young (n = 19; age range 18-35 years) and older participants (n = 26; age range 66-84 years) were given 1000 credits ($10) to bet with on a simulated EGM, and each bet cost 10 credits. After every win (60 credits) and fake win (5 credits), participants were forced to choose red or black to either double their win or lose it. For example, a win of 60 credits could subsequently result in a further gain of 60 credits or a loss of 60 credits. There were 48 such double-or-nothing features and the probability of winning was 50%. HR and SCR were continuously monitored and were then analyzed every 0.5 s from 1.5 s pre- to 6 s post-outcome. Wins and losses produced HR and SCR increases relative to baseline, but unlike previous studies, responding was not larger to wins relative to losses. Similarly, older adults’ SCRs were greater for larger outcomes following a win compared with smaller outcomes following a fake win. In summary, autonomic responding to wins may index generalized excitement rather than financial gain for both young and older adults.

Neural reactivity to monetary gain and loss in depression and anxiety

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Converging evidence from electrophysiological and neuroimaging research suggest that reduced reward responsiveness may be a potential biological marker of pathology and risk for depression. At the same time, there is evidence in support of a heightened sensitivity to threat (of danger or loss) as a core mechanism of anxiety. It is known that depression and anxiety have a strong shared genetic liability and co-occur far beyond chance, particularly major depressive disorder (MDD) and generalized anxiety disorder (GAD), suggesting there may be common mechanisms for these psychopathologies. Direct comparison of MDD and GAD provides a particularly conservative test of processes that are shared and specific in anxiety and depression. The Monetary Incentive Delay (MID) task assesses anticipation and consumption of monetary gain (reward) and loss (conceptualized as threat). The present study utilized functional magnetic resonance imaging (fMRI) to explore neural reactivity during the MID task in adults diagnosed with MDD (without GAD; N=16), GAD (without MDD; N=13), and healthy controls (with no history of psychopathology; N=13). Preliminary results revealed a similar pattern of neural responses in the clinical groups to both anticipation and consumption of reward. In contrast, the GAD-only group displayed reduced activity in striatal regions (nucleus accumbens, putamen, caudate), frontal regions (orbital, medial), anterior cingulate cortex, and insula during anticipation or consumption of threat, compared to the MDD-only group. These results suggest that blunted reward responsivity is a shared process and potential mechanism of comorbidity in MDD and GAD. The disorders diverge however in their neural reactivity to threat (loss). Implications for treatment intervention and theoretical conceptualisation of emotional disturbance will be discussed.

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The magnitude of suppression to self-initiated sensations is dependent on the initiating motor-action

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Background: Self-initiated auditory sensations have been found to elicit smaller N1 amplitudes in the auditory evoked potential compared to physically identical externally-initiated sensations; this has been dubbed ‘N1-suppression’. The magnitude of N1-suppression is typically larger to sounds evoked by willed vocalizations compared to sounds evoked indirectly by motor actions (e.g., button-pressing for tones). While this effect may be due to a learning effect (i.e., auditory sensations are more likely to result from mouth movements than finger movements), it may also be due to the different sensations elicited in the different conditions.

Methods: The present study compared the magnitude of N1-suppression to three different types of motor movements, namely, mouth movements, finger movements and eye movements. Twenty-five healthy individuals underwent Event-Related Potential (ERP) recording. Participants were required to either blow into a microphone (Blow condition), press a button (Press condition) or move their eye (Saccade condition) to generate a simple auditory tone. N1-suppression was calculated for each of the three conditions by subtracting the N1-amplitude for each condition from the External condition, where the auditory stimulus was generated automatically by the computer.

Results: There were marked differences in N1-suppression between the 3 conditions. N1-suppression was largest in the Blow condition and smallest in the Saccade condition, with the Press condition showing intermediate levels of N1-suppression.

Conclusions: The results of the study indicate that when holding auditory stimulus constant the magnitude of N1-suppression is dependent on the eliciting motor action; mouth movements are associated with higher levels of N1-suppression than eye-movements, with finger-movements in-between. These results suggest that N1-suppression is influenced by prior ‘learning’ as to the likelihood that a given motor action will result in an auditory sensation.

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The prevalence of the negativity bias on associative learning in major depressive disorder

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The Negativity Bias is the distinctive tendency to perceive and learn all stimuli negatively, and is considered an important aspect in the aetiology of Major Depressive Disorder (MDD). It is hypothesised that due to this bias, learning occurs differently for depressed individuals, in that they form more negative learning associations than positive ones. In order to investigate the extent to which learning in depression is influenced by the Negativity Bias, 40 adults completed a visual conditioning task where faces were paired with emotional stimuli to ascertain whether negative stimuli influenced learning more than positive or neutral stimuli. Depressed participants exhibited evidence of learning, however it was potentially in response to the arousal elicited by the stimuli, as opposed to stimulus valence. These findings have important implications for depression’s pathophysiology, which in turn may influence how the disorder is treated in the future.

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The psychophysiology of sport and exercise
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A psychophysiological perspective offers many advantages to advancing theory and practice in sport. It also presents several challenges. Research will be reviewed that shows how physiological measurements have increased our understanding of affective states and cognitive processes in sport and exercise, particularly in regards to the effects of different attentional focus strategies and goal setting. Measures discussed will include ECG, EMG, VO2, and respiratory flow and the sport tasks will include golf, pistol shooting, cricket, cycling, rowing, running, and strength training. In this work, a triangulation of physiological-motor-verbal data has proved to be a useful framework to address the theoretical and methodological challenges that result from a psychophysiological approach. Practical applications, including a cognitive training approach to biofeedback enhanced sport performance, are also discussed.
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The effects of introducing probe stimuli on background psychophysiological states during video viewing
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The probe stimulus method has been used for assessing the level of engagement in a video clip. Event-related brain potentials (typically, the P3/P300 component) are recorded in response to stimuli that are irrelevant to the video clip. The higher the level of engagement in the video, the more attentional resources are allocated to it and the lower the amplitude of the probe-evoked P3. However, it is unclear whether introducing probe stimuli affects background psychophysiological states during video viewing. In this study, we conducted two experiments to address this issue. To manipulate the level of engagement, we selected two video clips with audio and asked the participants to view one of the clips four times before the experiment. They then viewed a new video clip and the repeated one while the electroencephalogram (EEG) and heart rate were recorded. The new video clip was rated as more engaging than the repeated one. In Experiment 1, 16 university students viewed the video clips without probe stimuli. The alpha-band EEG power and heart rate were significantly lower when the participants were viewing the new video clip than when viewing the repeated video clip. In Experiment 2, another 15 university students viewed the same video clips, but this time, a 2000-Hz probe stimulus was presented concurrently with a random interval of 5 to 7 s. A button-press response to the tone was required. The amplitude of the probe-evoked P3 was lower for the new clip than for the repeated clip, which is consistent with previous findings. However, the differences in alpha-band EEG power and heart rate between the video clips diminished. The results suggest that although the probe stimulus method is useful in assessing the level of engagement, it may obscure the differences in psychophysiological measures that are observed in natural settings without probe stimuli.
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Impairment in predicting reward value when contingencies change after severe traumatic brain injury
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Aims: Socially inappropriate behaviour after severe traumatic brain injury (TBI) has been associated with impairments in reversal learning, suggesting that it may result from an inability to update behaviour when social reinforcement contingencies change. One reason that people with TBI may be unable to update responding is that they are unable to update information about the value of an expected reward. This study aimed to determine whether participants with TBI could update information about the value of a predicted reward when reinforcement contingencies change. Method: Eighteen participants with TBI (14 males, mean age 42.7) and 18 control participants (13 males, mean age 43.1) completed a simple reinforcement learning task in which they learned which stimulus predicted high reward (50 points) and which predicted low reward (1 point). The reinforcement contingencies were reversed half way through the task. Reward positivity was measured as the mean amplitude 300-400ms after the predictive stimulus was displayed. Results: In both the TBI and control group, 12 of the 18 participants demonstrated an electrophysiological differentiation of the high and low reward prediction cues in the learning phase before contingencies were reversed. A repeated measures ANOVA with control participants who did differentiate high from low reward cues in the learning phase revealed a significant main effect of reward, $F(1,11) = 19.05, p = .001, \eta^2 = .63$, but no main effect of phase, and no significant interaction. A repeated measures ANOVA with the TBI group who differentiated high from low reward in the learning phase revealed a trend toward a significant interaction, $F(1,11) = 4.58, p = .056, \eta^2 = .29$. Conclusions: The control participants who demonstrated an electrophysiological differentiation between the high and low reward cues, but not those with TBI, were able to update these contingencies when they were reversed. This inability to update information about the value of an expected reward may contribute to inappropriate social responding.
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Presentation order modulates responses to standards and deviant tones in MMN paradigms
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The evoked response to a rare deviation in a sequence of regular sounds can be modulated by presentation order such that responses are smaller for tones that were previously presented as regular repeating “standards”. In this study the effect of presentation order is examined for responses to both standard and deviant tones in two experiments (frequency and duration) using sequences of sound comprising blocks in which two tones alternate roles as a common standard ($p = 0.875$) or rare ($p = 0.125$) deviant (1000Hz vs. 1200 Hz or 60ms vs. 30ms, respectively). Participants heard six sequences of sound organized into “order” pairs. Order was defined by which sound was the first-deviant. Sequences contained 1920 sounds presented at regular 300ms intervals. Pairs began with a “stable” sequence containing four blocks of 480 sounds (~ 2.4mins) followed by an “unstable sequence” containing 12 blocks of 160 sounds (~0.8mins with deviant and standard roles alternating over blocks). In order 1 the higher frequency sound and the longer duration sound were first-deviants for the frequency and duration experiments, respectively. In order 2 the initial roles (standard and deviant) were reversed. In order 3 the initial roles were reinstated (same as order 1). Response to both standard and deviant tones in the stable sequences were analysed in separate repeated measures ANOVAs for each experiment with within subjects factors of tone (2 levels) and order (3 levels). A significant tone by order interaction was present in every case ($p < .05$). Sounds first encountered as a deviant at sequence onset elicited larger responses (more negative) in the role of deviant and smaller responses (more suppressed) in the role of standard. A potential explanation of this order effect, the initial high-information value assigned to the first-deviant, is discussed in the context of network models of MMN.
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Impaired mu suppression to negative affect in traumatic brain injured patients
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Background: The disrupted capacity to understand, process and express emotional information found in people with severe traumatic brain injury (TBI) has a major impact on their social functioning. Around two thirds of patients with TBI experience deficits in arousal and emotional responsivity. The discovery of the mirror neuron system (MNS) in the human brain has provided a neurobiological substrate for understanding human social cognition directly relevant to the emotional processing deficits observed in TBI. While a large body of research has investigated MNS function in Autism Spectrum Disorder (ASD), there have been no studies investigating MNS functioning in individuals with TBI. However, this group represents an important opportunity to examine MNS function in a population with an acquired social cognition deficit, in contrast to the developmental deficit found in ASD.

Method: 19 adults (15 male, age 44.9, SD = 13.7), who had sustained a TBI, and 19 age, gender and education matched healthy controls participated. Electroencephalography was recorded while participants viewed repeated presentations of happy and angry facial expressions. Event-related power in the lower alpha (8-10 Hz) and upper alpha bands (10-12 Hz) was derived for expression (happy vs. angry), and group (TBI vs. Controls).

Results: Suppression was found in the lower alpha band to the happy but not the angry faces for both groups. For the upper alpha band suppression was found to both facial expressions, and this was larger to angry faces for controls compared to the TBI group (F(1, 36) = 9.7, p < 0.001).

Conclusion: These findings suggest disrupted functional connectivity in neural networks that process negative affect following TBI. Possible treatments to repair functional connectivity will be proposed.

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The social function of tears in crying
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Despite various accounts of the function of tears over the last 150 years, scant research exists investigating its role in signalling sadness. In a set of three studies, we tested the hypothesis that tears signal the intensity of a person’s emotion and thus serve an important social function. In the first study, participants rated photos of men and women expressing sadness with either tears present or digitally removed from the faces. Analyses revealed that the presence of tears led to ratings of greater sadness (especially toward males) and more genuine emotion. In the second study we measured physiological responses to the same images used in Study 1. Forty photos were presented for 4 seconds each while facial electromyography (EMG) from the corrugator and zygomaticus muscle regions was recorded. Participants’ ratings of sadness and genuineness were nearly identical to those of Study 1. Corrugator activity was greater when tears were present versus when they were removed.

In study 3, the role of culture was investigated using Caucasian and Asian participants. Participants viewed 40 images of Caucasian and Asian sad faces with no tears or tears digitally added. Self-reports revealed tears to be sadder and more genuine than no tears across all groups. However, females were overall perceived as sadder and more genuine than males. Interestingly, Caucasian participants showed no differences between groups in either their self-report or facial EMG. Asian participants, on the other hand, rated Caucasian faces as sadder than Asian faces when tears were present. However, more corrugator activity was displayed when viewing Asian male faces compared to Caucasian males when tears were present. Additionally, Asian participants showed less corrugator for Asian male faces compared to Asian females with no tears. We discuss our results with respect to the possible social benefits expressing tears may have.

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Using evoked brain rhythms to investigate the role of brain functional connectivity in cognition
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It is now appreciated that cognitive and affective processes are mediated by intercommunicating networks of cortical, subcortical and cerebellar regional activity. Furthermore, communication between and within cortical networks (cortico-cortico communication) is now understood to be mediated by synchronous oscillatory activity extending a wide frequency range from low frequency delta activity to high frequency gamma activity. In this address, I will review a number of studies using steady state visually evoked potential partial coherence as a measure of cortical network functional connectivity and use these as a stepping stone to discuss two organizational principles determining cortical network function. One of these is the role catecholamine neuromodulators as network ‘decoupling’ agents while the other is the role and significance of the frequency of synchronous oscillatory activity as a factor mediating top-down and bottom-up cortico-cortico communication.
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Brain functional connectivity, dopamine and the default mode network in ADHD
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Recent evidence suggests that Attention Deficit Hyperactivity Disorder (ADHD) is associated with reduced inhibition of the default mode network (DMN) while performing a cognitive task. In this study, we use steady state visual evoked potential event related partial coherence as a measure of brain functional connectivity to examine functional connectivity differences between a control group of 25 boys and an age/IQ matched group of 42 boys newly diagnosed with ADHD. Functional connectivity was estimated while both groups performed a low demand reference task and the A-X version of the continuous performance task (CPT A-X). Functional connectivity estimates were repeated in the ADHD group 90 minutes after the administration of the first dose of methylphenidate (Ritalin). Controls exhibited high parieto-frontal connectivity during specific components of the reference task and this was suppressed during the equivalent point in time in the more demanding CPT A-X task. By contrast, the pre-methylphenidate ADHD group exhibited a robust increase in parieto-frontal functional connectivity during the CPT A-X task. The administration of methylphenidate reversed the increase in parieto-frontal connectivity and appeared to normalize the pattern of functional connectivity in the ADHD group. These findings will be discussed in the context of the possible role of the DMN in ADHD symptomatology.
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KIBRA rs17070145 polymorphism and resting EEG spectral activity: Biomarkers for reduced risk of Alzheimer’s disease

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KIBRA (KIdney/BRAin) is a cytoplasmic protein encoded by the WWC1/KIBRA gene and is primarily expressed in memory-related regions of the brain (hippocampus, cortex). A functional Single Nucleotide Polymorphism (SNP) (rs17070145) within KIBRA has been associated with memory performance and Alzheimer’s disease risk. Recent work has demonstrated that KIBRA T allele carriers have significantly better episodic memory scores than non-carriers, and a reduced risk of Alzheimer’s disease. Identifying EEG biomarkers of KIBRA T allele carrier status may further our understanding of the impact of this SNP on neural networks, and early risk factors for Alzheimer’s disease. Sixty-one young adults had their resting EEG activity continuously recorded from 30 scalp sites for 2 minutes with their eyes open. Participants also completed a computerised neurocognitive test battery (CogState), and provided a saliva sample for DNA extraction and analysis. Mean EEG band power was computed across the 2-minute block for delta, theta, alpha, beta, and gamma. The genotyping for KIBRA rs17070145 polymorphism was performed using Sequenom MassARRAY® genotyping assay. KIBRA T allele carrier status was related to delta and theta only, with greater delta power at the vertex and midline parietal sites, and reduced theta power centrally on the left for T allele carriers. Increased delta levels also improved reaction time in a sustained attention task independent of KIBRA T allele carrier status. Results indicate that delta and theta power are modulated by KIBRA. Given the role of the hippocampal-cortical memory system in the generation of slow wave activity, further work should explore whether KIBRA affects this neural network during cognitive tasks, and whether this activity is associated with Alzheimer’s disease risk.

Validating the use of emotiv EPOC in resting EEG coherence research

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Introduction: Resting electroencephalographic (EEG) coherence provides an index of baseline functional connectivity between regions of the brain and has a variety of important applications in neurocognitive and clinical research. However traditional EEG cap fitting and calibration procedures can be extensive and intimidating especially for child and clinical populations. Alternatively, a portable, wireless and easy-to-fit EEG gaming system (Emotiv EPOC®, www.emotiv.com) has been recently manufactured but not validated for use in resting EEG coherence research. To this end, the present study assessed the equivalence in EEG coherence as recorded by Emotiv EPOC and research-based Compumedics Neuroscan systems. Method: Sixteen adult participants completed 3 blocks of resting EEG (eyes-closed, eyes-open, eyes-closed) with each recording system in counterbalanced order across participants. Neuroscan recordings were downsampled to 128Hz to match the Emotiv EPOC recordings, and coherence between 25 electrode pairs were computed for each of the traditional frequency bands (delta, theta, alpha, beta), resting condition, and recording device. Results: Across participants, the Emotiv EPOC derived coherence values were generally smaller than those from the Neuroscan data, particularly in delta. However, the alpha band coherence values were comparable between the recording devices in the eyes-open condition. Analysis revealed significant correlations between the coherence measures derived from the Emotiv EPOC and Neuroscan recording systems in each assessed band and condition. Conclusion: The present findings suggest that Emotiv EPOC offers a reasonably valid measure of resting EEG coherence across eyes closed and eyes open conditions. Future endeavours in refining the Emotiv EPOC headset/recording system will be invaluable, especially in its application for use in child and clinical research.

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Investigating the influence of cross-modal temporal correspondence on EEG entrainment: A comparison between children and adults

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The relationship between the temporal features of cross-modal stimuli can facilitate the integration of information across separate sensory systems, i.e. multisensory integration. Prior neurophysiological research has shown that cross-modal temporal correspondence can increase the magnitude and phase coherence of oscillatory neural activity, a potential mechanism for the binding of cross-modal information. Little research has explored the role of temporal correspondence in multisensory integration in children. The current study aimed to extend prior research by comparing the influence of cross-modal temporal correspondence of acoustic and tactile stimuli on EEG entrainment across children and adults.

Method: Child and adult EEG activity was recorded while participants were presented with either auditory or tactile stimuli alone (i.e. unisensory) or audio-tactile multisensory stimuli. Two temporal rates were used to drive all stimuli including 23 and 40 Hz. The cross-modal correspondence between the temporal rates of the multisensory stimuli varied across two conditions: Same (i.e. the same cross-modal rate) and Different (i.e. different cross-modal rates). To measure the influence of temporal correspondence on the entrained oscillatory activity both FFT and inter-trial phase coherence (ITC) measures were extracted to examine EEG entrainment at the frequency of stimulation (i.e. steady-state response (SSR)).

Results: Results revealed that the influence of temporal correspondence on the SSR followed a similar pattern across child and adult participants. Responses were largest for multisensory stimuli that shared the same cross-modal temporal rate (i.e. the Same condition). This suggests that cross-modal temporal correspondence increased both the magnitude and phase coherence of the SSR. Conclusions: This study showed that increased temporal correspondence between acoustic and tactile multisensory stimuli led to enhancements in EEG entrainment in both children and adults, a potential mechanism for multisensory integration. This potentially suggests that the mechanisms underlying multisensory integration in children and adults are both governed by similar temporal principles.

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Psychophysiological indices of predictive processing: New insights from mismatch negativity (MMN)

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The brain has excellent mechanisms for filtering relevant from irrelevant information. In goal directed behaviour, relevance filtering processes help optimise behavioural performance by directing attention towards relevant input, and protecting limited attentional resources from being interrupted by task-irrelevant information. However this capacity to focus attention must be balanced against the need to remain alert to any changes in the environment that may be important. Prediction modelling of sensory activation is an essential component of this process. Regularities in the sensorial environment facilitate predictions about the likelihood of upcoming sensory input (or rather, the resultant neural response to these inputs). Prediction models therefore facilitate “suppression” of response to anticipated states of activation while response to unanticipated input is enhanced- a process that therefore gives priority to input carrying new and potentially relevant information. The mismatch negativity (MMN) component of the auditory evoked potential emerges as a result of this process. Elicitation of MMN is evidence that the current sensory input was not predicted as a likely occurrence in the present context. The presence and amplitude of MMN have long been considered to reflect a faithful representation of probabilistic inference with amplitude inversely proportional to the likelihood of the eliciting event. In this talk I will present the results of a series of studies that challenge the notion that the inferential processes underlying MMN reflect simple statistical inference. I will present a case that this system is in fact subject to biases that reveal a more sophisticated application of relevance filtering that can distort or modulate how we learn.

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Determination of the prevalence of depression among the elderly using the Geriatric Depression Scale
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Background: Geriatric mental health is emerging as an acute public health concern. In the older population, mental disorders, such as depression, can significantly affect one’s physical health and prognosis of a disease. Depression, a silent disorder, largely remains untreated because health assessment is generally focused on the physical medical conditions of patients. This study sought to determine the incidence of depression in the geriatric population of an elderly community in Quiapo, Manila, Philippines.

Materials and Methods: A descriptive, cross-sectional study of 35 subjects that are part of the geriatric population (52 years old and above) in St. John of God Elderly Association, was conducted via survey using the Geriatric Depression Scale Form (GDSF). On August 9, 2014, all the respondents were interviewed using the GDSF. The questionnaire consists of 15 close-ended questions and there are corresponding points for each answer. A total of greater than five implies depression of the elderly subject. The respondents are predominantly female (34 females and 1 male) with a mean age of 67.2 years old.

Results: Only 31.43% (11 out of 35) exhibited GDSF scores that are greater than five (5) which indicates depression. Results show that the incidence of depression occur in 11 out of 35 respondents (31.43%). Symptoms of depression are infrequent among Filipino geriatrics in the selected community in Quiapo, Manila. Still, in the study, the GDSF proved to be an accessible tool in the assessment of depression.

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Trust, schadenfreude, guilt, and the shapes of rocks on a New Hampshire farm
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In this talk I will review three lines of research from the UQ Social Neuroscience Lab on intergroup emotions: (1) perceptions of intergroup distrust, (2) schadenfreude, and (3) collective emotions on the brain. The first trio of studies examined how perceptions of trust in strangers is moderated by facial features, as well as whether or not the target person shares a group membership with the perceiver. The second group of studies focused on how people in a group respond when their group is the target of laughter from an opposing group when the ingroup has suffered a misfortune. Finally, the third set of studies that I will present looked at how feelings of "collective guilt"—how responsible one feels for the negative actions of one’s group—are related to a possible neural marker (i.e., an event-related potential component) of collective emotions. Each of these sets of studies used artificial groups (e.g., the red vs. the blue team) and psychophysiological measures (e.g., facial EMG, EEG) to examine emotional processes that might not otherwise be revealed via more standard self-report measures. Rather than treating emotions as a simple matter of one or two affect dimensions (e.g., positive or negative valence), our approach underscores the importance of taking a functional approach to specific emotions, as many likely evolved in a social context.

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Phasic arousal during gambling: A comparison of younger and older adults
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The largest growth in gambling participation is among older adults who additionally show an increased preference for electronic gambling machines (EGMs) over other forms of gambling. The present study aimed to investigate if the greater appeal of EGMs among older adults was associated with age-related differences in arousal following wins and losses, and to biased recall of wins and losses. Younger (n = 26; age range 18-34 years) and older adults (n = 20; age range 59-83 years) played a simulated EGM, whilst their skin conductance levels (SCLs) were monitored, as a measure of arousal. SCL changes associated with bet and bet-outcomes were captured by analyzing an eight-second epoch (2 s pre- and 6 s post-outcome). SCL changes were assessed as a function of age, outcome type (win, loss), and risk level (low, high). The low risk bet consisted of a choice of one of two colors (red, black), while the high risk bet consisted of a choice of one of four card suits. Results indicated that larger SCLs were elicited for wins than losses, and for high than low risk bets, and these effects were significantly stronger among younger than older adults. Indeed, relative to younger adults, older adults had smaller SCLs averaged across risk and outcome. There was no difference in recalled wins between the two age groups, but older adults recalled fewer losses. Overall, the research indicates that older adults are hyposensitive to both wins and losses, which may be related to their ability to better regulate their emotions. Older adults’ reduced recall of losses is consistent with substantial evidence for an age-related positivity effect in attention and memory.

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Distinct developmental changes in auditory and somatosensory N1 ERP enhancements at rapid stimulus intervals
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Prior ERP research reveals dramatic developmental changes in event-related potential (ERP) components, where adult-like ERP components are not typically observed until 12-15 years of age. This has been consistently demonstrated for the auditory ERP where the N1-P2 components predominate in adults while in children the auditory ERP is characterised by the P1-N2 components. However the nature of the correspondence between ERP components in children and adults is not well understood. The aim of the present study was to better understand the relationship between ERP components in children and adults by examining the extent to which ERP components in children are differentially sensitive to rapid stimulus onset asynchrony (SOA) as has been previously established in adults. To achieve this EEG recordings were undertaken in 43 adult (mean age 27.9yrs) and 12 child (mean age 6.1yrs) participants while auditory and tactile stimuli were presented at random SOAs between 50 and 650ms. The resulting ERPs were then subaveraged according to modality (auditory or tactile), SOA (100ms SOA ranges) and sequence (auditory-auditory or tactile-tactile). To minimize distortion resulting from ERP response overlap at short SOAs the subaveraged ERP waveforms were corrected using the ADJAR correction procedure. The results replicated prior ERP research in adults where the N1 ERP component was enhanced at SOAs below 300ms relative to longer SOAs for both auditory and somatosensory responses. In contrast, only the somatosensory N1 ERP component showed evidence of enhancements in children. Consistently, the morphology of the child somatosensory ERP response was found to be similar to that of adults, while the auditory ERP response differed dramatically. The results are discussed in terms of neuroanatomical evidence suggesting a more rapid developmental trajectory of somatosensory relative to auditory cortex and the extent to which ERP components in children reflect similar cortical activity observed in adults.

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Modulation of time perception by eye movements
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The perception of time is intricately linked to attention. Overt shifting of one’s attention involves foveating to the area of interest through ballistic eye movements known as saccades. However, the direction of gaze does not always indicate one’s attentional focus because attention shifts also occur covertly in the absence of saccades. Microsaccades are small eye movements that occur during eye fixations and underlie covert attention shifts (Engbert and Kliegl, 2003). In the present study, we investigated whether saccades and microsaccades impact interval timing. Participants were asked to memorise the duration of a six-second visual (Experiment 1) or auditory (Experiment 2) stimulus and to then reproduce that duration in subsequent test trials. In three of the four test conditions, the interval timing trials included a secondary cue discrimination task. Participants were required to foveate to stimuli appearing in the periphery (Saccade-Discrimination), maintain fixation in the center despite appearance of peripheral stimuli (No Saccade-Peripheral Discrimination), or maintain central fixation with stimuli appearing in the center (No Saccade-Central Discrimination). In the fourth condition, participants did not perform saccades or the discrimination task (No Saccade-No Discrimination). Using mixed effects modelling, we examined the relationship between saccade duration and reproduced duration in the Saccade-Discrimination condition and between microsaccade duration and reproduced duration in all No Saccade conditions. Saccade duration positively predicted reproduced duration in both experiments. In addition, microsaccade duration positively predicted reproduced duration for all No Saccade conditions in Experiment 2. However, this relationship was only found in the No Saccade-Central Discrimination and the No Saccade-No Discrimination condition for Experiment 1. Taken together, the results suggest a role of both saccades and microsaccades in visual attention and time perception.