23rd Australasian Society for Psychophysiology Conference

& Annual Meeting of the Australasian Society for Psychophysiology

PROGRAM, ABSTRACTS AND INFORMATION

Hosted by the School of Psychology and Faculty of Social Sciences at the University of Wollongong

University of Wollongong
November 20 – 22 2013
Capture Natural Behaviour with the Mobile Eye XG

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- People walk up/down hills, stairs, etc.
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Welcome

Welcome to the 23rd Annual meeting of the Australasian Society for Psychophysiology at the University of Wollongong. The 3 day conference will feature a range of fascinating keynote speakers, scientific plenary sessions, methods workshops, poster session, and two social events. Day 1 will end with a celebratory reception and poster session, with the conference dinner to be held on Thursday 21st November at a picturesque location near Wollongong’s South Beach. The conference brings together researchers from psychology, psychiatry, and neuroscience, with a focus on relationships between the brain and behaviour. We hope you find the conference program to be stimulating and thought-provoking!

ASP2013 Organising Committee

Convenors
A/Prof Stuart Johnstone, Dr Samantha Broyd, Ms Frances De Blasio

Scientific Committee
Robert Barry, Frances De Blasio, Jacqueline Rushby, Bill Budd, Samantha Broyd, Stuart Johnstone

Support Team
Diana Karamacoska, Jay Borchard, Adam Verrender, Felicity Webster

Along with our other sponsors and exhibitors, ASP2013 is proudly sponsored by:

FACULTY OF SOCIAL SCIENCES

SCHOOL OF PSYCHOLOGY

CENTRE FOR PSYCHOPHYSICS
PSYCHOPHYSIOLOGY & PSYCHOPHARMACOLOGY
Registration and Conference Information

Venue and times

ASP2013 will be held in Theatre 4 and the adjacent foyer of the Communications Building (Building 20) at the University of Wollongong, Northfields Avenue, Wollongong, commencing 9 am on Wednesday November 20th 2013 and concluding 2.30 pm Friday November 22nd. A campus map is provided below.

Registration

The registration desk will be open from 8.00 am Wednesday, and from 8.30 am Thursday, in the foyer of the Communications building.

Name Badges

Please wear your name badge at all times at the venue to facilitate interactions with other delegates and to verify entitlements to refreshments.

Refreshments and Lunch

Arrival tea and coffee will be available each morning before the first session. Morning/afternoon teas and lunch will be provided on Wednesday and Thursday. On Friday, morning tea and lunch will be provided. The cost is included in your registration.

Day 1 Evening Event

Drinks and canapés will be served during the poster session in the foyer of Building 20 (the conference venue) from 5.30 to 7.30 pm Wednesday 20th November.

Conference Dinner

Will be held at Rocksalt Bar and Grill (located at 1 Marine Drive, Wollongong NSW 2500) on Thursday 21st November. Included is a 3 course dinner and 3 hour drinks package. Drinks will be available from 7 pm, and the first course will be served at 7.30 pm.

Free shuttle buses

The free GONG Shuttle covers the conference venue, dinner and suggested accommodation (see bus route map below). See campus map below for pickup\drop-off location. The Shuttle runs a circuit linking UOW to the city, the beach, Innovation Campus and Fairy Meadow - see timetable below. All Gong Shuttles are wheelchair accessible. The university also offers a free North Gong shuttle between the university and North Wollongong train station. For a full list of the shuttles, and timetables, please see: www.uow.edu.au/transport/shuttles.

Parking on campus
See Pay and Display parking areas on the Campus map below. If you are carpooling with 3 or more people in your vehicle you can take advantage of the free carpool parking in Western Car park (P4). See www.uow.edu.au/transport/carpooling for more information.

**Trade Displays**

*Eyetracker, Compumedics NeuroScan, Temple Healthcare, BMedical, and ADI Instruments* will have displays in the Communications Building foyer during the conference, and we encourage you to visit them.

**Notes for presenters**

*Platform*

The lecture theatre contains a Windows PC, document viewer, and laptop connection facilities. Please notify the registration desk if alternative equipment is required. Powerpoint presentations should be loaded using a USB memory stick. **Speakers should ensure that their equipment needs are met and their presentation slides are loaded no later than 15 mins before the start of their session.**

The maximum speaking time for each presentation will be 15 minutes, with an additional 5 minutes for questions. The session chair will warn you as you approach this time limit.

*Posters*

The poster session will be held at 5.30 to 7.30 pm Wednesday 20th November. Posters should be provided to the registration desk before lunch on Wednesday (Day 1), and will be put up by ASP2013 helpers following afternoon tea. Posters should be removed at the end of the session. Poster size should be A0 (841 mm x 1189 mm) in either portrait or landscape orientation.

*Edit your slides*

There will be a Windows PC available in Building 20 (Theatre 2) for delegates to view/edit their slides. Please ask one of the ASP2013 helpers for information.
Free GONG Shuttle route

**55A - Anti-clockwise loop – Weekday indicative times**

<table>
<thead>
<tr>
<th>UOW</th>
<th>Hospital</th>
<th>Mall</th>
<th>Harbour</th>
<th>IC</th>
<th>UOW</th>
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<tr>
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<td>7:12 AM</td>
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<td>7:23 AM</td>
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<td>10:03 PM</td>
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**55C – Clockwise loop – Weekday indicative times**

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<thead>
<tr>
<th>UOW</th>
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<th>Harbour</th>
<th>Mall</th>
<th>Hospital</th>
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<tbody>
<tr>
<td>7:05 AM</td>
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<td>10:06 PM</td>
<td>10:13 PM</td>
<td>10:25 PM</td>
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**Routes 55C (clockwise) & 55A (anti-clockwise)**

The Gong Shuttle connects Wollongong City and UOW in a loop including Wollongong Station, North Beach and the Innovation Campus. It runs from 7am to 10pm weekdays and 8am to 6pm on weekends. Weekday services operate every 10 minutes in both directions from 7am ‘til 6pm, and every 20 minutes in the evenings. The service runs every 20 minutes in both directions on weekends. The service does not run to a strict timetable but indicative times are provided in these tables. All buses start and finish at the Northfields Ave bus terminal.
Pay and Display Parking is available in areas P3, P4 and P8.
# PROGRAM

**Wednesday 20\textsuperscript{th} November**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>8.00 am</td>
<td>Registration opens</td>
</tr>
<tr>
<td>9.00 am</td>
<td>Welcome address, ASP President Robert Barry</td>
</tr>
</tbody>
</table>

## Scientific Session 1 9.10 to 10.30  
Chair: Robert Barry

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
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<tbody>
<tr>
<td>9.10</td>
<td>Sequential response processes in a cued CPT: A temporal PCA study</td>
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<tr>
<td></td>
<td><em>Diana Karamacoska, Robert J. Barry, Genevieve Z. Steiner and Frances M. De Blasio</em></td>
</tr>
<tr>
<td>9.30</td>
<td>Matching-stimulus-interval affects the N2 and the P3: a principal components analysis</td>
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<tr>
<td></td>
<td><em>Genevieve Z. Steiner, Robert J. Barry and Craig J. Gonsalvez</em></td>
</tr>
<tr>
<td>9.50</td>
<td>N1, P2, and P3b are affected by the matching-stimulus-interval in an auditory equi-probable Go/NoGo task</td>
</tr>
<tr>
<td></td>
<td><em>Genevieve Z. Steiner, Robert J. Barry and Craig J. Gonsalvez</em></td>
</tr>
<tr>
<td>10.10</td>
<td>Prestimulus EEG-ERP determinants in the equi-probable auditory Go/NoGo: Assessing the influence of ten levels of activity using PCA</td>
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<td></td>
<td><em>Frances M. De Blasio and Robert J. Barry</em></td>
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</table>

## Morning tea 10.30 to 11.00

## Keynote 1 11.00 to 12.00  
Chair: Jason Bruggemann

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
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<tbody>
<tr>
<td>11.00</td>
<td>Advances in understanding emotional and motivational processes gained from psychophysiology</td>
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<td></td>
<td><em>Prof Eddie Harmon-Jones</em></td>
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</table>

## Scientific Session 2 12.00 to 12.40  
Chair: Bill Budd

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>12.00</td>
<td>Reduced brain volume and physiological responsivity explain dysregulated emotional arousal in severe traumatic brain injury</td>
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<tr>
<td></td>
<td><em>Alana Fisher, Jacqueline A. Rushby, Skye McDonald, Nicklas Parks and Olivier Piguet</em></td>
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<tr>
<td>12.20</td>
<td>Impaired emotional prosody processing in severe traumatic brain injury: An event-related potential study</td>
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<td></td>
<td><em>Jacqueline A. Rushby, Skye McDonald, Francesca Frereich, Alana Fisher and Jaimi Iredale</em></td>
</tr>
</tbody>
</table>

## Lunch 12.40 to 13.40

## Scientific Session 3 13.40 to 15.00  
Chair: Stuart Johnstone

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
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<tbody>
<tr>
<td>13.40</td>
<td>Mismatch negativity (MMN) and schizotypy in nonclinical young adults</td>
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<tr>
<td></td>
<td><em>Samantha Broyd, Pat Michie, Jason Bruggemann, Kaitlin Saunders, Rodney Croft, Juanita Todd, Rhoshel Lenroot and Nadia Solowij</em></td>
</tr>
<tr>
<td>14.00</td>
<td>An investigation of mismatch negativity in current and ex- cannabis users using a</td>
</tr>
</tbody>
</table>


**Feature controlled method**

Felicity Webster, Samantha Broyd, Lisa-marie Greenwood, Rodney Croft, Juanita Todd, Patricia T. Michie, Stuart Johnstone, Ben Lee-Bates, Hannah Coyle and Nadia Solowij

14.20 Electrophysiological evidence of subtle deficits in memory processes in young heavy drinkers and cannabis users

Janette L. Smith, Richard P. Mattick and Jaimi M. Iredale

14.40 Cortical connectivity correlates of conscious stimulus discrimination

Dr Curtis Ponton from Compumedics

<table>
<thead>
<tr>
<th><strong>Afternoon tea</strong></th>
<th>15.00 to 15.30</th>
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<tbody>
<tr>
<td><strong>Scientific Session 4</strong></td>
<td>15.30 to 16.10</td>
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<tr>
<td>15.30</td>
<td>The psychophysiological effects of ostracism in Autism Spectrum Disorder</td>
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<tr>
<td>Emily Trimmer, Skye McDonald, Danielle Mathersul and Jacqueline A. Rushby</td>
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<tr>
<td>15.50</td>
<td>EEG activity in children with Asperger’s Syndrome</td>
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<tr>
<td>Adam R. Clarke, Robert J. Barry, Franca E. Dupuy, Rory McCarthy and Mark Selikowitz</td>
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</table>

**Workshop I** 16.30 to 17.30

16.30 PCA: Application and methods

Frances De Blasio and Prof Robert Barry

**Evening event** 17.30 to 19.30

17.30 Posters, drinks and canapés
**Thursday 21st November**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>8.30 am</td>
<td>Registration opens</td>
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<tr>
<td>9.00</td>
<td><strong>Scientific Session 5</strong> 9.00 to 10.20 Chair: Frances Martin</td>
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<tr>
<td></td>
<td>Sleep-wake behaviour and the EEG in altered states of consciousness</td>
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<td></td>
<td>Sarah Laughran, Sabine Regel, Lilith Buetler, Martin Wieser, Robert Riemer and Peter Achermann</td>
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<tr>
<td>9.20</td>
<td>A combined explicit, implicit and psychophysiological assessment of affective evaluations of plain cigarette packaging in Australia</td>
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<td></td>
<td>Timothy W. Budd, Madeleine Argaet, Eliza Butt, Samia Harije, Sara Lennon, Emily Martin, Rowan Miller and Suki Scade</td>
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<tr>
<td>9.40</td>
<td>Insight into the neural basis of why we feel how we feel during exercise</td>
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<td>Gavin D. Tempest, Gaynor Parfitt and Panteleimon Ekkekakis</td>
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<tr>
<td>10.00</td>
<td>Wearable physiological and physical monitoring - The new generation</td>
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<td></td>
<td>Sandra Lewis from Temple Healthcare</td>
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<tr>
<td>10.20 to 10.50</td>
<td>Morning tea</td>
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<tr>
<td>10.50 to 11.50</td>
<td><strong>Keynote 2</strong> 10.50 to 11.50 Chair: Stuart Johnstone</td>
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<tr>
<td></td>
<td>Mobile phone related bioeffects, human neurophysiology and health</td>
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<td></td>
<td>Prof Rodney Croft</td>
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<tr>
<td>11.50</td>
<td><strong>Scientific Session 6</strong> 11.50 to 12.30 Chair: Susan Thomas</td>
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<tr>
<td></td>
<td>Detecting the sound of feelings: An ERP investigation of vocal emotion perception</td>
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<td></td>
<td>Christopher Sufani, Jacqueline A. Rushby and Skye McDonald</td>
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<tr>
<td>12.10</td>
<td>The effects of caffeine on emotional processing: An ERP study</td>
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<tr>
<td></td>
<td>Frances H. Martin and Emily Hayes</td>
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<tr>
<td>12.30 to 13.30</td>
<td>Lunch</td>
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<tr>
<td>13.30 to 14.30</td>
<td><strong>Workshop II</strong> 13.30 to 14.30 Chair: Prof Rodney Croft</td>
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<td></td>
<td>Dealing with ocular artefact in EEG research: A methods workshop</td>
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<td></td>
<td>Prof Rodney Croft</td>
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<td>14.30</td>
<td><strong>Scientific Session 7</strong> 14.30 to 15.10 Chair: Jason Bruggemann</td>
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<tr>
<td></td>
<td>Intensity and trial effects from simple auditory stimuli in a dishabituation paradigm</td>
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<td></td>
<td>Brett MacDonald and Robert J. Barry</td>
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<tr>
<td>14.50</td>
<td>Equiprobable Go/NoGo auditory ERP components: Adults vs. children</td>
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<td></td>
<td>Robert J. Barry, Frances M. De Blasio and Jay P. Borchard</td>
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<tr>
<td>Time</td>
<td>Session/Event</td>
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<tr>
<td>15.10</td>
<td><strong>Afternoon tea</strong> 15.10 to 15.40</td>
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<td>15.40</td>
<td><strong>Scientific Session 8</strong> 15.40 to 16.40 Chair: Robert Barry</td>
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<tr>
<td></td>
<td>The impact of anxiety and its disorders on heart rate variability: A meta-analysis</td>
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<td></td>
<td><em>John Chalmers, Daniel S. Quintana, Maree J. Abbott and Andrew Kemp</em></td>
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<tr>
<td>16.00</td>
<td>PR-interval compensation - a new form of HRV?</td>
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<td><em>James A. Heathers</em></td>
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<tr>
<td>16.20</td>
<td>The impact of anxiety on heart rate variability at rest and under stress</td>
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<td></td>
<td><em>John Chalmers, Daniel S. Quintana, Maree J. Abbott and Andrew Kemp</em></td>
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<tr>
<td>16.40</td>
<td><strong>Meeting</strong> 16.40 to 17.40</td>
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<td></td>
<td>Annual General Meeting</td>
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<td>19.00</td>
<td><strong>Evening event</strong> 19.00</td>
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<td></td>
<td>Conference dinner: <em>Rocksalt Bar &amp; Grill</em></td>
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<td>Time</td>
<td>Session/Activity</td>
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</table>
| 9.00     | Central neuronal pathways mediating respiratory activation in response to alerting and stressful stimuli  
*Evgeny Bondarenko, Drielle D. Guimaraes, Lee Averell, Valdir A. Braga, Deborah M. Hodgson and Eugene Nalivaiko*
| 9.20     | Startle eyeblink modulation as a measure of environmental concern  
*Royce Willis and Stephen Provost*
| 9.40     | Skin sympathetic nerve activity in humans during exposure to emotionally-charged images: gender differences  
*Rachael Brown and Vaughan G. Macefield*
| 10.00    | Eyetracking research: A snapshot of current challenges and solutions  
*Luke Vu from Eyetracker*
|          | **Morning tea**  
10.20     |  
|          | **Keynote 3**  
10.50     | How to define emotion? New ideas and evidence for a new emotion model  
*Prof Peter Walla*
| 11.50    | Behavioural correlates of brain activity during self- versus other- referential emotion processing depend on emotion awareness  
*Aimee Mavratzakis, Cornelia Herbert and Peter Walla*
| 12.10    | An autonomic arousal perspective of Autism Spectrum Disorder: Implications for social motivation  
*Danielle Mathersul, Skye McDonald and Jacqueline A. Rushby*
|          | **Lunch**  
12.30     |  
|          | **Scientific Session 11**  
13.30     | EEG activity of men and women with DSM-5 adult AD/HD  
*Franca Dupuy, Adam R. Clarke, Robert J. Barry, Rory McCarthy and Mark Selikowitz*
| 13.50    | Set-switching in obsessive-compulsive disorder: An ERP comparison with panic disorder  
*Susan J. Thomas, Craig J. Gonsalvez and Stuart J. Johnstone*
| 14.10    | Conference close and prizes
The effect of information and emotion on heart period

Douglas J. Angus¹* and Marc de Rosnay¹

¹School of Psychology, University of Sydney, Australia

Aims: Past research has established that emotional arousal is frequently associated with increases in heart rate. This study aimed to extend previous work by investigating the extent to which arousal, valence, and contextual information about forthcoming films would influence changes in heart period from baseline before, during, and after viewing. Method: Adult participants (N=35) were assigned to information (N=16) or no-information conditions (N=19), and viewed four mildly evocative films, each starting and ending with a 20-second rest period. R-R intervals were collected using an electrocardiogram (ECG) during a 4-minute baseline, during rest periods, and during each film. Before each pre-film rest period, participants in the information condition were instructed to read a brief passage of text aloud describing the emotional and contextual characteristics of the film they were about to see, while participants in the no-information condition were given no explicit information about the film, but were aware that the study involved emotional films. Results: Results indicate no effect of information on change in heart period during the films or in post-film rest periods. Further, heart period changes during pre-film rest periods in the information group were not sensitive to the expected valence of the films. However, decreases in heart period from baseline - an increase in heart rate - during pre-film rest periods were significantly greater for the no-information group than the information group. Conclusions: These findings suggest that although the provision of information about a mildly evocative film may reduce cardiovascular activity typically associated with emotional arousal, this particular manipulation may only be powerful enough to affect activity before, but not during or immediately following an emotional event.

Keywords: Anticipation, Psychological, Heart Rate, Emotions, Humans, Anxiety


*Correspondence: Mr. Douglas J. Angus, School of Psychology, University of Sydney, Sydney, Australia, dang9080@uni.sydney.edu.au
Equiprobable Go/NoGo auditory ERP components: Adults vs. children

Robert J. Barry¹*, Frances M. De Blasio¹ and Jay P. Borchard¹

¹School of Psychology, University of Wollongong, Australia

Aims: We are interested in exploring sequential-processing in the uncued equiprobable auditory Go/NoGo task, and recently proposed an ERP-based sequential-processing schema derived from an adult sample. Our aim here is to investigate sequential processing in children, comparing the PCA-derived ERP components for adults vs. children in this paradigm. Method: Continuous EEG at 19 scalp sites was recorded from 18 adults and 18 children in an uncued equiprobable auditory Go/NoGo Task. Following our earlier investigation, Go and NoGo ERP components were extracted using unrestricted Varimax-rotated Principle Components Analyses; these were conducted separately for the adult and child samples. We used the coefficient of congruence to assess the equivalence between the corresponding ERP components identified for each group. Results: A broadly-similar series of components was identifiable in both age groups: P1, N1-3, N1-1, PN, P2, N2, P3, Slow Wave, and a diffuse Late Positivity. The N1 subcomponents and late components were similar in adults and children, but the intervening P2 and N2 were substantially different in relation to Go/NoGo. Conclusions: The results in adults confirmed our previous findings and supported our hypothetical processing sequence in this paradigm. Despite the broad similarity between the identified components in the adult and child samples, important differences in the detailed stimulus-response relationships between the PCA components of each group were apparent. Aspects of stimulus categorisation differ between children and adults, but early sensory processing and late imperative processing appear to be more similar. Further research on the developmental aspects involved in this paradigm should be fruitful.

Keywords: adults, Children, event-related potentials (ERPs), Principle Component Analysis (PCA), auditory Go/NoGo task


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Central neuronal pathways mediating respiratory activation in response to alerting and stressful stimuli

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Aims: Links between respiration and emotion are well-established in humans, but such links were only recently investigated in animals. We have previously shown that the magnitude of respiratory responses to alerting or stressful stimuli is linked with animals’ anxiety state. The aim of the current study was to investigate central neuronal pathways that mediate this respiratory activation in response to various stressors. Method: Four groups of 8 rats received microinjections of GABAa agonist Muscimol or saline via bilateral guide cannulas into the dorsomedial hypothalamus (DMH), the medial prefrontal cortex (mPFC), the amygdala or the dorsolateral periaqueductal gray (dlPAG). They were then subjected to a respiratory assessment via whole-body plethysmography with presentation of 6 acoustic stimuli of increasing intensity (40-90 decibel, 500 millisecond white noise) and a 15-minute restraint stress. Results: Acoustic stimuli evoked transient increases in respiratory rate proportional to the stimulus intensity, ranging from 12 cycles per minute in response to the 40-decibel stimulus to 329 cycles per minute in response to the 90-decibel stimulus. Inhibition of the DMH abolished these respiratory responses to the 40-70 decibel stimuli and attenuated responses to the 80 and 90-decibel stimuli, while inhibition of the amygdala significantly decreased responses to the 70-90 decibel stimuli. Microinjections of Muscimol to the PAG or the PFC did not affect respiratory responses to any of the acoustic stimuli. Restraint stress elevated resting respiratory rate by 51 cycles per minute. Inhibition of the DMH completely abolished this respiratory response, while inhibition of the amygdala and the PFC significantly reduced it. Conclusions: Consistent with previous studies, integrity of the DMH is essential for generation of autonomic responses, including respiratory responses. The amygdala contributes to respiratory activation, probably by mediating anxiety state. The mPFC contributes to maintaining elevated respiratory rate during stress, but does not contribute to short-lasting respiratory activation.

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Keywords: Respiration, Anxiety, Rats, dmh, PAG, PFC, Amygdala, Dorsomedial Hypothalamic Nucleus, dorsomedial hypothalamus, prelimbic prefrontal cortex, Prefrontal Cortex, Periaqueductal Gray

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Combined cognitive and state-control training for children with and without AD/HD: Effects on behaviour, working memory and resting EEG

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Aims: There is increasing evidence that working memory, inhibitory control, and state-control training can lead to behavioural improvement in children with Attention-Deficit/Hyperactivity Disorder (AD/HD). State-regulation theories of AD/HD suggest it is a disorder characterised by an inability to adjust the energetic state level, which in turn has an effect on executive functioning and behaviour. As such, the present study examined the efficacy of a combined cognitive and state-control training program for children with a diagnosis of AD/HD and with sub-clinical symptoms, using a randomised control design. Method: The final sample consisted of 38 children aged 7-12 years, 18 in the training and 20 in the waitlist (WL) condition. Wizard-themed training games (Focus Pocus) took place in the childrens’ 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 a 2-minute eyes-open (EO) and one minute Focus task before and after training. Results: Compared to children in 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. There was also a significant increase in digit length recall post-training for the digit span task. EEG power for the two EEG tasks showed typical AD/HD topographical differences at Time 1. Post-training there was some evidence of a directional trend towards EEG normalisation for children in the training condition, with more support for the active Focus than the resting EO task. Conclusions: Overall the results provide some support for the efficacy of a combined cognitive and state-control training program for children with AD/HD.

Conflict of Interest: SJ is co-inventor of intellectual property licensed by UOW to NeuroCog and used in Focus Pocus and is entitled to a small portion of royalties

Keywords: cognitive control, state-control, Neurofeedback, working memory, impulse control, ADHD, Attention-deficit/hyperactivity disorder (ADHD), Children, Attention, training program


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ERP source localisation using eLORETA: Adults vs. children

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Aims: In the current study we were interested in using Exact Low Resolution Brain Electromagnetic Tomography (eLORETA) to investigate the component source localisations of the sequence of event-related potentials (ERPs) elicited in the equiprobable auditory Go/NoGo paradigm. Specifically, we aimed to compare these in adults vs. children. Method: Eighteen adults and 18 children completed an uncued equiprobable auditory Go/NoGo task while continuous EEG was recorded at 19 scalp sites. The data were recorded and quantified separately for each group. Go and NoGo ERP components were identified from an unrestricted Varimax-rotated Principle Components Analysis. The identified components were examined using eLORETA for source localisation. Major cortical generators of each ERP component were derived as the three cortical structures with the greatest absolute current density in eLORETA. Results: Adult/child Go responses, identified by eLORETA, show some similar sources for: N1-1 (Inferior Temporal Gyrus), PN (Postcentral Gyrus), adult P3 when compared with child P3a (Medial Frontal Gyrus) and P3b (Inferior Frontal Gyrus), SW (Medial Frontal Gyrus), and LP (Middle Frontal Gyrus); but not for P1, N1-3, P2, or N2. Comparisons of adult/child NoGo responses found source similarities for: N2 (Postcentral Gyrus), adult P3 when compared with child P3a (Medial Frontal Gyrus), and LP (Superior Frontal Gyrus); but not for P1, N1-3, N1-1, PN, P2, child P3b, or SW. Conclusions: The ERP component sources obtained using eLORETA show some commonalities between Children and Adults. However, ERP component source localisations are largely dissimilar across the groups. These differences are likely attributable to developmental changes. The results may be beneficial to future developmental research. Follow up studies could extend on the results by comparing different maturational stages of development (e.g. young vs. older children).

Keywords: adults, Children, event-related potentials (ERPs), Exact Low Resolution Brain Electromagnetic Tomography (eLORETA), Principal Component Analysis (PCA), Source Localisation


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Skin sympathetic nerve activity in humans during exposure to emotionally-charged images: gender differences

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Aims: While it is known that the level of skin sympathetic nerve activity (SSNA) is affected by anxiety, the majority of emotional studies have utilised the galvanic skin response (GSR) as a means of inferring increases in SSNA. We have previously shown significant increases in SSNA with direct nerve recordings, while showing subjects emotionally-charged images. The purpose of this study was to assess gender differences in SSNA when showing subjects neutral or emotionally-charged images from the International Affective Picture System (IAPS).

Methods: SSNA was recorded via tungsten microelectrodes inserted into cutaneous fascicles of the common peroneal nerve in 19 subjects (9 female, 10 male). Neutral images, positively-charged images (erota) or negatively-charged images (mutilation) were presented in blocks of 15 images of a specific type, each block lasting 2 minutes. Images of erotica or mutilation were presented in a quasi-random fashion, each block following a block of neutral images.

Results: Results show that overall, both images of erotica or images of mutilation caused significant increases in SSNA, coupled with sweat release and cutaneous vasoconstriction. The increases in SSNA however, were greater in females viewing mutilation and greater for males viewing erotica.

Conclusions: We conclude that SSNA, comprising cutaneous vasoconstrictor and sudomotor activity, increases with both positively-charged and negatively-charged emotional images, yet gender differences are present. In addition, measurement of SSNA provides a more comprehensive assessment of sympathetic outflow to the skin than does the use of sweat release alone as a marker of emotional processing.

Keywords: skin sympathetic nerve activity, microneurography, IAPS pictures, sweat release, gender differences


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Mismatch negativity (MMN) and schizotypy in nonclinical young adults

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Aims: The auditory mismatch negativity (MMN) is a marker of sensory memory and is thought to index the functionality of glutamatergic NMDA receptor mediated neurotransmission. MMN amplitude is robustly attenuated in patients, and attenuated in unaffected family members of patients with schizophrenia relative to controls. The extent to which MMN amplitude varies as a function of schizotypal traits, which are associated with schizophrenia liability in a healthy population, is unclear. The aim of the current study was to explore the association between MMN and schizotypy in a nonclinical sample. Method: Thirty-eight healthy undergraduate students were administered the Schizotypal Personality Questionnaire (SPQ, Raine, 1991) and took part in a multifeature MMN paradigm (standards 82%, 50 ms, 1000 Hz, 80 dB) with duration (100 ms), frequency (1200 Hz) and intensity (90 dB) deviants (6%). Associations between SPQ total and subscale scores and MMN amplitude at Fz for each deviant condition were explored. Results: SPQ total score was not found to correlate with MMN amplitude in any condition (p>0.100), however we did observe a trend association between the suspiciousness subscale and frequency MMN (ρ = - .306, p = .073). To explore this further we divided the sample using a median split into high and low scorers on Suspiciousness. MMN amplitude was then compared between the two groups using a group by deviant condition repeated measures ANOVA. This analysis revealed a significant main effect of group such that the high suspiciousness group had larger MMN amplitude compared to the low group (p = .048). No interaction between group and deviant condition was identified. Conclusions: Larger MMN in high suspiciousness scorers is in contrast to the robustly attenuated MMN amplitude observed in patients with schizophrenia. These results may point to a complex association between NMDA receptor function and psychotic liability in the healthy population but require replication.

Keywords: mismatch negativity (MMN), Schizotypal Personality Questionnaire (SPQ), event-related potential (ERP), Schizophrenia, Electrophysiology

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A combined explicit, implicit and psychophysiological assessment of affective evaluations of plain cigarette packaging in Australia

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Aims: In 2012 the Australian Government introduced the world’s first ‘plain cigarette packaging’ legislation designed to reduce the appeal of cigarette packets. In 2013 similar legislation was rejected in the United Kingdom due to the ‘absence of any reliable research demonstrating the effectiveness of plain packaging’. The aim of the present research was to extend this prior research, typically limited to survey or ‘explicit’ measures of affective evaluations (i.e. ‘liking’) of cigarette-packs, by combining these with ‘implicit’ and psychophysiological measures. Method: To achieve this 42 participants completed an online survey and a computer-based version of the Affect Misattribution Procedure (AMP) where affective responses (pleasant/unpleasant) were recorded to 4 Australian cigarette-pack designs (pre-2004; 2004; 2011; 2012) and where graphic health warnings (GHW) were manipulated using existing GHW images and the International Affective Picture System (IAPS) providing 4 image types (GHW; Pleasant, Unpleasant and Neutral. During the AMP task electromyographic (zygomatic and corrugator), skin conductance and peripheral pulse activity was also recorded. Results: A two-way 4 (Image Type) x 4 (Pack Type) repeated measures GLM analysis of variance were carried separately for the implicit and psychophysiological measures to assess differences in affective responses according to cigarette pack and image type. Both the explicit (survey) and implicit (AMP) measures revealed that image type had a significantly stronger effect on the perceived pleasantness of cigarette packs than pack design, although trends for an interaction for both the explicit and implicit measures were observed. For the psychophysiological measures a more complex pattern of results was found, indicating that psychophysiological measures are sensitive to different aspects of affective processing. Conclusions: The results of the first phase of this research provides a ‘proof of concept’ that affective processing of cigarette packaging is dependent on the nature of the measure used and that graphic health warning images image may be a stronger determinant of cigarette pack appeal than pack design.

Keywords: cigarette packaging, Affective Neuroscience, implicit attitudes, consumer behaviour, affective arousal


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The impact of anxiety and its disorders on heart rate variability: A meta-analysis

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Aims: Anxiety increases the risk of future cardiac disease and mortality, irrespective of cardiac disease history, even after control for confounds including smoking, lifestyle, and socioeconomic status. Reductions in HRV may be one mechanism linking anxiety and cardiac disease. However, prior studies have reported inconsistent findings highlighting a need for a meta-analysis to examine the impact of anxiety on HRV. Method: Studies comparing resting state HRV in patients with an anxiety disorder as their primary diagnosis and healthy controls were considered for meta-analysis. Results: Meta-analyses were based on 27 articles, 2991 patients with an anxiety disorder and 3304 controls. Those with anxiety had lower HRV (time frequency: Hedges’ g= -0.45, p=.001; high frequency: Hedges’ g= -0.287, p=0.001) than controls. Generalised Anxiety Disorder (time frequency: Hedges’ g= -0.552, p =.002; high frequency: Hedges’ g= -0.563, p=.001) and Post-Traumatic Stress Disorder (time frequency: Hedges’ g= -0.657, p=.001; high frequency: Hedges’ g= -0.355, p=.034) participants exhibited the largest reductions; whereas those with Panic Disorder did not differ from controls in high frequency HRV. Conclusions: Anxiety disorders are associated with reduced HRV, with Generalised Anxiety Disorder and Post-Traumatic Stress Disorder, not Panic Disorder, displaying the greatest reductions in HRV.

Keywords: Anxiety, Heart rate variability, meta analysis, Parasympathetic Nervous System, Autonomic Nervous System

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The impact of anxiety on heart rate variability at rest and under stress

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Aims: Anxiety increases the risk of developing cardiovascular disease (CVD), and is associated with poorer prognosis once CVD is diagnosed. Reduced heart rate variability (HRV) – indicative of reduced parasympathetic nervous system (PNS) activity – may be one mechanism underlying this relationship. Low HRV predicts CVD and all-cause mortality, and is associated with a number of anxiety disorders. However, it remains unclear whether anxious apprehension or arousal underpins HRV reductions. This is the goal of the present study, during rest, and stress conditions. Method: Eighty participants (55 controls) were recruited, and administered the Anxiety Disorders Interview Schedule IV and a semi-structured medical interview to assess psychiatric and medical history. Participants also completed measures (i.e. Penn State Worry Questionnaire, GAD-7, Anxiety Sensitivity Index, & Body Sensations Questionnaire) assessing anxiety related symptoms. Five laboratory tasks were administered (baseline rest, anticipation of shock, acute threat of shock, anticipation of serial subtraction, acute serial subtraction) during which electrocardiogram was collected from which indices of HRV were derived. Results: Participants with a primary anxiety disorder displayed significant reductions in HRV at baseline relative to controls (t= 2.58, p =.03) Multiple regression indicated that general apprehension and worry (Penn State Worry Questionnaire) predicted unique variance in HRV at rest. High worriers also exhibited significantly lower resting state HRV than low worriers. Conclusions: Decreased HRV is driven more by symptoms of worry and apprehension, than symptoms of panic and arousal.

Keywords: Heart rate variability, Anxiety, Autonomic Nervous System, Parasympathetic Nervous System, Stress, Psychological


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EEG activity in children with Asperger’s Syndrome

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Aims: This study investigated differences in the EEG of children with Asperger’s Syndrome. Method: Twenty two boys with Asperger’s Syndrome, aged 7 to 12 years, and an age and sex matched control group, participated in this study. The EEG was recorded during an eyes-closed resting condition from 19 electrode sites, which were clustered into nine regions prior to analysis. One minute of trace was analysed using Fourier transformations to obtain both absolute and relative power estimates in the delta, theta, alpha and beta frequency bands. Results: The Asperger’s group had global increase in absolute delta and a frontal increase in relative delta. Both absolute and relative theta were globally increased and relative alpha was globally decreased. Conclusions: These results suggest the existence of frontal lobe abnormalities in children with Asperger’s Syndrome, and possible abnormalities in normal CNS maturational processes.

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Keywords: EEG, Asperger’s syndrome, autism, maturation, Frontal Lobe


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Human neurophysiology and mobile phone-related health

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Mobile telecommunications devices, such as mobile phones, base stations and Wi-Fi, are ever present in the modern age. Underpinning their functionality is electromagnetic radiation (which is the medium for coding, transmitting, receiving and then decoding information), with the frequency of electromagnetic radiation utilised termed ‘radiofrequency’ (RF). There has been considerable debate concerning the relative harm that may result from this RF, and consequently a considerable body of science exploring the issue. Of particular relevance is EEG research, which has demonstrated that RF emissions impact human brain functioning, both in terms of resting (alpha band) and sleep (sleep spindle frequency range) EEG. This presentation will provide a brief overview of this science more generally (including the epidemiology, in vitro and in vivo research), before focusing on the roles and outcomes of human neurophysiology research in this domain, and ramifications of this for the RF safety standards that we are all governed by.

Keywords: electromagnetic radiation, EEG/ERP, bioelectromagnetics, Health Status, alpha-EEG

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Empathy in alexithymia: Hypoarousal and hypermimicry

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Aims: There is increasing interest in the literature concerning an empathic deficit in the alexithymic population. Empathy is constructed of three components: the cognitive component relates to emotion perception, the autonomic component is expressed by fluctuations in skin conductance and heart rate, and the behavioural component is conveyed by facial mimicry. Currently, there is little consensus regarding the results of these individual measures in alexithymia, and few studies have incorporated measures of the three components in one design. We sought to clarify whether alexithymia is associated with (1) low emotion perception accuracy, (2) aberrant arousal, (3) aberrant facial mimicry, and finally (4) whether poor emotion recognition and atypical physiological responding are associated in alexithymia.

Method: Fifty-nine participants (Mean age=19.67, SD=2.01) were divided into two groups based on alexithymia scores from the TAS-20 (Bagby, Parker, & Taylor, 1994). Thirty-six participants scored within the normal range, and 23 were in the moderate to high range. Skin conductance, heart rate, and facial EMG (zygomaticus and corrugator) were recorded while participants viewed happy and angry facial expressions, and an emotion recognition task followed (ERT; Montagne, Kessels, De Haan, & Perrett, 2007). Results: Alexithymic individuals displayed intact emotion recognition and orientation but hypoarousal and hypermimicry. Skin conductance levels were reduced throughout the task, F(1,57)=5.30, p=.025; zygomaticus activity was greater to dynamic faces, F(1,57)=5.85, p=.019; and corrugator activity was greater to angry faces, F(1, 57)=6.90, p=.011. Conclusions: The dissociation between arousal and mimicry suggests: (1) disruption to feedback processes, in that facial feedback and autonomic responding function independently without intervening communication; or (2) lack of inhibitory control, in that individuals high in alexithymia display lack of top-down control over the mirror neuron system.

Keywords: alexithymia, hypoarousal, hypermimicry, emotion recognition, Empathy


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Prestimulus EEG-ERP determinants in the equiprobable auditory Go/NoGo: Assessing the influence of ten levels of activity using PCA

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Aims: We have recently mapped the empirically testable EEG–ERP relationships in the uncued equiprobable auditory Go/NoGo paradigm for two levels of immediately-prestimulus EEG. Here we utilise PCA to extend our investigation to assess the nature of these relationships across ten levels of prestimulus EEG band activity. Method: Continuous EEG was recorded at 19 sites while twenty-four university undergraduates completed an uncued equiprobable auditory Go/NoGo task. Separately for each traditional EEG band, and for Go and NoGo responses, the accepted trials were sorted evenly into ten bins according to their level of prestimulus EEG activity, and average ERPs were computed. An unrestricted PCA was computed for the grand mean accepted Go and NoGo trials, and separate unrestricted PCAs were conducted for each prestimulus EEG band (x4) and level (x10). Each PCA involved Varimax-rotation of all 250 factors. Results: Five ERP components were consistently identified across the PCA solutions, accounting for 58.6 – 91.3% of the variance: N1-1, PN, P2, P3, and classic SW. Prestimulus delta had a curvilinear (U) effect on the magnitude of the PN, and a positive linear effect on P3. Theta modulated the overall positivity of the SW, producing a curvilinear (inverted–U) pattern. Prestimulus alpha level had a quadratic (inverted–U) effect on the positivity of the P3 and SW amplitudes. Quadratic Level × Stimulus interactions were also found between prestimulus alpha level and the PN, P2, and P3 amplitudes. In beta, an inverse linear effect in N1-1, and a quadratic Level × Stimulus interaction in the SW, each approached significance. Conclusions: As expected, the pattern of prestimulus EEG-ERP relationships differed across the traditional bands, and ERP components. This pattern of results supports and extends prior findings, providing a more comprehensive understanding of the relationships, and incorporating ERP subcomponents that were not able to be assessed previously.

Keywords: EEG-ERPs, delta, theta, alpha, beta, Principal Components Analysis (PCA)


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EEG activity of men and women with DSM-5 adult AD/HD

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Aims: Despite knowledge that AD/HD often persists into adulthood, there have been minimal investigations of the EEG activity of adults with AD/HD. This study aimed to explore the EEG activity of adult males and females who were initially diagnosed with AD/HD as children, and then re-assessed, as unmedicated adults, using the new DSM-5 criteria. A secondary aim of this study was to explore gamma power within this population.

Method: Participants included 16 females and 16 males with AD/HD, and sex-matched control groups. A five minute eyes-closed resting EEG was recorded from 19 electrode sites. The EEGs were Fast Fourier transformed and estimates for total power, absolute and relative power in the delta, theta, alpha, beta and gamma bands, and the theta/beta ratio, were analysed in nine cortical regions.

Results: Males with AD/HD, compared with male controls, had globally reduced absolute beta, globally elevated relative theta, and a larger theta/beta ratio. In contrast, no global effects emerged between females with and without AD/HD. Significant sex by group interactions found that globally elevated relative theta and elevated frontal-midline theta/beta ratio noted in males with AD/HD differed significantly from results in females. Also, relative to male controls, males with AD/HD had reduced posterior absolute gamma activity. No significant gamma differences were found between women with and without AD/HD.

Conclusions: There are statistically significant EEG differences in relative theta and the theta/beta ratio between males and females with and without AD/HD. These results indicate that AD/HD affects the EEG activity of males and females differently. The male gamma findings are similar to findings reported in children with AD/HD, suggesting a continuing gamma deficit in males with AD/HD, but not in females.

Keywords: Attention-Deficit/Hyperactivity Disorder, adults, DSM-5, EEG, sex differences


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Reduced brain volume and physiological responsivity explain
dysregulated emotional arousal in severe traumatic brain injury

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Aims: Emotional responsivity and arousal deficits are well-documented in adults with a severe
traumatic brain injury (TBI). Alpha power and skin conductance levels (SCL) may provide
measures of these deficits. Moreover, atrophy in the insula and amygdala may contribute to
dysregulated arousal, given their established role in regulating arousal and emotional
responses. This study aimed to elucidate the electrophysiological correlates of dyregulated
emotional arousal and responsivity after severe TBI. Method: Nineteen adults (15 males; mean
age 44.89; mean education 13.47 years) with a severe TBI and 19 matched controls (15 males;
mean age 43.95; mean education 14.79 years) (p> 0.05) participated. Magnetic resonance
imaging (MRI) scan established bilateral insulae and amygdala volumes. Mean EEG alpha
power and SCLs were recorded simultaneously across four, 2 minute conditions: eyes-closed
pre-task baseline, view neutral face, happy face and angry face. Results: Scalp-wide alpha
suppression occurred from pre-task baseline to the face-viewing conditions (p<.001), however,
this was diminished in TBI (p=.04). TBI participants also exhibited elevated alpha power in the
hemisphere means, in contrast to controls’ midline dominance (all p<.01), together with a trend
towards lower SCL (p =.051). Brain volume was significantly reduced in most structures in the
TBI group; greater left insula and right amygdala volumes both correlated positively with alpha
power, and alpha suppression. Conclusions: The present findings further bolster alpha power’s
role as indexing arousal dyregulation in TBI. Reduced grey matter volume in pertinent brain
structures may contribute to disturbances in arousal after TBI.

Keywords: emotion, Arousal, Alpha power, skin conductance level, insula volume, amygdala
volume, Traumatic brain injury (TBI), Electroencephalography (EEG)

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Aims: Determine whether reversal learning procedures modulate event-related potential (ERP) components associated with stimulus-outcome relationships during probabilistic association learning. The project is the first to document ERP components produced to stimulus aspects of the extensively tested Weather Prediction Task (WPT). Method: Participants completed two blocks (100 trials each) of the WPT while continuous electroencephalogram recordings were made. The probabilistic contingencies between stimulus cards and outcomes were reversed between block’s 1 and 2. ERP epochs (1000 ms) were temporally locked to stimulus presentations. Results: Stimulus presentations produced a number of ERP components related to the visually evoked potential (P1, N1, P2, N2, P3), however modulations of the components by the reversal of probability associations between blocks were topographic in nature only. Frontal N1 peaks were larger than posterior peaks in block 1 but not in block 2 (F=9.89, p=.007). Midline P2 responses were larger than bi-lateral hemispheric peaks in the same pattern (F=4.87, p=.045). Additionally, accuracy analyses revealed that P1 peaks were largest on trials that participants made incorrect choices (F=5.56, p=.033), while the opposite was true for N2 peaks (F=5.78, p=.031). N2 accuracy effects were present at posterior compared to frontal sites and were largest in block 2. Conclusions: While the reversal procedure didn’t affect overall peak amplitudes, N1 and P2 topographic changes with learning suggest modulations in subcomponents related to response preparation and selective attention, respectively. Additionally, P1 accuracy findings suggest that participants may experience increased arousal when presented with complex/difficult stimulus sets due to increased stimulus identification demands, while N2 peaks may be reflective of neural correlate of template matching which increased in efficiency as learning progressed.

Keywords: probabilistic learning, ERP, weather prediction task, reversal procedure, selective attention

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Neural correlates of successful encoding in schizophrenia: An event-related potential study

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Aims: Individuals with schizophrenia demonstrate pronounced deficits in cognitive processing with particular impairments in episodic memory. This may reflect a difficulty in the ability to encode new information. The subsequent memory paradigm has been used in the study of memory formation to segregate neural processes responsible for successful encoding. In healthy controls subsequently remembered items are associated with a more positive ERP waveform than those later forgotten. The aim of the study was to investigate neural correlates of encoding in schizophrenia using a subsequent memory paradigm. Method: EEG was recorded in 20 patients and 19 healthy controls during the semantic encoding of single words. ERPs were sorted according to whether words were subsequently recognised. Group differences were determined in late positivity (LPP; area under the curve 450-750 ms), as well as for N1, P2 and N400 ERP peak amplitudes, as a function of subsequent recognition. Results: Patients tended to perform poorer than controls on the recognition test (slower [p=0.069] and less accurate [p=0.006]). Mean amplitude of the encoding-related LPP was greater for recognised than not-recognised words (p=0.035, eta-squared=0.12), with patients showing reduced mean amplitude compared to controls regardless of whether the word was recognised (p=0.018, eta-squared=0.15). Further, compared to controls, patients showed significantly reduced P2 (p=0.032, eta-squared=0.11) and frontal N400 peak amplitudes (p=0.012, eta-squared=0.15) during encoding. Conclusions: The results suggest that reduced activation of encoding processes contributes to poorer recognition memory performance in schizophrenia, however the relative importance of early attentional (P2) and later semantic processing (N400 and LPP) alternations cannot be determined from the present study.

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Keywords: Schizophrenia, episodic memory, encoding, event-related potential (ERP), subsequent memory paradigm


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PR-interval compensation - a new form of HRV?

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Aims: Current theory within heart rate variability treats RR intervals - the distance between the electrocardiographic signals corresponding to the depolarisation of the ventricles - as if they are the only source of information in the heart. This is obviously not the case, as each ECG complex describes a series of complex interrelated depolarisation events. Are there any other signals within these events which, like HRV, give us access to further information on autonomic state? One section which has received comparatively little attention is the coordination between the P wave (the initial sinoatrial depolarisation of the heart) and the R wave. Previous work has shown that this period changes dynamically in multiple circumstances; for instance, during exercise and for periods during sleep. Can we reproduce these changes in the laboratory measurement? Method: Several datasets were created or retrospectively analysed: at rest (n=20), during deep breathing (n=14), after ventricular premature contractions (VPC; n=3), during stress/anxiety tasks (n=40). Results: PR interval compensation occurs reliably after VPC, occasionally during deep breathing and anxiety-provoking task, and never at rest. The properties of this change support the idea that this is caused by either spikes in or the 'uncovering' of basal sympathetic activity. As such, it is not rate-dependent - it occurs during very slow post-VPC intervals, but also during heart rates above approximately 88 BPM. Conclusions: PR interval compensation may represent a novel form of analysis which draws information from basal cardiac sympathetic tone.

Keywords: HRV, Electrocardiography, Autonomic Nervous System, Parasympathetic Nervous System, Sympathetic Nervous System


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Advances in understanding emotional and motivational processes gained from psychophysiology

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I will present theory and evidence that challenges two widely held assumptions in contemporary approaches to the study of emotion. The first assumption is that approach motivation is always associated with positive affect. The second assumption is that positive affective states create attentional and cognitive broadening. Employing both trait and state designs with measurements of electrical brain activity, subjective reports, and behavioural responses, our research has found that approach motivation may be associated with certain negative affective states, particularly anger, and that positive affective states can create attentional and cognitive broadening or narrowing depending on the approach motivational character associated with the positive affect state. In the end, I will suggest that considering the motivational direction dimension as separate from the affective valence dimension will assist in further understanding the relationships between emotions, physiological responses, attention, cognition, and behaviour.

Keywords: Approach Motivation, Anger, asymmetrical frontal cortical activity, late positive potential, Emotions

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A facial EMG study of differentiation in feelings of “kawaii”

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Aims: “Kawaii” is one of the most frequently used adjectives in modern Japanese. It is often translated into English as “cute,” but its meaning appears to go beyond that. Baby schema has been thought to be a key stimulus feature that triggers the feelings of cuteness, but the word “kawaii” is also used for other types of items that are seemingly irrelevant to baby schema, making the definition of the word confusing even for Japanese people. In this study, we compared facial electromyographic (EMG) responses to two types of pictures described as kawaii to see whether both types of stimuli elicited similar patterns of activity. Method: Twenty female university students were asked to view various colored photographs for six seconds each. Facial EMGs were measured over the regions of the zygomaticus major and the corrugator supercilii. After viewing each picture, the participants rated it on several scales (e.g., kawaii, pleasant, exciting). Based on the photographic objects and mean rating scores, three categories of pictures were selected by controlling valence and arousal: kawaii items with baby schema (human and animal babies), kawaii items without baby schema (flowers, sweets, and dresses), and neutral items that had lower scores with regard to kawaii ratings (both animals and inanimate things). Results: Zygomaticus major activity increased for both kawaii items with and without baby schema. On the other hand, corrugator supercilii activity reduced reliably only for items with baby schema. Conclusions: Even when levels of subjective pleasantness and arousal are equivalent, kawaii items with baby schema produce greater affective facial responses. The findings suggest that kawaii is not a unitary concept but a generic term for a positive emotion associated with approach motivation, and that baby schema is a strong elicitor of emotional expressions.

Keywords: kawaii, cuteness, baby schema, facial electromyography, feminine culture


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An examination of impulsivity in adolescence: Frontal alpha EEG markers and relations with emotion regulation

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Aims: This study assessed the relationship between impulsivity, effortful control and emotion regulation. The construct of impulsivity was explored by examining relationships between psychophysiological and behavioural measures, and self and observer reports.

Method: One hundred and seventy (170) typically-functioning adolescents participated in the study. Frontal alpha EEG power, heart rate, and heart rate variability were recorded while participants undertook two 3-minute resting tasks (eyes open and eyes closed), a visual inhibitory control task and a visual selective attention task. Prior to testing, parents and adolescents completed a questionnaire measuring effortful control, and parents completed a questionnaire measuring AD/HD symptomatology, including impulsivity.

Results: Analyses revealed mixed findings. A lack of emotion regulation strategies and clarity, and the presence of impulse control difficulties, were most strongly associated with observer-reported impulsivity. There were no significant relationships between emotion dysregulation and psychophysiological measures, or behavioural measures of impulse control. Relationships between subsets of emotion dysregulation and behavioural measures of selective attention were varied.

Conclusions: Overall, some support for a relationship between emotion dysregulation and impulsivity in adolescents was found, but it was concluded that this relationship may be exclusive to certain aspects of each construct. Finally, while effortful control correlated inversely with impulsivity, there were few significant correlations amongst different measures of impulsivity, suggesting this construct may indeed be multi-dimensional, with different measures tapping into different types or subsets of impulsivity.

Keywords: EEG, impulsivity, Emotion Regulation, Adolescent Behavior, Nogo, flanker task

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Aims: Event-related potentials (ERPs) are extensively studied in cued Continuous Performance Tests (CPTs) in relation to imperative stimuli (Target/NonTarget), but less so for the cue. There is contention in the literature as to whether the contingent negative variation (CNV), elicited by the cue, affects imperative ERPs. This study aimed to clarify the sequential response processes for the cue and imperatives in this paradigm. Method: Seventy participants performed a numbered-variant of the visual Gordon-CPT, with 1000 ms SOA, while continuous EEG was recorded. The cue (1) warned participants to either: press a button to the Target (9), or inhibit responses to NonTargets (0-8). Single trial ERPs were extracted for the cued imperatives and subjected to an initial Principal Components Analysis (PCA) to obtain the CNV component. To better analyse response components, separate PCAs were then conducted on the cue and imperatives. The imperatives were analysed in 2 ways: an unbaselined set relative to the pre-cue period was compared to a set baseline-corrected to the pre-imperative activity to remove CNV processes. To determine ERP component similarities between data sets, congruence coefficients (rc) were computed and latencies were assessed. Results: The CNV peak extracted in the initial PCA was identical to that in the unbaselined imperatives dataset (rc = .99). Similar sequential ERP components were identified in the cue and imperatives PCA datasets: N1, PN, P2, N2c, N2b, P3 and SW. Cue components correlated better with the unbaselined imperatives than the baselined dataset. All cue and imperative response components were comparable (rc > .80), except the N2cs, which showed little resemblance. Latencies also correlated strongly (r = .99). Conclusions: These results demonstrate that CNV removal from the imperative ERPs is unnecessary. The identification of comparable ERP components, with similar latencies, to the cue and imperatives, suggests that similar sequential processes occur for these stimuli.

Keywords: Continuous Performance Test (CPT), event-related potentials (ERPs), Sequential Processes, Principal Components Analysis (PCA), Contingent Negative Variation (CNV)


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Emotion regulation and heart rate variability: Effect of emotion reappraisal on subjective and cardiovascular responses to pleasant and unpleasant pictures

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Aims: The ability to regulate emotional responses has been linked to psychological wellbeing (Côté, Gyurak & Levenson, 2010), while dysfunctional emotion regulation is associated with psychopathology and increased risk of cardiovascular disease. The current study experimentally examined links between baseline HRV and emotion regulation, including assessment of the effects of emotion induction and emotion regulation on state frequency measures of HRV. Method: 88 healthy participants (71 female) viewed 2 sets of positive and 2 sets of negative images. Participants were instructed to either “reappraise” the image so that they felt nothing in relation to the image, or to “simply view” the image without attempting to regulate their emotional experience, for sets of positive and negatively valanced images. HRV frequency measures collected via ECG, and subjective responses to each picture and set of pictures were compared using a 2 (Valence, positive vs. negative) x 2 (Regulation, view vs. reappraisal) repeated measures design. Correlations between baseline HRV and individual differences in emotion regulation were also examined. Results: As expected, there was a correlation between baseline High Frequency HRV and reduction in arousal to negative images during reappraisal vs. free viewing (r(57)=.311, p = .018) and marginal correlation with reduced negative valence to negative images in reappraisal compared to free-view (r(58)= -.259, p = .050). Correlations were not significant for baseline HF with regulation of valence (r(57)=.012, p = .932) or arousal (r(57)=-.079, p = .557) for positive images. ANOVA revealed significant HRV differences between viewing positive and negative images for all HRV measures and for subjective responses. Compared to free-viewing, subjective ratings of valence and arousal for positive and negative images were less extreme during reappraisal, indicating successful emotion regulation. Physiologically, however, there was an effect of reappraisal only for the component of the low frequency band corresponding to image presentation. Conclusions: Findings suggest that not only is HRV related to individual differences in emotion regulation, but also that the regulation of emotional responses can modify a series of phasic cardiac responses over time.

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Keywords: emotion, emotion regulation, reappraisal, Heart rate variability, Autonomic, Parasympathetic

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Monocular and binocular induction of visual long-term potentiation

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Aims: Long-term potentiation (LTP) refers to an enduring enhancement of synaptic transmission following high frequency repeated stimulation of the pre-synaptic neuron, and contributes to learning and memory. LTP has been thoroughly examined in animals, but only recently extended to include isolated human cortical tissue which showed matching properties demonstrated in prior animal studies. Our paradigm non-invasively induces LTP in humans (hLTP) and shows that hLTP exhibits properties analogous to LTP examined in animal and human cortical tissue studies. The current study conducted 5 experiments to examine where visual hLTP is taking place by incorporating the inter-ocular transfer technique with the original non-invasive paradigm. Method: Experiment 1 followed the non-invasive paradigm commonly used. Participants viewed the checkerboard stimulus presented at the rate of 9 Hz with both eyes (induction). Baseline VEP recordings were obtained before and after induction while participants binocularly viewed the checkerboard stimulus presented at 1 Hz. VEP recordings were used to determine if potentiation occurred following induction. Experiment 2 induced to one eye (monocular induction) while baseline recordings were made from the non-induced eye (monocular transfer baseline). Experiment 3 employed monocular induction but obtained monocular non-transfer baseline recordings. Experiment 4 employed monocular induction but binocular baseline recordings. Lastly, experiment 5 employed binocular induction but monocular baseline recordings. Results: Experiments that employed monocular induction did not demonstrate visual hLTP for monocular or binocular baseline recordings. In contrast, experiments that employed binocular induction showed successful potentiation for both monocular and binocular baselines. Conclusion: The five experiments strongly suggested that method of baseline recording does not influence whether or not visual hLTP can be measured when it occurs. Binocular induction was the key to successfully elicit visual hLTP. These findings indicated involvement of binocular neurons located in the visual cortical region. Therefore, this implies that visual hLTP is occurring in the cortex and not along the visual pathways, consistent with previous findings.

Keywords: visual long-term potentiation, monocular vision, binocular vision, Long-Term Potentiation, learning and memory


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Background sounds, arousal, and the pace of behaviour: A psychophysiological study

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Aims: Hearing music with a fast tempo in the background has been shown to increase the pace of motor behaviour. One of the possible underlying mechanisms is that performance increases because individuals’ arousal increases when a larger number of sounds are presented per unit time than when a smaller number of sounds are presented. We tested this hypothesis by assessing psychophysiological measures of arousal and the pace of behaviour in an experiment in which the regularity of rhythm was manipulated while the number of sounds per unit time was kept constant. Method: Thirty-two university students were asked to perform a self-paced line tracing task while hearing a sound sequence in the background. There were four conditions, in which the tempo of sound sequence (30 vs. 120 beats per minute) and the regularity of rhythm (regular vs. irregular) were manipulated orthogonally. The total alpha-band power of electroencephalogram (EEG), heart rates, and skin conductance levels were recorded during a rest period before performing the task. The length of the line that was completed by participants in 110 seconds was used as an index of behavioural pace (i.e., the longer the line completed, the faster the pace). Results: When a larger number of sounds were presented per unit time, the total EEG power of low alpha band (8.0-10.5 Hz) decreased at the frontal sites, regardless of the regularity of rhythm. Although no differences were found for autonomic measures of arousal, the EEG results indicate that temporally denser sounds increase listeners’ levels of arousal. However, the behavioural pace of participants increased only when the sound sequence involved a fast tempo and a regular rhythm. Conclusions: The results suggest that increased behavioural pace does not directly reflect increased arousal, and that the regularity of rhythm is an important factor determining behavioural pace.

Keywords: background music, tempo, Electroencephalography (EEG), Autonomic Nervous System, Arousal


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Emotional responses to violated expectations

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Aims: Many social psychological theories describe cognitively complex responses to psychological threats such as those in cognitive dissonance and mortality salience research. Some of these responses can be explained simply as palliative responses to negative emotional state induced by violated expectations. The aim of the present experiment was to demonstrate a negative emotional response to a simple expectancy violation. This would support the idea that a common mechanism can explain and unify disparate theories, and has not been directly measured until now. Method: The present experiment violated participants' expectations with a cognitively simple manipulation: incongruent sentence endings. EMG Corrugator supercilii (brow) activity to the sentence endings, EEG event related potentials (ERPs) to emotional pictures presented after the sentences, and a questionnaire measured participants responses to sentence endings. Some participants held a fearful posture allowing examination of the effect of embodying negative affect on the negative emotional response to the expectancy violation. Results: Corrugator and questionnaire results together indicated a negative emotional response to the incongruent sentence endings. Posture did not significantly interact with the effect of the incongruent sentence endings. Conclusions: This study provides some support for unifying disparate theories under the common psychological mechanism of emotional responses to expectancy violations.

Keywords: expectancy violation, EMG, ERPs (Event-Related Potentials), embodiment, dissonance


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Skin conductance responses of problem and non-problem gamblers to large and small magnitude wins

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Aims: Theoretical conceptualisations of problem gambling posit that the aberrant behaviours associated with this disorder are due to abnormal incentive processing in affected individuals. Previous autonomic research has suggested problem gamblers are less responsive to the experience of reward during real gambling activity on electronic gaming machines (EGMs) compared to non-problem gamblers; however, it remains unclear whether problem gamblers respond differently to wins of various magnitude. The current study sought to examine the psychophysiological responses of problem gamblers following small and larger magnitude wins in order to determine whether these individuals are more or less sensitive these outcomes compared to non-problem gamblers. Method: Seventeen problem gamblers and eighteen non-problem gamblers played a computer EGM task in a laboratory setting. Skin conductance responses (SCRs) following small and large wins, losses, and near-wins task were recorded and analysed. Results: A significant main effect of outcome type showed that larger magnitude wins elicited greater SCRs than small wins across the problem and non-problem gambler groups. While problem gamblers elicited reduced but comparable SCRs as non-problem gamblers to small wins, these individuals demonstrated significantly attenuated SCRs following larger magnitude wins. Conclusions: Consistent with previous research, the findings of the current study provide further support for the notion that problem gamblers are hyposensitive to reward, although further research is required to verify these results during genuine gambling activity where real money is returned. Nevertheless, the current study provides valuable information on the psychophysiological responses of problem gamblers using ecologically-valid stimuli, and has important implications for explaining the problematic behaviours associated with this complex disorder.

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Keywords: skin conductance response (SCR), Gambling, Electronic Gaming Machine (EGM), problem gambling, reward processing


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Sleep-wake behaviour and the EEG in altered states of consciousness

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Aims: Sleep-wake behaviour in patients with severe brain damage remains poorly understood. The severe brain damage seen in vegetative and minimal conscious state patients is generally accompanied by alterations in electrical brain activity. Despite this, only few studies have addressed this and generally reported large discrepancies in observations, while also suffering from methodological weaknesses. One important consideration is whether scoring sleep based on standard criteria is appropriate due to the large changes in brain activity. Therefore, in view of these shortcomings and to improve our understanding, there is an urgent need for systematic sleep-wake assessment in these patients, which was the aim of the current study.

Methods: Three ~24h polysomnographic recordings were collected as part of a collaborative project assessing the effectiveness of verticalisation treatment on various physiological parameters in vegetative and minimal conscious state patients. Nine patients (4 males, 5 females) between 18 and 63 years of age (mean ±SEM: 43.9 ± 4.5y) were evaluated at three-week intervals. Data was visually scored, however, as predicted, scoring according to standard criteria was not appropriate and therefore scoring criteria were developed based on common physiological signals seen across patients as well as spectral analysis techniques. Results: Overall, patients exhibited similar physiological patterns across all three of their recordings, whereas a high variability between patients was observed. A combination of physiological signals and video recordings were required to score sleep and wake-like states. All patients showed signs of sleep and wake-like states, however none showed a clear or typical sleep-wake rhythm. Conclusions: Sleep and waking in altered states of consciousness disorders does not show a common pattern and is different to that seen in healthy populations. Accordingly, scoring based on standard criteria seems to be inappropriate and quantitative EEG analysis provides additional important information. These aspects should be taken into account for more accurate diagnosis and prognosis, and our understanding of these conditions in the future.

Keywords: EEG, vegetative state, Consciousness Disorders, Sleep Stages, brain damage

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

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Aims: We investigated variations of intensity and novelty in the rarely-used auditory dishabituation paradigm. Stimulus-response (S-R) patterns were examined for autonomic and central measures and compared to the phasic skin conductance response (SCR) ‘yard-stick’ of the orienting reflex (OR). 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 trial), and a subsequent dishabituation trial at the initial tone. The evoked cardiac response (ECR), Respiratory Pause (RP), SCR, and single-trial ERPs from 19 sites, were collected. EOG-corrected ERP data were submitted to a temporal principal components analysis (PCA). Results: SCR displayed decrement, recovery, and dishabituation; intensity effects were apparent as a group x trials interaction at the recovery trial. ECR and the PCA components P1, N1-3, N1-1, PN, P3a, and SW showed no decrement. RP, P3b, and HabP3 showed decrement, but recovery was evident only in RP and HabP3. Dishabituation was apparent solely in SCR. Intensity effects were observed in SCR, P3a, and P3b. Conclusions: The S-R patterns of the autonomic measures were consistent with previous findings. No ERP component showed the hallmark S-R pattern of the OR. That is, fractionation of responses were found for autonomic and central measures, consistent with Preliminary Process Theory (PPT).

Keywords: orienting reflex, Preliminary Process Theory (PPT), dishabituation, Intensity, trials, Principal Component Analysis


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The effects of caffeine on emotional processing: An ERP study

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Aims: Research on the effects of caffeine on attention related processing has provided evidence that caffeine increases arousal, particularly in suboptimal conditions. This has been reflected in increased peak amplitudes and shorter latencies of ERPs and these have been linked to attentional processing. Research on emotional processing has also shown that ERP amplitudes are enhanced in response to stimuli that have emotional value and that are particularly arousing. The aim of this study was to explore the effect of caffeine on emotional processing using event related potentials. Method: Sixteen females aged between 18 and 35 participated in the study. All participants completed two experimental sessions in which they were given either caffeine (200 mg) or a placebo under double blind conditions. Participants viewed both high and low arousing pleasant, unpleasant and neutral stimuli (IAPS) while EEG activity was recorded from Affective picture viewing was used as a means to induce emotional processing while ERP components measured were recorded from ten sites. Results: N1, N2, and P3 peak amplitudes and latencies were analysed for the effects of caffeine on arousal and valence. P3 amplitude was enhanced in pleasant and unpleasant conditions but not neutral conditions. This enhancement was greater under caffeine conditions than under placebo conditions and this was to an even greater degree when caffeine was administered. Caffeine generally flattened the expected valence and arousal effects compared to placebo for N1 and N2 amplitude. Conclusions: The results support the negativity-bias model of emotional processing. The differential effects of caffeine on the early and late components of the ERP suggest that caffeine acts differentially on early and later attentional and emotional processes.

Keywords: ERPs, Caffeine, emotional processing, Negativity bias, Arousal


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An autonomic arousal perspective of Autism Spectrum Disorder: Implications for social motivation

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Aims: Individuals with autism spectrum disorders (ASDs) are characterised by marked impairments in social interactions. One potential explanation for this is the social motivation hypothesis, which proposes that individuals with ASDs have impaired social motivation that results in reduced attention to faces and other socially-relevant stimuli (voices, body language). Recent conceptualisations of the social motivation hypothesis propose deficits in ASDs occur not just at the behavioural level, but also encompass social orienting/attention. Skin conductance responses (SCRs) are the most commonly examined physiological marker of the orienting response (OR), a process affected by the novelty, intensity and significance of environmental stimuli. Therefore, SCRs to social stimuli in ASDs have important implications for the social motivation hypothesis. A series of studies were conducted examining SCRs to faces and affective scenes in ASDs. SCRs were utilised as a measure of social orienting and motivational engagement, to test the validity of the social motivation hypothesis of ASDs. Method: Thirty adults with high-functioning ASDs were matched to 32 controls. Participants viewed images (facial expressions (happy, angry, neutral), affective scenes (pleasant, unpleasant, neutral)) for 6s, with an inter-stimulus interval of 8s. SCR was quantified for each subject as the difference between the average 500ms pre-stimulus baseline period and the maximum value occurring for each 1s epoch of stimulus viewing time. SCR change scores were logarithmically transformed to normalise the distribution of scores. Results: Across all studies, the ASD group consistently demonstrated atypical SCRs to socially-relevant stimuli. For the facial expressions, the ASD group failed to habituate in their SCRs; for the affective scenes, they demonstrated dampened SCRs to pleasant/unpleasant vs. neutral. Conclusions: The findings are reflective of atypical orienting and allocation of attention and (emotional) significance in ASDs, providing support for the social motivation hypothesis of ASDs.

Keywords: autism, Asperger’s, social motivation, Skin conductance, orienting response


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Behavioural correlates of brain activity during self- versus other-referential emotion processing depend on emotion awareness

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Aims: Recognising our own and others emotions is vital for healthy social development. The aim of the current study was to determine how the brain integrates Self and Other emotion ownership concepts, and how the integration of this information influences behavioural expressions of emotion. Method: EEG was used to record changes in neural activity during the ‘input’ stage of emotion processing, while facial EMG was used to record the ‘output’ stage when behavioural responses are elicited, including spontaneous facial muscle activity. Eighteen participants passively viewed negative, positive and neutral emotional pictures during three blocks of referential instructions. Each participant imagined themselves, an unknown person or no one experiencing the emotional scenario, with the priming words ‘You’, ‘Him’ or ‘None’ presented before each picture for the respective block of instructions. Emotion awareness (EA) was also recorded using the TAS-20 Alexithymia questionnaire. Results: The late positive potential over the central-parietal cortex was significantly greater when participants were not imagining anyone experiencing the scenario. As expected, Corrugator Supercilii (CS) muscle activity increased significantly between 500-1000 ms post-stimulus onset during negative picture presentations regardless of ownership. Independent of valence, CS activity was greatest during the ‘No one’ task and lowest during the ‘Self’ task from less than 250-1000 ms. Interestingly, the degree of CS activation during referential tasks was further modulated by EA. Low EA corresponded to significantly stronger CS activity overall compared to high EA, and this effect was even more pronounced during the ‘No one’ task. Conclusions: The findings suggest that cognitive processes related to the perception of emotion ownership can influence the course of neural affective processing, and that a greater degree of integration between higher cognitive and lower affective levels of information may alter or suppress behavioural expressions of emotion. These findings are discussed with reference to current models of cognitive-affective regulation.

Keywords: Emotion Ownership, EEG, facial emg, Affective-cognitive interactions, Emotion Awareness, self-awareness


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The neural correlates of emotion ownership using biologically relevant emotional stimuli

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Aims: The relationship between emotion and self-awareness has rarely been addressed in neuroscience despite the potential clinical relevance of this knowledge. So far, existing studies using pronouns combined with emotion words such as ‘my fear’ have revealed that the interaction between emotion and self-other awareness develops hierarchically across several stages of processing. The aim of the current study was to determine whether using a biologically relevant paradigm of emotion processing, involving pictures rather than words, changes how these aspects of information are integrated across time. Method: Brain potential changes were recorded for 20 healthy participants while they viewed negative, positive and neutral emotional pictures during three blocks of emotion ownership instructions. Each participant imagined themself, an unknown person or no one experiencing the emotional scenario depicted in each picture. The words ‘You’, ‘Him’ or ‘None’ were presented before each picture to prime and reinforce the referred ownership for the respective block of instructions. Results: Rapid emotion discrimination in the visual cortex preceded ownership discrimination, with positive stimuli eliciting a significant early posterior negativity between 140-180 ms. Consistent with language-based studies, personal ownership (Self and Other) elicited stronger positive potentials over parietal-occipital regions compared to no ownership at 200-300 ms. Between 300-450 ms Self-referential processing was significantly pronounced, but only when combined with positively valenced emotion ownership. Conclusions: The findings firstly suggest that, for pictures, emotional valence is processed earlier in the brain than is emotion ownership, which may be a direct result of their biological relevance. Second, the findings confirm previous literature, demonstrating that self-other discrimination involves two hierarchical stages of processing, beginning with selective processing of information with any personal reference over no reference. This is followed by the selective processing of information directly referred to the Self, where it is theorised that a proper distinction between Self and Other first evolves.

Keywords: Emotion Ownership, EEG, Biological emotion, Self- Other discrimination, self-awareness


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The correlation between probe P3 amplitude and degree of interest in movie trailers

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Aims: The amplitude of the P3 (P300) component of event-related potential (ERP) has been used as an index of the perceptual-central attentional resources allocated to eliciting stimuli. Using a secondary-task technique, a previous study showed that P3 amplitude elicited by auditory probe stimuli was lower when participants were viewing interesting movie clips than when they were viewing neutral movie clips. In our study, we examined whether P3 amplitude is proportionally related to the degree of interest in short movie clips. To eliminate stimulus masking at the perceptual level, somatosensory probe stimuli were used. Method: Fifteen university students were asked to watch 12 movie trailers (M = 143 s). Meanwhile, a non-painful electric pulse (0.2 ms) was sent to their left middle fingers once per five to seven seconds (M = 6 s). The participants responded with the left thumb as quickly as possible whenever they felt the stimulus. After viewing each trailer, participants completed subjective impression ratings on nine visual analog scales (0–100). A composite “interest” score and ERP waveforms in response to probe stimuli were calculated for each movie trailer. A temporal-spatial principal component analysis was applied to the ERP waveforms to obtain a component score corresponding to probe P3 amplitude for each trailer. Results: P3 was identified as a principal component peaking at 390 ms with a central scalp distribution. The component score of the P3 was negatively correlated with the composite interest score (r=-.22, p=.003). Conclusions: The results suggest that viewers allocate more attention to movie clips that interest them, as the amplitude of the P3 elicited by somatosensory probe stimuli is inversely related to the degree of interest in movie clips.

Keywords: ERPs (Event-Related Potentials), Interest, Somatosensory Evoked Potentials (SEP), movie, P300


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Influences of mood valence and arousal on the breadth of visual attentional focus: An ERP study

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Aims: Affective states are thought to modulate the breadth of attention, with positive moods broadening and negative moods narrowing visual attentional focus. Although traditional research addressing the effects of moods on the breadth of attention has emphasized the effects of affective valence (i.e., pleasant vs. unpleasant), the role of arousal associated with moods has remained unclear. In this study, we examined the effects of both mood valence and mood arousal on the breadth of attentional focus by using event-related potentials (ERPs).

Method: Twenty-four students performed a flanker task under high-arousal positive, high-arousal negative, low-arousal positive, and low-arousal negative moods, which were induced by music and imagery. Simultaneously with the flanker task stimuli, a white rectangle ‘probe’ stimulus was presented at one of four locations (inner probes: 0.5 degrees left or right from the central letter, outer probes: 1.5 degrees left or right from the central letter). The amplitudes of P1 (95-105 ms post-stimulus) and N1 (140-160 ms post-stimulus) in response to the probe stimulus were used as indices of the amount of attention allocated to a particular position.

Results: Subjective affective ratings confirmed that the mood-induction procedures effectively produced the target moods. The amplitudes of P1 and N1 were larger for inner probes than for outer probes, indicating that attention was focused on the central letter. This probe position effect was smaller under positive moods than under negative moods. Moreover, the effect was reduced and became statistically non-significant in the low-arousal positive moods.

Conclusions: Positive moods broaden attentional focus at the early sensory input stages, in comparison to negative moods. This effect is most prominent when mood arousal is low. Our results suggest that the effect of positive moods on breadth of attention is modulated by mood arousal.

Keywords: mood, Attention, Event-related potentials, Visual Processing, Arousal


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Impaired emotional prosody processing in severe traumatic brain injury: An event-related potential study

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Aims: Impaired communicative competence is well-documented among individuals with a severe traumatic brain injury (TBI). These impairments may in part result from a reduced perception of paralinguistic cues, such as emotional prosody which help inform judgments about another’s emotional state. This study used event-related potentials (ERPs) to examine the neural mechanisms of emotional prosody perception in TBI, within the framework of Schirmer and Kotz’s (2006) model of vocal emotion perception. Methods: Nineteen adults with severe TBI (15 male, age 46.1, education 12.5, average post-traumatic amnesia 66.78 days, average time post-injury 12.5 yr), and 18 neurologically-healthy controls (11 males, age 43.9, education 15.4) completed a discrimination task which presented semantically-neutral word pairs from five prosody conditions (happy/happy, angry/angry, neutral/neutral, angry/happy, happy/angry); participants were required to judge the emotional prosody as the ‘same’ or ‘different’ whilst electroencephalogram and accuracy were recorded. Results: Preliminary analyses indicated that ERPs were larger in control compared with TBI participants, and were larger in central than lateral sites for both emotion categories compared with neutral, whereas the converse was found in TBI, who showed a hemisphere > midline topography, but no topographical differentiation across frontal/posterior regions (F=4.26, p=.046). This difference was also reflected in reduced accuracy for both emotion conditions for TBI group. Conclusions: TBI participants were not impaired in sensory processing of acoustic cues or recognition of emotional salience in acoustic cues. In regards to cognition and evaluative judgement however, TBI participants showed obvious differences in both ERP morphology, and behavioural outcomes, compared with controls. These findings are consistent with the frontal and posterior poles being more vulnerable to damage in TBI.

Keywords: emotion, Prosody, ERP, Severe traumatic brain injury, Sensory Processing


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Electrophysiological evidence of subtle deficits in memory processes in young heavy drinkers and cannabis users

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Aims: Long-term heavy use of cannabis and alcohol are known to be associated with memory impairments. In this study, we examined whether subtle deficits were observable in young adults using both behavioural measures and ERPs. Method: Twenty-one regular heavy drinkers, 18 regular cannabis users, and 22 controls aged 18-21 completed a modified verbal learning test (the Rey Auditory Verbal Learning Test) while EEG was recorded. ERPs were calculated for words which were subsequently remembered vs. those which were not remembered, and for presentations of learnt words, previously seen words, and new words in a subsequent recognition test. Principal components analysis was used to increase signal:noise ratio, since the RAVLT typically has too few trials for ERP research. Results: Relative to controls, heavy drinkers showed (nonsignificant) trends to poorer initial learning and impaired recall after a distractor task; cannabis users also showed the latter effect. In recognition tests, heavy drinkers were less likely to recognise learnt words, while cannabis users were slower to reject previously seen and new words. At encoding, both cannabis users and heavy drinkers showed reductions in the usual P2 recall effect (larger for recalled than not-recalled words) observed in controls. In the recognition test, the parietal old/new effect (~550 ms post-stimulus) discriminated between learnt words and previously seen and new words (which did not differ) in controls, but heavy drinkers responded to previously seen words more like learnt words. Cannabis users displayed a reduced frontal N400, reflecting familiarity, to all words, but were mostly like controls. Conclusions: The study is the first examination of ERPs in the RAVLT in healthy control participants, let alone in substance-using individuals, and represents an important advance in methodology. The results suggest the presence of subtle brain dysfunction associated with encoding and recognition not yet significant enough to cause substantial behavioural differences, and underline the potential for brain dysfunction with early exposure to alcohol and cannabis.

Keywords: alcohol, Cannabis, learning and memory, recognition memory, Recall

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Differential conflict monitoring in young heavy drinkers

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Aims: Difficulties in monitoring ongoing behaviour may be linked to real-life problematic drinking behaviours. Additionally, some prior research suggests females in particular display greater cognitive control deficits. In this study, we examine conflict adaptation in an Eriksen flanker task relative to sex and drinking behaviours. Method: Twenty regular binge drinkers (10 male) and 33 non-binge drinkers (18 male) completed an Eriksen flanker task while EEG was recorded. Reaction time, error rates, P2-N2 amplitude, and P3 amplitude were analysed. Results: For all measures, conflict adaptation was evidenced by a differential response to the current (congruent vs. incongruent) trials dependent on the identity of the previous trial. There were no behavioural differences as a function of Sex or Drinking Group. Conflict adaptation for P2-N2 was larger for binge drinkers, and particularly so for females. The P3 conflict adaptation effect was larger for females than males, with no difference between Drinking Groups. Conclusions: Results will be discussed in terms of individual differences in cognitive control.

Keywords: conflict monitoring, cognitive control, conflict adaptation, heavy drinkers, Alcohol Drinking, sex differences


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Aims: Intervals between matching stimuli (target-to-target interval, TTI; nontarget-to-nontarget interval, NNI) have been shown to play a role in determining the amplitude and latency of the P3 ERP component in a variety of oddball tasks. The mechanism of matching-stimulus-interval effects is unknown, however it has been theorised that interval effects seen in the P3 are an outcome of working memory processes (update and decay of the memory trace, or “template”). To further understand this mechanism, we explored whether TTI and infrequent NNI determined the magnitude of another ERP component, the N2, in a visual three-stimulus oddball task. Method: Continuous EEG data were acquired from 24 university students whilst they completed a three-stimulus visual oddball task with a fixed SOA and seven manipulations of TTI and infrequent NNI. Offline data were corrected for artefact, filtered, epoched, baselined, and separate averages were computed for each TTI and infrequent NNI. Post-processed ERPs were then submitted to an unrestricted temporal principal components analysis (PCA) with orthogonal VARIMAX rotation. Two factors identified as the N2 and P3 in terms of their latency, topography, and sequence, were extracted for subsequent analysis. Results: As expected, P3 amplitude augmented as matching-stimulus interval increased; this linear trend differed between stimuli, with targets eliciting a steeper increase in P3 amplitude than infrequent nontargets. N2 also showed an across-stimulus increase in negativity as interval increased, but unlike the P3, this did not differ significantly between stimulus types. Conclusions: It was demonstrated that matching-stimulus-interval effects are not restricted to the P3, with interval effects evident in an earlier component, the N2. This suggests that the TTI/NNI-mechanism may be the outcome of a wider range of executive processes than originally conceptualised, or a refractory-period effect, and future theory development needs to take this into account.

Keywords: Event-related potentials (ERPs), Target-to-target interval (TTI), Sequence effects, Interstimulus interval (ISI), P3(00), Principal Components Analysis (PCA)

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N1, P2, and P3b are affected by the matching-stimulus-interval in an auditory equiprobable Go/NoGo task

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Aims: It has been demonstrated that as the target-to-target interval (TTI) and the nontarget-to-nontarget interval (NNI) increase P3b amplitude augments in a linear fashion. A similar response pattern has also been demonstrated for N1, but this has been explored with TTI only. This study aimed to discern whether both TTI and NNI affect early sensory components (N1 and P2) in a fashion analogous to the P3b. Method: Thirty university students completed an auditory equiprobable Go/NoGo task with a variable SOA and manipulations of TTI and NNI whilst their EEG activity was recorded. Data were corrected for EOG artefact, epoched, baseline-corrected, filtered, and averages were computed for five separate TTIs and NNIs for each subject. An unrestricted temporal principal components analysis with VARIMAX rotation was applied, and factors identified as N1, P2, and P3b ERP components were analysed further. Results: Across stimuli, P3b showed a linear increase as interval increased. This trend did not differ significantly between targets and nontargets. N1 amplitudes became more negative as interval increased before plateauing at the longest interval (15 s); this did not differ with stimulus type. A similar linear trend was observed for P2 with amplitudes augmenting as interval increased. Again, there was no difference in this linear trend between targets and nontargets. Conclusions: Here we demonstrated that NNI effects are present for N1, and that changes in both TTI and NNI affect N1, P2, and P3b in a similar fashion. Together, these findings indicate that matching-stimulus-interval effects are present at the early sensory stages in sequential processing, for both task-relevant and background information. The mechanism of TTI and NNI effects is currently unknown, but these findings could suggest that early-perceptual processes, or a refractory period effect, are contributing to this phenomenon.

Keywords: event-related potentials (ERPs), Target-to-target interval (TTI), Sequence effects, Interstimulus interval (ISI), P3(00), Principal Components Analysis (PCA), Nontarget-to-nontarget interval (NNI)

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Detecting the sound of feelings: An ERP investigation of vocal emotion perception

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Aims: In speech, an individual’s tone of voice modulates systematically to signal their emotional state and intentions. Hence the accurate perception of tone in voice plays a critical role in everyday psychosocial functioning. Using an oddball paradigm, the current study investigated event-related potential (ERP) correlates of acoustic analysis (100ms), emotional salience detection (200 ms) and cognitive evaluation (300-500 ms) of emotional voices, as proposed by Schirmer & Kotz (2006). Method: In the oddball task, 34 undergraduate psychology students (18 females, 20.0 years old) were fitted with EEG caps and told to mouse-click in response to rare auditory presentation of emotionally vocalised words. Participants completed two blocks of the oddball task, each consisting of words spoken in neutral (300), happy (25), angry (25) and disgusted (25) tones. Behavioural, responses and peak-amplitudes differences to emotional tones at 100, 200, and 300-500 ms were analysed. Results: The task elicited P1 (50-150 ms), N2 (150-250 ms), P3 (250-350 ms) and N3 (300-450 ms) components. Rare emotional tones in comparison to frequent neutral tones elicited greater P1, N2 and N3 peak-amplitudes. Moreover, both N2 and N3 components elicited greater peak-amplitudes at right central regions in response to negative (angry/disgust) compared to positive tones. P3 however, elicited greater P3 peak-amplitudes to neutral tones. Behaviourally, participants were significantly better at detecting negative tones with significantly faster response times to angry tones. Conclusions: Given the early (100-200 ms) peak-amplitude differences between neutral and emotional tones, the P1 and N2 components are likely reflect early acoustic analysis and emotional salience detection processes. Differences in the topographical distribution of N3 may reflect a distinction in the neural mechanisms underlying the cognitive evaluation of positively and negatively valence tones. P3 reflected inhibitory processes associated with the nature of the task.

Keywords: vocal emotion perception, Event-related potentials, oddball paradigm, P1, N2, P3, N3
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Following erotic stimuli, cognitive inhibitory responses are diminished in sex offenders but enhanced in healthy controls

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Aims: Previous studies have indicated that emotion could both enhance and dampen task performance. Whether emotion enhances or dampens task performance may depend on whether individuals have particularly strong reactions to emotional stimuli. In the current study, we used event-related potential (ERP) to investigate the influence of emotional stimuli on inhibitory control in healthy individuals and sex offenders. Method: In each trial, the participants viewed one emotional picture (pleasant, unpleasant or neutral) passively and then made a series of five Go/No-Go decisions. In particular, the pleasant pictures were composed of erotic pictures and pictures of beautiful women. Results: Results indicated that during picture-viewing period, pleasant pictures elicited a larger late positive potential (LPP) than unpleasant pictures only in the sex offenders. In addition, during the Go/No-Go task, the healthy individuals had a smaller “No-Go minus Go” N2 in the emotion conditions compared to the neutral condition. However, the sex offenders had a larger No-Go N2 specifically in the pleasant condition. Conclusions: Taken together, these results suggest that the sex offenders may have stronger motivation and sustained attention toward the erotic stimuli, and as a consequence, their emotive response to these stimuli interfered with their inhibition. In contrast, for the healthy individuals, emotion was beneficial to inhibition. Overall, emotion benefited inhibitory control in healthy individuals but harmed it in sex offenders.

Keywords: emotion, Inhibitory Control, event-related potential (ERP), late positive potential, N2


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Insight into the neural basis of why we feel how we feel during exercise

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Aims: To examine the influence of frontal cortex activation, amygdala activity and perception (tolerance) of the intensity of exercise upon affective (pleasure-displeasure) responses to exercise. Method: Changes in cerebral oxygenation (O₂Hb), deoxygenation (HHb), blood volume (tHb) and saturation (HbDiff) were measured using near infrared spectroscopy. Amplitude of the eye blink response (to indicate amygdala activity) was recorded using acoustic startle methods. Affective responses were reported using the Feeling Scale. Measures were taken during exercise at intensities standardised to metabolic processes: 80% of ventilatory threshold (below VT), at VT and respiratory compensation point (RCP). Tolerance of the intensity of exercise was measured using a questionnaire prior to exercise. Results: A series of ANOVAs revealed significant (p<.05) Hemisphere (right, left) by Intensity (below VT, VT, RCP) interactions for O₂Hb and HbDiff, and Intensity main effects for HHb, tHb, amplitude and affective responses. At VT, O₂Hb and tHb were greater and HHb and HbDiff were stable in both hemispheres than below VT. At RCP, O₂Hb and HbDiff were greater in the left than right hemisphere and HHb and tHb were greater in both hemispheres than VT. Amplitude and affective responses declined as the intensity increased. Significant (p<.05) bivariate correlations revealed that at VT, O₂Hb (right, left) was associated with amplitude (r=.46 and .55, respectively). At RCP, O₂Hb in the right hemisphere (r=-.51) and amplitude (r=-.51) were inversely associated with affective responses and amplitude was inversely associated with tolerance (r=-.50). Conclusions: During exercise at physiologically challenging intensities (above VT), frontal cortex activation and amygdala activity are associated with affective responses and amygdala activity is associated with an individual’s perception (tolerance) of exercise. These findings provide a novel insight into the neural basis of why we feel how we feel during exercise.

Keywords: affective responses, frontal cortex, Amygdala, Near Infrared Spectroscopy (NIRS), acoustic startle reflex, physical activity


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Set-switching in obsessive-compulsive disorder: An ERP comparison with panic disorder

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Aims: Cognitive flexibility, including the ability to shift adaptively between changing tasks or rules, may be impaired in obsessive-compulsive disorder (OCD), contributing to repetitive symptoms. Brain mechanisms and the specificity of set-switching difficulties to OCD are inadequately understood. We investigated the neurophysiology of set-switching in participants with OCD versus healthy and anxious controls. Method: Participants with OCD (n=20) versus healthy (n=20) and anxious controls with panic disorder (n=20) performed a specially designed Go/NoGo task, where some stimuli had switching, and some had fixed, response requirements. ERPs, response time (RT) and accuracy were compared between groups. Results: Switch costs occurred in terms of higher errors to switching stimuli across participant groups, particularly commission errors to switching NoGo stimuli. For N2, there was a Switch by Go/NoGo interaction, with the largest N2 amplitude occurring to switching NoGo stimuli. Additionally, N2 latency was longer to switching stimuli. Classic NoGo enlargement and anteriorisation occurred for N2-P3, across groups. Both clinical groups had higher switching versus non-switching P3 amplitude, compared to healthy controls. Additionally, clinical groups shared general RT impairments and atypical topography of N2. Conclusions: We identified similar general deficits and ERP anomalies during task-switching in OCD and panic disorder, precluding OCD-specific interpretations. Both conditions may be characterised by shared anomalies in cognitive flexibility and control.

Keywords: set-switching, OCD, inhibition, ERPs, Panic Disorder, P3, N2


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Cross-modal modulation masking: A psychophysical and EEG investigation of simultaneous acoustic and vibrotactile amplitude modulation

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Aims: Modulation masking refers to a disruption in the ability to detect amplitude modulation (AM) in sound in the presence of an auditory masker with a similar temporal pattern. Previously, we have shown that multisensory presentations of acoustic and vibrotactile AM stimuli increase auditory and vibrotactile AM detection thresholds, suggesting a cross-modal modulation masking effect. Prior psychoacoustic research suggests that this masking effect is dependent on the phase of the AM masker. This study aimed to determine whether cross-modal phase differences for simultaneously presented acoustic and vibrotactile AM stimuli increase AM detection thresholds and whether this is reflected in the steady-state response (SSR) elicited by the same multisensory stimulus combinations. Method: A 2I-3AFC psychophysical procedure was used to estimate AM detection thresholds for auditory and vibrotactile stimuli at two AM rates (27 and 40 Hz) and three cross-modal phase conditions: None (AM stimulation in the target modality only); Same (AM in both modalities/no cross-modal phase difference); Different (AM stimulation in both modalities/180˚ phase difference). In a separate EEG session SSR activity was measured to the same stimulus combinations. Results: Vibrotactile AM thresholds significantly varied according to Phase F(2,28)=4.81, p=.02. Thresholds for the Same condition were higher relative to None F(1,14)=8.06, p=.01. Differences between None and Different were non-significant. The influence of Phase on auditory 27 and 40 Hz SSR activity significantly varied according to AM rate F(2,16)=8.65, p=.003, F(2,16)=6.43, p=.01, with greater increases in activity at the EEG frequency corresponding to the AM rate. Conclusions: The increased sensitivity to vibrotactile AM stimuli resulting from a cross-modal phase difference suggests a release from masking and provides further evidence of cross-modal modulation masking. Cross-modal AM stimulation increases auditory SSR activity at the frequency of stimulation but has no effect on vibrotactile SSR activity which suggests a dissociation between SSR activity and AM detection.

Keywords: amplitude modulation, auditory steady-state responses (ASSRs), vibrotactile steady-state responses, cross-modal modulation masking, temporal processing


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The psychophysiological effects of ostracism in Autism Spectrum Disorder

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Aims: Little is known about how adults with Autism Spectrum Disorder (ASD) experience the effects of ostracism. However, these individuals commonly experience such negative and potentially distressing treatment. This study examined the psychological and physiological effects of ostracism in these individuals. Method: Nine individuals aged 16 or older (9 males; 33.67 years) with a diagnosis of ASD and 11 matched controls (6 males, 26 years) participated in a pretend online game of ball tossing, Cyberball. Each participant played one game in which they were excluded from the game and another in which they were included. Whilst playing, participants’ arousal level was monitored via skin conductance (SCL). Participants were also required to complete a self-report questionnaire about their experience after both games. Results: Individuals with ASD showed increased arousal compared with controls (p=.05), both when excluded and included. Both groups showed greater SCL to being ostracized than when included (p=.001). Furthermore, individuals with ASD did not demonstrate a reduction in arousal over the course of the game, as controls did. Psychological responses indicated that individuals with ASD did not differ in their perception of having their needs fulfilled or in their mood after playing the game. Conclusions: The present findings suggest that individuals with ASD were more engaged in the game than controls, regardless of whether they were included or excluded. They demonstrated higher arousal throughout the game than controls, but appeared to interpret negative feelings of exclusion and ostracism in a similar way to the control group.

Keywords: ostracism, Autism Spectrum Disorder, Arousal, Skin conductance response, cyberball

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What is an emotion in the first place? Time to sort things out

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Research on emotion has a long history, and yet, we still don’t understand how exactly it contributes to guiding behaviour and how it interacts with cognition, not even do we have an agreeable definition of emotion in the first place. There is accumulating scientific evidence that supports the idea to more clearly define what and what should not be labelled an emotion. By taking various different simultaneous measures while study participants view emotional material it turns out that the same set of stimuli causes different patterns of results depending on the measure and its sensitivity. These different findings mirror the fact that emotion-related processing happens on various different levels and thus deserves a more sophisticated terminology. Various different data are presented that support an emotion-model that defines emotion as the behavioural output of affective information processing (see Walla & Panksepp, 2013). Also, affective processing is separate from cognitive processing and it evolved before language came into existence. Thus, it is hard to find words for deep and raw affective content, which in turn means that survey-based investigations about emotion-related information may not necessarily tell us the entire truth. The fields for implications are enormous and span from basic neuroscience over clinical domains to even consumer neuroscience and marketing.

References

Keywords: Emotions, affective processing, brain imaging, Self-report, Models, Biological
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When compulsive and impulsive people make financial decisions their brain activity differs

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Aims: In this study we hypothesized that impulsivity and compulsivity are associated with different brain activity patterns when financial decisions have to be made. Method: Via using a selected set of surveys we first grouped a sample of non-clinical volunteers into compulsive and impulsive and then we invited them to our laboratory in order to conduct an electroencephalography (EEG) study. A delay discounting task with various immediate small rewards versus delayed larger awards was used and participants had to choose between these two options. During their performance on the task brain activity was recorded with high temporal and spatial resolution. Results: Averaging brain activity patterns across all different reward conditions we found that compulsivity was associated with significantly higher brain activity over right frontal cortical areas compared to impulsivity regardless of the participants’ decisions. Conclusions: This finding demonstrates that neural processes during decision making differ between compulsive and impulsive people when financial decisions have to be made. At this stage, this finding cannot be generalized to any decision making, but it represents an interesting step into a promising future, where Neuroscience marries with Clinical Psychology for a best possible understanding of conditions such as compulsivity and impulsivity.

Keywords: compulsivity, impulsivity, EEG/ERP, Decision Making, non-clinical populations


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Familial analysis of MMN in cannabis users: A case study

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Aims: The Mismatch Negativity (MMN) is a brain event-related potential marker of sensory memory and prediction error, and is thought to index N-methyl-D-aspartate receptor-mediated glutamate neurotransmission functionality. MMN is reduced in patients with schizophrenia and in their unaffected first degree relatives. MMN is also reduced in chronic cannabis users and in ex-cannabis users (33-month abstinent). Reduced MMN in ex-users suggests that cannabis-related deficits may persist after cessation of use, or alternatively this may reflect a pre-existing condition. One way of potentially elucidating this issue, is to conduct a familial analysis of the MMN in cannabis users and their non-user first degree relatives: attenuated MMN in relatives might indicate a familial vulnerability to cannabis use or to glutamatergic dysfunction.

Method: One sibling pair (one cannabis user, one non-user sibling) and three non-user, unrelated, matched controls completed a multi-feature MMN paradigm with duration (100 ms), frequency (1200 Hz) and intensity (90 dB) deviants (deviants 6%; standards 82%, 50 ms, 1000 Hz, 80 dB). Results: Visual inspection of MMN waveforms and patterns of means suggests that non-user siblings have MMN amplitudes intermediate to their user-siblings (whose MMN is most attenuated) and controls. Examination of confidence intervals for controls (reflecting MMN amplitude variability across conditions) indicated that the user-sibling had smaller MMN amplitudes for all deviant conditions, and the non-user sibling had reduced duration MMN amplitude, compared to controls. Conclusions: These preliminary data provide early evidence that MMN might reflect a pre-existing vulnerability that is antecedent to cannabis use, but exacerbated by subsequent cannabis use, and may inform current conceptualisations of cannabis as a component cause of schizophrenia. However future research should attempt to replicate these findings in a larger sample.

Keywords: mismatch negativity, sibling, Cannabis, familial, Glutamate


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An investigation of mismatch negativity in current and ex- cannabis users using a feature controlled method

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Aims: The Mismatch Negativity (MMN) is a brain event-related potential marker of sensory memory and prediction error. Studies have found reduced MMN amplitude in long-term cannabis users, and in ex-cannabis users, relative to non-user controls. These groups have not been directly compared. A criticism of previous research is a lack of control for perceptual differences between the deviant and standard tone within the oddball sequence of a multifeature paradigm, which may enhance N1 and therefore overestimate MMN. The current study investigated the use of a novel, feature-controlled extraction method to further explore MMN in chronic users, ex-users and controls. Method: 39 chronic users, 16 ex-users and 44 non-user controls completed a multi-feature MMN paradigm with duration (100 ms), frequency (1200 Hz) and intensity (90 dB) deviants (deviants 6%; standards 82%, 50 ms, 1000 Hz, 80 dB), with runs preceded by trains of deviants presented as standards. MMN was extracted using (i) the traditional method (deviant – oddball standard) and (ii) a feature-controlled method (deviant – perceptually identical stimuli presented as standards prior to the oddball sequence). Results: A main effect of Method type indicated the traditional method produced larger MMN amplitude estimates for all groups and deviant conditions. A main effect of Group was identified for frequency MMN indicating reduced MMN in chronic users compared to controls. In ex-users, frequency MMN was reduced relative to controls using the traditional method, but only at trend level for the feature-controlled method. No differences between chronic and ex-users were identified for any deviant condition with either method. Conclusions: Reduced frequency MMN in chronic and 33-month abstinent users suggests chronic use may lead to early sensory information processing deficits that persist after cessation of use. These data demonstrate the utility of a feature-controlled method of examining MMN, and suggest the traditional method may overestimate MMN due to stimulus perceptual differences enhancing N1.

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Keywords: mismatch negativity, Cannabis, feature-controlled method, chronic users, ex-users


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Startle eyeblink modulation as a measure of environmental concern

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Aims: Fear appeals seek to elicit behaviour designed to reduce negative affective associated with certain images and the thoughts which they engender. They are widely employed in efforts to encourage environmentally sustainable behaviour. The success of fear appeal depends upon whether the images employed elicit negative affect in the target group. Subjective reporting may not provide accurate information on which to base intervention decisions for a variety of reasons, including social desirability. The startle eye-blink modulation paradigm is founded on evidence showing that startles are inhibited by pleasant stimuli and facilitated by unpleasant stimuli, enabling the measurement of attitudes in a number of social domains. The present study was designed to provide initial evidence for its utility in assessing stimuli relevant to environmentally sustainable action. Method: Nineteen participants completed an environmental concern questionnaire. Participants then viewed environmentally positive, environmentally negative, and neutral images (5 seconds in duration each) prior to startle elicitation by 50 milliseconds of white noise at 95 decibels, presented 3.5 seconds after image onset. Results: Positive environmental images resulted in suppression of eyeblink startle responses, relative to neutral pictures, as anticipated. However, negative environmental images also resulted in smaller eyeblink startle responses. The size of this suppressive effect for both types of images correlated with the environmental concern scale. Eyeblink startle elicited during neutral stimuli was negatively correlated with environmental concern scores. Conclusions: The influence of environmental images on eyeblink suppression is complex. Further research including unambiguously valenced pictorial cues is needed to determine the likely value of such images in fear appeals. The relation between environmental concern and eyeblink startle to neutral stimuli, though unexpected, is consistent with reports of similar effects obtained with respect to, for example, political conservatism. These data thus suggest possible links between environmental attitudes and other dimensions of social concern.

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Keywords: startle eyeblink modulation, startle reflex modulation, environmental concern, Electromyographic (EMG), attitude measurement, physiological measurement


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An ERP investigation of specific inhibition in experienced table tennis players

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Aims: Inhibitory control has been regarded as a remarkable and central feature of human cognitive ability. Our study aimed to examine the relationship between inhibition and experience, exploring whether it was suitable to measure the general ability of athletes using simple objects in sport psychology. Method: With the purpose of understanding the effect of experience, we manipulated independent variables with groups (experienced table tennis players vs. control) and tasks (relevant vs. normal). The stimuli in the relevant task were round in shape, and thus were highly relevant to the experienced table tennis players. Behavioural and electrophysiological data were subjected to repeated-measures ANOVAs, with Task as a within-subjects factor. Results: There were no significant effects for behavioural variables. For the relevant task, the amplitude of N2d and P3d were larger for the experienced than control, with no differences in latency. For the normal task, the experienced group showed longer latency than controls with no differences in amplitude. Comparing within group, for the experienced, they showed a shorter and smaller N2d component with a shorter and larger P3d component in relevant compared to the normal task. However, these differences were not found for the control group. Conclusions: The results suggest that experience does affect inhibitory processes reflecting in ERPs, with the experienced group being efficient in conflict detection and able to put more resources towards motor related phase when stimuli match their sports experience. However, the advantage seems to disappear in the normal task. The results suggest that people possess specific as well domain-general inhibitory mechanisms. Researchers in sports psychology should be careful to measure the general ability of the athlete through cognitive paradigm as the simple stimulus may relate to their specific training and experience, and thus affect electrophysiological responding.

Keywords: ERPs (Event-Related Potentials), Sport, Inhibition (Psychology), Expertise, N200, P300 event-related potential


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