CONFERENCE PROGRAM

for the

26th Annual Conference of the
Australasian Society for Psychophysiology

Central Queensland University,
Appleton Institute, Adelaide
12 to 14 December, 2016
Welcome to ASP2016!

The ASP2016 organising committee warmly welcomes all delegates to the 26th Annual Conference of the Australasian Society for Psychophysiology (ASP2016). This year, the conference will be hosted by the Psychology and Public Health Department within the School of Health, Medical, and Applied Sciences at Central Queensland University in Adelaide, Australia. The three-day event features a range of fascinating keynote speakers, oral presentations and a poster session, informative post-conference workshops, as well as social events. The conference brings together researchers from psychology, psychiatry, and neuroscience, and has a focus on relationships between the brain and behaviour. For conference information, please refer to the sections of the Conference Program Table of Contents below.

With best wishes,

The ASP2016 Organising Committee

Lisa Lole (Convenor) – Central Queensland University
Raymond Matthews (Convenor) – Central Queensland University
Frances De Blasio – University of Wollongong
Bob Barry – University of Wollongong
Stuart Johnstone – University of Wollongong
Diana Karamacoska – University of Wollongong
Jacqueline Rushby – University of New South Wales

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Venue Information and Map

Venue and Times
ASP2016 will be held on the Ground Level of the Central Queensland University’s Adelaide campus, 44 Greenhill Road, Wayville Adelaide, South Australia 5034. The conference will commence at 9:00am (ACDT/Adelaide time) on Monday 12 December 2016 and conclude at 1:30pm (ACDT) Wednesday 14 December 2016. Following the close of the conference, post-conference workshops will run from 1:30 to 4:00pm (ACDT).

Transport to the Venue

TRAIN – Adelaide Showground Train Station is in close proximity to the venue. Please visit the Adelaide Metro website for timetable information (http://adelaidemetro.com.au/).

BUS – Many bus routes service this area. Please visit the Adelaide Metro website for timetable information (http://adelaidemetro.com.au/).

CAR – There is limited campus parking available. There is also limited on-street parking surrounding the campus. Parking is also available at various parking stations located nearby (e.g., 85 Gilbert St, Adelaide; https://www.wilsonparking.com.au/park/5079_85-Gilbert-St-car-park_85-Gilbert-Street-Adelaide-SA).
Registration and Delegate Information

Registration
The registration desk will open from 9:00am to 9:30am (ACDT/Adelaide time) each day, and is located in the Foyer on the Ground Level of the building (please see the previous page).

Name Badges
Please wear your name badge at all times at the venue to facilitate interactions with other delegates and to verify your access to the campus and entitlement to refreshments. Please be aware that ASP2016 delegate access is restricted to the Ground Level of the CQU Adelaide campus, and that classes or exams may be underway in some areas of the campus.

Refreshments and Lunch
Morning tea, Lunch, and Afternoon Tea will be provided on Monday, Tuesday, and Wednesday. The cost of these is included in your registration.

Welcome Event
Drinks and canapés will be served during the poster session from 5:00pm to 6.30pm (ACDT/Adelaide time) on Monday 12th December. The cost is included in your registration.

Trade Displays
Symbiotic Devices has an exhibition booth in the Foyer on the Ground Level on Day 1 of the conference. We encourage you to visit them and thank them for their support of ASP2016.

Information for Presenters

Oral presentations
The lecture theatre contains a Windows laptop and connection facilities. PowerPoint presentations should be loaded using a USB memory stick. The maximum speaking time for each presentation is 15 minutes with an additional 5 minutes for questions. The session chair will warn you as you approach this time limit. Speakers should ensure that their equipment needs are met and that their presentation slides are loaded no later than 15 mins before the start of their session.

Poster presentations
The poster session will be held on Monday 12 December from 5:00pm to 6:30pm (ACDT/Adelaide time) during the same time as the welcome function. Posters should be left at the registration desk when registering on Day 1. Posters will remain in place for the duration of the conference and may be taken down after morning tea on Wednesday 14 December (please notify the people at the registration desk if other arrangements for collection need to be made). Poster size should be A0 (841 mm x 1189 mm), in either portrait or landscape orientation.

Delegate Assistance and Advice
Should you need any assistance or advice during the conference please visit the registration desk or speak to any of our conference volunteers who can be identified by the ‘red dot’ on their name badge.
Proud Sponsor of ASP2016
Conference Dinner

The conference dinner will be held at the Tivoli Function Centre from 6:00pm to 9:00pm (ACDT/Adelaide time) on Tuesday 13 December 2016. A three-course sit down meal and a three-hour drinks package are included in the ticket price.

The restaurant is located at 265 Pirie Street, Adelaide, South Australia 5000.
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<td>9:30 - 9:45am</td>
<td>Welcome to ASP2016</td>
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<td>9:50am - 10:30am</td>
<td>Session 1 – Oral Presentations</td>
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<td>Resting EEG Sex Differences</td>
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<td>Adele E. Cave and Robert J. Barry</td>
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<td>Electrophysiological Correlates of Extraversion: Arousal, Arousability and Activation</td>
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<td>Infant Stress Reactivity: A Systematic Review of What Causes Elevated Cortisol in Infants</td>
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<td>Yaroslava King and Sarah Blunden</td>
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<td>EEG Development in Attention-Deficit/Hyperactivity Disorder: From Child to Adult</td>
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<td>Adam R. Clarke, Robert J. Barry, Franca E. Dupuy, Rory McCarthy, and Mark Selikowitz</td>
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<td>Prestimulus alpha and beta brain state effects in the equiprobable Go/NoGo task: Healthy ageing</td>
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<td>Frances M. De Blasio and Robert J. Barry</td>
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<td>Detecting target/nontarget differences in ERP components from a visual oddball task with separate PCAs: Young vs. older adults</td>
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<td>Genevieve Z. Steiner, Robert J. Barry, and Jack S. Fogarty</td>
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<td>Females display increased empathy for pain and poorer autonomic regulation under cognitive stress compared to males</td>
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<td>Lincoln M. Tracy and Melita J. Giummarra</td>
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| 9:30am - 10:30am| Session 4 – Oral Presentations                                                                 | *Mu suppression differentiates between happy and angry faces in controls and people with traumatic brain injury (TBI)*
<p>|                 |                                                                                               | Emma J. Kornfeld, Jacqueline A. Rushby, Frances M. De Blasio, and Skye McDonald |
|                 |                                                                                               | <em>Error detection but not behavioural inhibition intact in young heavy drinkers</em> |
|                 |                                                                                               | Janette L. Smith, Richard P. Mattick, and Christopher Sufani             |
|                 |                                                                                               | <em>Behavioural and ERP Correlates of Hypervigilance and Inhibitory Control in Spider Fear</em> |
|                 |                                                                                               | Monique E. Williams and Allison J. Matthews                             |
| 10:30am - 11:00am| Morning Tea                                                                                     |                                                                        |
| 11:00am - 12:00pm| Keynote Address                                                                                | Leon Lack – The diagnosis and treatment of circadian rhythm disorders |
| 12:00pm - 1:00pm| Lunch                                                                                           |                                                                        |
| 1:00pm - 2:30pm | Session 5 – Oral Presentations                                                                 | <em>Frequency-PCA improves EEG estimates in the EEG-ERP dynamics field</em>  |
|                 |                                                                                               | Robert J. Barry and Frances M. De Blasio                               |
|                 |                                                                                               | <em>Sequential Processing in the Traditional Go/NoGo Paradigm</em>             |
|                 |                                                                                               | Jack S. Fogarty, Robert J. Barry, and Genevieve Z. Steiner             |
|                 |                                                                                               | <em>Resting EEG Delta Affects Go-Related Decision-Making Efforts</em>         |
|                 |                                                                                               | Diana Karamacoska, Robert J. Barry, and Genevieve Z. Steiner           |
|                 |                                                                                               | <em>Significance and Trial Effects from Simple Auditory Stimuli in a Dishabituation Paradigm</em> |
|                 |                                                                                               | Brett MacDonald and Robert J. Barry                                    |
| 2:30pm - 3:00pm | Afternoon Tea                                                                                  |                                                                        |
| 3:00pm - 4:00pm | Keynote Address                                                                                | Thomas Whitford – Psychophysiological measures of sensory attenuation to self-generated actions: A biomarker for schizophrenia? |
| 6:00pm - 9:00pm | Conference dinner                                                                               |                                                                        |</p>
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<td>9:30am - 10:30am</td>
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<td></td>
<td>*Modifying N1 amplitude: Training an expectation that delayed auditory</td>
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<td>sensations result from a self-initiated action*</td>
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<td>Ruth B. Elijah, Mike E. Le Pelley, and Thomas J. Whitford</td>
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<td></td>
<td>*Enhanced brainstem and cortical encoding of sound during synchronized</td>
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<td>movement*</td>
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<td>Sylvie Nozaradan, Marc Schönwiesner, Laura Caron-Desrochers, and Alex</td>
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<td>andre Lehmann</td>
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<td>*Homeostatic plasticity in the primary motor cortex of patients with</td>
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<td>non-specific chronic low back pain*</td>
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<td>and neurocognitive training: The way of the future?</td>
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Please note, all times listed above are in Australian Central Daylight Time (ACDT/Adelaide time)
Keynote Addresses

The assessment and treatment of altered neuroplasticity in musculoskeletal pain

Siobhan Schabrun

Brain Rehabilitation and Neuroplasticity Unit, School of Science and Health, Western Sydney University, Australia

Aims: Structural and functional changes are evident in the brains of people experiencing musculoskeletal pain. In particular, maladaptive neuroplasticity is present in the primary sensory and motor cortices when pain becomes persistent, and these changes are thought to contribute to movement dysfunction and the recurrence and/or persistence of pain. This presentation will outline measurement tools that can be used to assess neuroplasticity in the primary sensory and motor cortices of people with pain. Neuplastic changes in the acute (pain lasting minutes to hours), transition (pain lasting for days to weeks) and persistent (pain lasting for months) stages of pain will be presented. The relationship between altered neuroplasticity and the symptoms of pain will be discussed. Following this, evidence for a range of novel treatments designed to directly target altered neuroplasticity in pain will be presented including non-invasive brain stimulation and peripheral electrical stimulation. Therapeutic potential, controversies and future directions of these treatments applied alone, and in conjunction with traditional therapies (e.g. exercise) will be discussed. Methods: This presentation will cover a range of methodologies including Transcranial magnetic stimulation, somatosensory evoked potentials, transcranial direct current stimulation and peripheral electrical stimulation. Results: Data from mechanistic studies that utilize experimental pain models to understand how neuroplasticity is altered in pain, as well as clinical studies of patient groups, will be provided in the first part of this presentation. Data from clinical studies of novel treatments designed to target neuroplasticity in musculoskeletal pain (including focal dystonia, low back pain and knee OA) will form the basis of the second half of this presentation. Conclusions: Neuroplasticity is altered when pain is persistent. This presentation will provide an overview of methods to assess neuroplasticity throughout the transition from acute to persistent pain and discuss novel treatments to target altered neuroplasticity in musculoskeletal pain conditions.

s.schabrun@uws.edu.au

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Psychophysiological measures of sensory attenuation to self-generated actions: a biomarker for schizophrenia?

Thomas J. Whitford

School of Psychology, University of New South Wales, Australia

Aims: Sensations which arise as a result of our own actions – such as the sound of our voice when we speak, or the sound of our fingertips on the keyboard – evoke less activity in the EEG compared to physically identical sensations that are externally-generated. This phenomenon, dubbed ‘sensory attenuation’, suggests that our brain predicts and suppresses the sensory consequences of our own movements. There is now a substantial body of evidence indicating that patients with schizophrenia show subnormal levels of sensory attenuation. Method: This presentation will provide an introduction to the electrophysiological paradigms which have been used to identify sensory attenuation in healthy individuals. It will also provide an overview of the evidence for sensory attenuation deficits in patients with schizophrenia, and also recent evidence for sensory attenuation abnormalities in high-risk populations. Results: As will be discussed, there is now strong evidence that patients with schizophrenia show sensory attenuation deficits to self-generated sounds. It is less clear whether these deficits extend to other sensory domains (e.g., vision). Discussion: Sensory attenuation deficits are highly significant as they are uniquely capable of accounting for schizophrenia patients’ characteristic tendency to misattribute self-generated actions to external agents. If sensory attenuation deficits are found to be specific to sounds in patients with schizophrenia, this may explain why auditory hallucinations are more common than hallucinations in other sensory domains.

t.whitford@unsw.edu.au

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The Diagnosis and Treatment of Circadian Rhythm Disorders
Leon C. Lack

*Flinders University, Australia*

Sleepiness is determined biologically by two comparable but independent factors: homeostatic sleep drive and circadian rhythm sleep drive. The circadian sleepiness varies with a host of synchronised endogenous physiological and hormonal rhythms across the 24-hour period. Normal entrainment of this circadian system favours sleep at night (approx. 2300-0700h) and alertness/productivity during the day. However, abnormalities of the circadian system in timing or amplitude can cause chronic or short term difficulties sleeping when desired and being alert when necessary. Delayed sleep phase disorder (DSPD) results from a 2-6 hour delay from normal of the circadian system making it impossible to initiate sleep before 0100h. Advanced sleep phase disorder (ASPD) results from an abnormally early timed circadian system making it impossible to maintain sleep past 0300h. Free-running rhythms do not remain stable in the 24-hour period but tend to drift later making night-time sleep and daytime alertness difficult for periods of days or weeks. Jet-lag and shiftwork usually produce short-lived sleep/wake problems. Since the most common disorders are from abnormal timing of the circadian system, tools to re-time circadian rhythms such as retinal light stimulation and exogenous melatonin administration can be used to treat these disorders. Light intensity, duration, and wavelength are important dimensions for treatment effect. However, the timing of light is critical for the effectiveness of these treatments. Bright light stimulation pushes the endogenous sleep period away from it like similar poles on a bar magnet (e.g. south/south) while the time of melatonin administration pulls the endogenous sleep period towards it like two opposite magnetic poles (e.g. north/south). The ‘push’ and ‘pull’ effects can be combined to shepherd the endogenous sleep period into the desired time (e.g. 2300-0700h). Other behavioural procedures and cognitive therapies can also be helpful in the treatment of these problematic circadian rhythm disorders.

leon.lack@flinders.edu.au

Notes
Combining Transcranial Direct Current Stimulation and Neurocognitive Training: The Way of the Future?

Rebecca Segrave

Monash Institute of Cognitive and Clinical Neuroscience, Monash University, Australia

Major depression is frequency resistant to standard therapeutic approaches. Among the many new treatment avenues being investigated two that have been developed separately, transcranial Direct Current Stimulation (tDCS) and Neurocognitive Training (NCT), may be more efficacious if delivered together. tDCS is a gentle non-invasive brain stimulation technique that can alter neural activity and modulate cognitive and emotional processing. NCT training refers to a range of highly specialised cognitive training paradigms designed to modulate activity within targeted brain regions and neurocircuits. As concurrent cognitive activity can enhance the impact of tDCS, we conducted a series of studies testing the hypothesis that co-administration of tDCS and NCT would result in greater efficacy than delivery of either therapy alone. Results that support the superiority of a combined tDCS + NCT approach, and others that support the efficacy of NCT alone will be presented. These will be discussed in the context of the broader literature, with particular attention to stimulation parameters and inter-individual characteristics that appear to influence outcomes.

rebecca.segrave@monash.edu

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Abstracts of the 26th Annual Conference of the Australasian Psychophysiology Society
(listed in alphabetical order)

Published in Frontiers in Human Neuroscience
**ORAL PRESENTATIONS**

**Frequency-PCA improves EEG estimates in the EEG-ERP dynamics field**

Robert J. Barry¹ and Frances M. De Blasio¹

¹School of Psychology, University of Wollongong, Australia

Aims: Our previous brain dynamics work investigated prestimulus EEG phase and amplitude effects upon behaviour and event-related potentials (ERPs) associated with stimulus processing. Frequency Principal Components Analysis (f-PCA) can identify data-driven EEG components, potentially paralleling our recent ERP move from peak-picked amplitudes to temporal PCA decomposition. Here we explored if f-PCA can provide insight to EEG analysis in the brain dynamics arena. Method: Continuous EEG (19 sites) was recorded from 20 young adults during 3 minutes of eyes-closed (EC) and eyes-open (EO) resting, and a subsequent equiprobable auditory Go/NoGo task. Two second resting EC and EO epochs were windowed, and 0.5 s prestimulus Go and NoGo epochs were windowed and zero-padded, before undergoing Discrete Fourier Transformation (resolution 0.5 Hz). Mean spectral amplitudes in 61 frequencies (DC to 30 Hz) were reshaped for each subject and condition (EC, EO, Go, NoGo) and entered into a single unrestricted f-PCA using Promax rotation. Frequency components were explored as predictors of Go P3b and NoGo P3a amplitudes obtained from temporal PCA of the ERPs. Results: EEG f-PCA yielded two components peaking in delta (0.5, 2.0 Hz), three in alpha (8.0, 9.0, 10.0 Hz), and two in the beta band (15.5, 24.5 Hz); these represented 91.3% of the variance. P3a amplitude was directly related to the 9.0 Hz alpha component, and inversely related to the 10.0 Hz component. P3b amplitude was inversely related to alpha components at 8.0 and 10.0 Hz, and directly related to the 9.0 Hz component. Conclusions: The mid-frequency 9.0 Hz alpha component directly affected P3a and P3b amplitudes, confirming previous findings of the direct impact of prestimulus alpha on P3. In addition, f-PCA has added refinement in the subdivisions of the EEG bands, and done so in a data-driven decomposition of the EEG spectrum rather than depending on arbitrary frequency ranges. robert.barry@uow.edu.au

**Resting EEG Sex Differences**

Adele E. Cave¹* and Robert J. Barry¹

¹School of Psychology, University of Wollongong, Australia

Aims: Previous literature investigating sex differences in the topography of resting electroencephalography (EEG) in a young adult population is conflicting. Furthermore, differences in eyes-closed (EC) and eyes-open (EO) measures, between females and males, have not been investigated comprehensively. The present study aims to confirm EC and reactivity (EO-EC) topography across groups, to clarify the topographical differences between sexes, and to confirm alpha is a good candidate measure of arousal. Method: Participants were 80 university students (40 female/40 male) with a mean age of 20.4 years (range 18–26). Participants were matched individually on age, and were all right-handed. Continuous EEG activity was recorded from 30 scalp sites, and EOG corrected. Data from each 2-minute condition (EO1, EC, EO2) were divided into 60 sequential 2 second epochs. Accepted epochs were Fast Fourier Transformed and absolute amplitudes in each EEG band were calculated. Results: For EC, significant topographical effects were found across groups and bands, in the parietal and midline regions. Significant effects in the reactivity measure were found in the parietal region across the four bands. Between sexes, overall EC activity in the delta, alpha and beta bands was significant for females, with larger parietal enhancements for females than males across the four bands. Reactivity was more evident parietally for females than males only in the alpha and beta bands. The change at each electrode in alpha amplitude from EC to EO was proportional to the resting EC amplitude. Conclusions: Across groups, EC band topographies were mostly comparable with the previous literature. Furthermore, sex and topographical differences were evident in the EC and reactivity measures. Additionally, alpha was found to be a good measure of arousal. These findings suggest females are less aroused, but more responsive, than males. Future EEG research should consider sex as a potential confounding variable. aec236@uowmail.edu.au
EEG Development in Attention-Deficit/Hyperactivity Disorder: From Child to Adult

Adam R. Clarke¹*, Robert J. Barry¹, Franca E. Dupuy¹, Rory McCarthy², and Mark Selikowitz²

¹University of Wollongong, Australia
²Sydney Developmental Clinic, Australia

Aims: Attention-Deficit/Hyperactivity Disorder (AD/HD) is the most common psychiatric disorder of childhood, and in the DSM-5, is classed as a neuro-developmental disorder. A vast literature over the past 50 years has investigated EEG abnormalities in this population. However, little is known about lifespan EEG development in these individuals. The aim of this study was to conduct an initial investigation of EEG maturational processes. Method: Twenty five male participants were initially assessed as children (aged 8 to 12 years) and met DSM-IV criteria for AD/HD combined type. Subjects were re-assessed as young adults with a mean age of 21.7 years. Two separate control groups were used (children, adults). EEG was recorded during an eyes-closed resting condition from 19 electrodes, and Fourier transformed to provide relative power estimates in delta, theta, alpha and beta bands. Results: As children the AD/HD participants had increased posterior delta, increased global theta and decreased global alpha activity. Significant maturational changes were found in the AD/HD group, with global reductions in delta and theta activity, and increases in alpha and beta activity. Beta activity changed more in the posterior regions than the frontal regions. As adults, the AD/HD groups had reduced frontal delta activity, and global theta activity was elevated. In the beta band, the AD/HD group had greater power in the right hemisphere while the control group had greater power in the left. Conclusions: Significant normal maturational changes occur in the EEG of AD/HD patients from childhood to adulthood. These results have important implications for the use of EEG as a diagnostic aid for AD/HD. Normalisation of the alpha band also raises important questions about the underlying mechanisms involved in AD/HD. aclarke@uow.edu.au

Prestimulus alpha and beta brain state effects in the equiprobable Go/NoGo task: Healthy ageing

Frances M. De Blasio¹* and Robert J. Barry¹

¹School of Psychology, University of Wollongong, Australia

Aims: It is well known that task-related processing, indexed by event-related potentials (ERPs), is affected by ongoing electroencephalographic (EEG) brain states. However, while EEG and ERP measures each show significant age-related change, little is known about the consistency in their relationship across the lifespan. Here we compare EEG-ERP relationships in the alpha and beta bands between young and older adults to assess EEG-ERP contribution stability in healthy ageing. Method: Continuous EEG was recorded from 20 young (aged 18-25 years) and 20 gender-matched older (aged 59-74) adults while they completed an auditory equiprobable Go/NoGo paradigm. Data were processed separately for the alpha and beta bands. Discrete Fourier transforms quantified prestimulus band amplitudes, and the topographic region of interest was determined. Mean band amplitude in the region of interest was then used to selectively sort accepted Go and NoGo epochs, yielding 10 sets of Go/NoGo ERPs for each band. Go reaction time (RT) data were also derived for these prestimulus EEG levels. Temporal principal components analyses analysed quantified ERP component amplitudes, and only components common to both groups were assessed. Results: Seven components were analysed: P1, N1-1, Processing Negativity (PN), P2/N2b, P3, Slow Wave (SW), and Late Positivity (LP). EEG-ERP relationships showed general consistency between the young and older adult groups. Age-related change was also seen for prestimulus alpha and N1-1, P3, SW, and LP, and between prestimulus beta and N1-1, PN, SW, and LP; most involved topographic interaction. Prestimulus alpha also modulated RT across the groups. Conclusions: The complex pattern of results supports the general maintenance of fundamental EEG-ERP relationships across the lifespan, and highlights the capacity for subtle and dynamic shifts in healthy ageing. Such adaptive shifts in brain dynamics may reflect a compensatory mechanism in healthy ageing, supporting task performance in light of age-related structural and functional brain changes. francesd@uow.edu.au
Modifying N1 amplitude: Training an expectation that delayed auditory sensations result from a self-initiated action
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Aim: Our ability to suppress self-generated sensations is dependent on the length of time between when an action is initiated and when the resultant sensory information is generated. Specifically, sensations that follow immediately from actions are attenuated to a larger degree than delayed sensations. The current study aimed to determine whether cortical responses to delayed self-initiated auditory events can be modified with training. Method: Electroencephalographic (EEG) recordings where undertaken while participants pressed a button to produce a tone that occurred either immediately or 100ms subsequent to the button-press. The event related potential (ERP) to the tone was generated, and the amplitude of N1 was extracted. Fifty participants were randomly assigned to one of two training groups; one group of participants (n=25) were repeatedly exposed to tones that followed immediately from their button-presses, whereas the other group (n=25) were repeatedly exposed to delayed tones. In order to evaluate the effect of training, participants’ evoked responses to immediate and delayed self-initiated tones were assessed before and after training. Results: Pre-training, the mean amplitude of N1 was significantly larger for delayed tones compared to immediate tones. Participants who were trained to the delayed tones showed a reduction in N1 amplitude across training, such that there was no difference in N1 between immediate and delayed tones post-training. This was in contrast to the participants who received training to immediate tones, who maintained a significantly larger N1 to delayed tones over immediate tones post-training. Conclusions: Repeated exposure to delayed sensory consequences of self-generated actions results in new learning about the temporal relationships between the action and the outcome, and, as such, increased cortical attenuation to temporally delayed sensations. This suggests that behavioural training could represent a potential avenue for alleviating sensory suppression deficits, such as those that have consistently been observed in patients with schizophrenia. ruth.elijah@unsw.edu.au

Sequential Processing in the Traditional Go/NoGo Paradigm
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Aims: This study compares the series of ERP components associated with auditory equiprobable and traditional Go/NoGo tasks, to improve our conceptualisation of those components, and explore the generalisability of a sequential processing schema. Method: Continuous EEG data, recorded in-task from sixty healthy young adults (mean age = 20.4 years, S.D. = 3.1), were averaged to generate ERPs associated with each paradigm. Components were then extracted using separate temporal PCAs, to enhance the data-driven factorisation of Go and NoGo ERP components, for each task. Correlations were then conducted to examine the temporal and spatial similarity of corresponding components, before MANOVAs were applied to determine how component amplitudes differed between tasks. Results: A comparable series of Go and NoGo components was identified within each paradigm, with two additional long-latency components linked to non-target processing in the traditional Go/NoGo task. Four early components (i.e., P1, N1-3, N1-1, & PN) in each paradigm, were consistent across conditions, after which processing differed for Go and NoGo stimuli. For Go, PN was followed by P2, N2c, P3b, and two slow wave components (SW1 & SW2). In contrast, the NoGo PN was followed by N2b, P3a, a late P3 (LP3), and a non-target SW1. Component amplitudes also differed significantly between tasks, with the exception of N1-3, NoGo P1, and NoGo N1-1, reflecting shifts in cognitive demands. Conclusions: These findings illustrate consistent neurocognitive events associated with target and non-target processing in equiprobable and traditional Go/NoGo tasks, bridging the ERP literature between those paradigms. This supports theory development, by providing insight into the effects of stimulus probability on an orthogonal series of ERP components. These findings encourage the generalisation of our PCA-derived processing schema, increasing its utility and potential application in other two-choice paradigms. jf752@uowmail.edu.au
Resting EEG Delta Affects Go-Related Decision-Making Efforts
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Aims Few studies have assessed the impacts of resting electroencephalographic (EEG) activity on task performance measures, particularly for both event-related potentials (ERPs) and behavioural outcomes. To ascertain the role of the brain’s intrinsic activity in stimulus-response processing, 20 healthy young adults had EEG recorded at rest, with eyes-closed (EC) then with eyes-open (EO), and subsequently during an auditory equiprobable Go/NoGo task. Participants were instructed to press a button to the designated Go tone and to avoid responding to the NoGo. Method Intrinsic brain activity was measured during EC and EO resting states, with EEG data segmented into 1 s epochs for Fast-Fourier transformation. Mean spectral band amplitudes were derived for delta, theta, alpha, and beta, with the difference between EC and EO also calculated as a measure of reactive change. Go/NoGo performance was assessed behaviourally through error rates, mean reaction times (RTs), and RT variability (RTV), and electrophysiologically using stimulus-locked ERPs (-100 to 600 ms) subjected to temporal PCA for component extraction. To confirm the ERP components involved in response outputs, correlations were calculated between ERP component amplitudes and behavioural outcomes. Resting EC band amplitudes and EC to EO EEG reactivity were then input as predictors into multiple regression analyses with Go/NoGo behavioural measures and their ERP correlates as dependent variables. Results Go RTV correlated positively with Go P2 amplitude, and mean RTs were negatively correlated with N2c and P3b amplitudes. Stepwise regression models for these response variables revealed EC midline delta as a significant predictor of Go P3b positivity. No significant relationships were found for NoGo performance. Conclusion The present results confirm involvement of P2, N2c, and P3b in the decision-making process to respond to the task-relevant Go stimulus, and highlight resting delta’s functional relevance to these cognitive operations.

Induction of vicarious social pain using Cyberball
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Aims: The measurement of empathy has traditionally relied on self-report, making it vulnerable to social desirability bias. The aim of this study was to examine whether an ostracism paradigm, Cyberball, could be used to induce vicarious social pain, thus eliciting empathy in observers. Method: Participants were 56 (7 male) undergraduate psychology students aged 18-44 years (M = 21, SD = 5). Two participants were present for each session, one player and one observer, seated next to each other. Participants played two games of Cyberball, a pseudo online ball tossing game. Participants were instructed that they are playing with other real participants while in reality the other players are programmed to either include or ostracise them. The Cyberball questionnaire was used to measure distress in the player, and was modified to measure the observers’ perceived distress of the player (vicarious ostracism). An already validated self-report measure of empathy (Interpersonal Reactivity Index) was also used to capture cognitive and affective empathy in the observer, and physiological responses (skin conductance) were collected from the observer to objectively examine affective empathy (arousal). Results: Players reported significantly greater distress [F(2.04, 55.09) = 8.82, p<.001], and observers inferred significantly greater levels of distress on the part of the player [F(3, 81) = 6.13, p<.001], during the ostracism condition compared with the inclusion condition. The magnitude of the observed distress was not associated with self-reported affective or cognitive empathy on the part of the observer (p > .05). Greater levels of arousal in the observer when the player was being ostracised were not observed, nor was a relationship found between skin conductance and self-reported affective empathy (p’s > .05). Conclusions: While the current methodology successfully elicited self-reported vicarious social pain (cognitive empathy), validation of an objective physiological measure (affective empathy) was not possible.

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Infant Stress Reactivity: A Systematic Review of What Causes Elevated Cortisol in Infants

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Aim: The aim of this study was to evaluate, facilitate understanding and provide a comprehensive overview of the causes of elevated cortisol levels in infants. Methods: This study is a systematic review of peer reviewed research that use salivary cortisol as biological markers of stress on infants and toddlers up to two years of age. An electronic database search was performed on PubMed, Scopus, Science Direct and PsychInfo following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA). Results: Eighty-three studies met inclusion criteria. All research focused on different stressful situations that elicit elevated cortisol levels. The research determined causes of elevated cortisol levels through either constructing stressful situations that induce cortisol elevations (i.e. separation from the caregiver), or measuring pre-existing stressful situations longitudinally in naturalistic experiments (i.e. determining effects of maternal depression, stress and alcohol use on infant cortisol elevations). Although all studies found elevations of infant cortisol, due to the difficulty of measuring infant salivary cortisol and the variation of basal cortisol levels at such a young age, the findings showed inconsistencies with determining the severity of each cause and the resulting consequences for the infant. Conclusions: Evidence has shown that although a wide range of stressful situations elevate infant cortisol levels, there seemed to be little distinction between whether the elevated cortisol secretion was simply a minor activation of the neuroendocrine system, or severe stress reactivity with short and long term consequences for the infant. Furthermore, stress was taken as the only form of stimuli that elevated cortisol in infants and few studies considered other factors that may be at play. There is need for further systematic studies to distinguish between acute and chronic causes of elevated cortisol to inform future research. yasya.king@gmail.com

Mu suppression differentiates between happy and angry faces in controls and people with traumatic brain injury (TBI)

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Aims: Mirror neurons, which are activated both when observing and performing actions, are thought to underlie social cognition, particularly emotional processing. The mu rhythm of electroencephalographic activity (EEG; 8 to 13 Hz), typically examined at sites across the motor cortex, has previously been found to be a non-invasive marker of mirror neuron activity, and may therefore be used to examine the social cognitive deficits often found in people with a traumatic brain injury (TBI). Method: 19 adults (15 male, Mean age 44.9, SD = 13.7) with TBI and 19 age, gender and education matched healthy controls viewed repeated presentations of static happy and angry facial expressions while EEG was recorded, and event-related power in the whole (8-13) mu band, as well as the lower (8-10 Hz) and upper (11-13 Hz) mu bands, was calculated for expression (happy vs. angry) and group (TBI vs. Controls). Results: When data were examined at traditional mu related electrode sites (C3 and C4), there was a main effect of expression for the upper mu band as well as the whole mu band, such that there was more suppression in response to angry faces compared to happy across groups for both bands. However, when examined across brain regions (frontal, central parietal), a group by expression interaction was found for the whole alpha band, such that the control group showed more suppression in response to angry faces compared to happy, whereas the TBI group showed the opposite effect. Conclusion: Findings suggest that mu rhythm recorded from central sites does differentiate between happy and angry facial expressions, suggesting that mirror neurons may indeed play a role in emotion processing. Further, results support previous work showing that individuals with TBI may have greater deficits in processing negative affect compared to controls, as evidenced by their reduced suppression to angry faces. emma.kornfeld@student.unsw.edu.au
**Significance and Trial Effects from Simple Auditory Stimuli in a Dishabituation Paradigm**

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Aim: We investigated the effects of Significance and Novelty in an 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: Thirty-two undergraduates experienced auditory stimuli of 80 dB tones at 1000 and 1500 Hz, with a duration of 50 ms (15 ms rise/fall times) presented at random variable ISI of 50 – 70 s. Ten tones were presented at one frequency, then a change trial (the other frequency), and the original tone was re-presented on trial 12. Frequency and counting tasks were counterbalanced between participants. Novelty was operationalised by trial repetition and Significance by silently counting tones. The evoked cardiac responses (ECR), Respiratory Pause (RP), SCR, and single-trial ERPs from 19 sites, were collected. EOG-corrected ERP data were submitted to a temporal PCA. Measures were examined for the main effects of Novelty and Significance over the first 10 trials. Results: Four patterns emerged. Pattern 1: no Novelty or Significance effect (ECR1 [HR deceleration], P1, N1-3, P3a, and Frontal SW). Pattern 2: no Novelty but Significance effect (ECR2 [HR acceleration], N1-1, and P2). Pattern 3: Novelty but no Significance effect (RP, PN, P3b, HabP3). Pattern 4: Novelty and Significance effects (SCR and SW). Conclusions: The S-R patterns of the autonomic measures were consistent with previous findings. SCR showed all the characteristics of the phasic OR. The cardiac components were differentially sensitive to experimental conditions in regard to cognitive processing load. The SW, sensitive to both Novelty and Significance, appears the mostly likely ERP candidate for the OR. These results may prompt further investigations into the OR. Response fractionation was found for autonomic and central measures, consistent with PPT. brettell08@yahoo.com

**Enhanced brainstem and cortical encoding of sound during synchronized movement**

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Aims: Movement to a steady beat has been widely studied as a model of alignment of motor outputs on sensory inputs. However, how the encoding of sensory inputs is shaped during synchronized movements along the sensory pathway remains unknown. Method: To investigate this, we simultaneously recorded brainstem and cortical electro-encephalographic activity while participants listened to periodic amplitude-modulated tones. Participants listened either without moving or while tapping in sync on every second beat. Cortical responses were identified at the envelope modulation rate (beat frequency), whereas brainstem responses were identified at the partials frequencies of the chord and at their modulation by the beat frequency (sidebands). Results: During sensorimotor synchronization, cortical responses at beat frequency were larger than during passive listening. Importantly, brainstem responses were also enhanced, with a selective amplification of the sidebands, in particular at the lower-pitched tone of the chord, and no significant correlation with electromyographic measures at tapping frequency. Conclusions: These findings provide first evidence for an online gain in the cortical and subcortical encoding of sounds during synchronized movement, selective to behavior-relevant sound features. Moreover, the frequency-tagging method to isolate concurrent brainstem and cortical activities even during actual movements appears promising to reveal coordinated processes along the human auditory pathway. S_Nozaradan@westernsydney.edu.au
Error detection but not behavioural inhibition intact in young heavy drinkers

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Aims: Increases in inhibitory errors in heavy drinkers are established; less well-studied is whether heavy drinkers are aware of these errors in performance. Reductions in error detection and awareness limit the possibility for remedial action to be taken, and have implications for substance abusers seeking to control use: failure to monitor and/or adjust ongoing behaviour may be linked to using more or more often than intended, and failing to adjust behaviour after a slip. Here we test both inhibitory control and error awareness in young heavy drinkers, using behavioural and psychophysiological measures. Methods: Heavy drinkers (n = 25) and light- or non-drinking controls (n = 35) completed a difficult inhibitory task which required signalling the awareness of inhibitory errors on the subsequent trial, while brain electrical activity was recorded. Results: Heavy drinkers made more inhibitory errors than controls, but were as aware of these errors, both via overt signalling and with equivalent amplitude of the error positivity (Pe), indexing conscious error detection. Similarly, controls and heavy drinkers showed no difference in amplitude or latency of the error-related negativity (ERN), indexing early pre-conscious error detection. Conclusion: This research suggests intact detection of errors in heavy drinkers, even as they are more prone to make these errors, a result seen in dependent drinkers reported elsewhere. Future research with larger sample sizes, and a more difficult task producing sufficient errors, should determine whether heavy drinkers employ sufficient post-error remedial action. janette.smith@unsw.edu.au

Detecting target/nontarget differences in ERP components from a visual oddball task with separate PCAs: Young vs. older adults

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Aims: Barry et al. (2016) demonstrated that condition-related differences between Go and NoGo event-related potential (ERP) components are best identified using separate principal components analyses (PCAs). This optimised PCA methodology was established using ERPs from an auditory equiprobable task completed by young adults. The present study aimed to test the sensitivity of this approach in differentiating target/nontarget condition effects between young and older adults in a visual oddball task. Methods: Equal numbers of young (N = 19, Mage = 21.2, SD = 3.7 years) and older adults (N = 19, Mage = 68.1, SD = 4.6 years) completed a visual oddball task and had their electroencephalographic (EEG) activity recorded. ERP component amplitudes were quantified with separate unrestricted PCAs for each age group and stimulus condition using Varimax rotation. Results: Error rates (omission/commission) and reaction times did not differ between groups. The four separate PCAs detected a range of ERP components. For rare targets, both groups showed a centro-parietal N1 (young = 108 ms, older = 100 ms), central P2 (young = 148 ms, older = 140 ms), centro-parietal P3 (young and older = 372 ms), and a frontally-negative/parietally-positive Slow Wave (SW; young and older = 452 ms). Target N2 was more clearly identifiable in young (N2 = 204 ms) compared to older adults. For frequent nontargets, both groups had identifiable N1s (young = 76 ms, older = 68 ms), temporo-occipital Processing Negativity (PN; young = 116 ms, older = 148 ms), and diffuse nontarget P3 (young = 308 ms, older = 356 ms). Conclusions: Despite statistically indistinguishable task performance and broadly similar component latencies, older adults had more topographically-diffuse components cf. young adults. Results from separate PCAs suggest that task performance can be maintained in healthy ageing via the recruitment of a wider range of associative neuronal networks. G.Steiner@westernsydney.edu.au
Homeostatic plasticity in the primary motor cortex of patients with non-specific chronic low back pain

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Aims: Homeostatic Plasticity (HP) mechanisms are known to regulate and stabilise use-dependent cortical plasticity. Previous studies suggest use-dependent cortical plasticity is altered in individuals with non-specific chronic Low Back Pain (cLBP). However, no study has investigated the effects of cLBP on HP. Here, we investigated HP in individuals with non-specific cLBP compared with pain-free controls. Methods: Fifty individuals participated with non-specific cLBP experiencing low [n=25; Visual Analogue Scores (VAS): 1.6 ± 1.1] and moderate (n=25; VAS: 5.7 ± 1.4) pain, as well as 25 age- and sex-matched healthy controls. Participants received a single block of excitatory transcranial direct current stimulation (tDCS) for 7-minutes in one session to confirm the existence of an excitatory response to tDCS. In a separate session, participants were exposed to two excitatory blocks of tDCS (7-min and 5-min separated by a 3 min rest period), to evaluate homeostatic responses to cortical over-excitation. Sessions were randomised and conducted one week apart. Transcranial magnetic stimulation induced motor evoked potentials (MEPs) were recorded from the First Dorsal Interosseous muscle before and after excitatory tDCS at baseline, and at 0, 10, 20 and 30-minutes follow-up. Results: MEP amplitudes reflecting corticomotor excitability were increased at all time-points in all three groups (p<0.001) following 7-min of tDCS, confirming the existence of an excitatory response to this protocol. However, only healthy controls demonstrated reduced MEP amplitudes (p<0.05) as a homeostatic response. MEP amplitudes in the two pain groups either increased over time (low pain group; p<0.049), or remained static (moderate pain group; p=0.996) indicating homeostatic impairment. Conclusions: These results demonstrate failure to stabilize excessive corticomotor excitability in the primary motor cortex of individuals with cLBP. This suggests impaired homeostatic mechanisms could contribute to maladaptive use-dependent plasticity in cLBP. Further research is required to determine the relationship between homeostatic plasticity and symptoms in cLBP. t.thapa@westernsydney.edu.au
Females display increased empathy for pain and poorer autonomic regulation under cognitive stress compared to males

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Aims: Empathy is a critical social process that involves both affective and cognitive components. Several studies have found that women have superior trait empathy compared with men, and there may be a biological basis for these differences. We investigated sex differences in empathy for pain and autonomic regulation (i.e., heart rate variability, HRV) in healthy young adults. Method: Eighty participants (37 female, mean age 26.7) completed the Empathy for Pain scale, a paced breathing (PB) task where they were prompted to inhale and exhale at regular intervals (15 cycles per minute for two minutes), and the serial sevens (SS) task where participants counted backwards from 1000 by sevens while being pressured by the experimenter. The SS task induces mild cognitive and physiological stress. HRV was recorded from a 5-lead ECG system, and the log transformed square root of the mean squared differences of successive R-R intervals (lnRMSSD) was analysed, as an indicator of parasympathetic tone. Results: Women reported higher empathic concern (p = .023) and affective distress (p = .005) than men when presented with a scenario whereby another person was in pain from an accidental injury. There were no sex differences in lnRMSSD during the PB or SS tasks taken alone; however, there was a significant sex difference in the relative change in lnRMSSD between tasks, whereby lnRMSSD increased in men for the SS task compared with the PB task, but it decreased between tasks from women (p = .01). Conclusions: Females reported higher trait empathy for pain compared with men, and also displayed a relative decrease in parasympathetic regulation under mild cognitive stress compared with a state of rest. Taken together, these findings suggest that the increased empathic responses in females may be mechanistically associated with poorer emotional and physiological regulation. lincoln.tracy@monash.edu

The psychological and physiological responses of emotional empathy in Autism Spectrum Disorders

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Aims: There is a general consensus in the literature that individuals with ASD have difficulty with cognitive empathy, however, much less is know about the process of emotional empathy in these individuals. Research to date has mostly employed subjective self-report measures, which can often be misinterpreted or under/over-reported. Objective measures, such as physiological recordings of arousal offer a more objective response. Combining physiological responses with self-report ratings also allows us to explore the relationship between these two responses to emotionally charged stimuli. Method: Twenty-five individuals with ASD were compared with twenty-five matched controls on their physiological (arousal and facial expression) and psychological (self-report) responses to emotionally distressing video scenes. Responses were also then compared with self-report cognitive and emotional trait empathy. Results: Results indicate that whilst individuals with ASD appear to respond similarly to controls physiologically, their interpretation of this response is dampened emotionally. Furthermore, this dampening of self-report emotional response is associated with an overall reduction in trait empathy. e.trimmer@psy.unsw.edu.au
Psychological and Physiological Effects of Ostracism Across Adulthood
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Aims: Younger adults have been found to be more effected by ostracism than older adults, but the mechanisms behind this are unclear. This study investigated the effect of ostracism on participants’ self-reported need satisfaction, mood and physiological arousal across adulthood and whether this relationship is moderated by quality of life (QoL) and perceived social support. Method: Twenty early adulthood (aged 18 – 24), 11 middle adulthood (aged 40 – 60) and nine late adulthood (aged 75 and older) participants played Cyberball, a virtual ball tossing game. All participants completed two conditions which were counterbalanced across participants. In the inclusion condition they received the ball fairly, while in the exclusion condition participants received four ball tosses initially, then were excluded from the game. Physiological arousal was measured continuously using skin conductance. After each game participants reported their needs satisfaction and mood. Participants then completed the Interpersonal Support Evaluation List and the World Health Organisation Quality-of-Life Scales (WHOQOL-BREF). Results: Ostracism negatively affected participants’ basic needs, F (2, 37) = 10.80, p < .001, and negative mood, F (2, 36) = 11.17, p < .001; however, the magnitude of the effect was larger in the younger group compared to the two older groups. This effect was not moderated by QoL and perceived social support, all p values being greater than .05. Expected differences between groups and between conditions were not found on physiological measures, F (5.35, 85.61) = 0.39, p = .864. Conclusions: Although ostracism may be a potent experience for all individuals, early adulthood may experience increased sensitivity to ostracism relative to their older counterparts. These findings have important implications for the potential effects of ostracism in real social settings, however more investigation would be needed into the protective mechanisms in play for older adults. Kimberley.Wallis@uon.edu.au

Behavioural and ERP Correlates of Hypervigilance and Inhibitory Control in Spider Fear
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Aims: Attentional Control Theory posits that attentional biases to threat (preferential attention allocation to threatening stimuli) arise as a result of anxiety promoting automatic attentional processing, while disrupting voluntary attentional processing (Eysenck, Derakshan, Santos, & Calvo, 2007). Given little support for the latter in specific fear, the current study examined whether high spider fear individuals exhibit increased hypervigilance (rapid attention allocation to threat) and decreased inhibitory control (suppression of responses or distraction). Method: Fifteen high and low spider fear females aged 18-40 years completed a modified flanker go/nogo task. Behavioural (reaction time/RT and accuracy) and electrophysiological correlates of hypervigilance (P1 amplitude) and inhibitory control (N2 amplitude) were measured. On go trials, participants responded to flowers or spiders, flanked by either opposite image or neutral dash distractors. On nogo trials, participants withheld responses to a mushroom flanked by either spiders or flowers. Results: High fears did not demonstrate hypervigilance via faster RTs and greater P1 amplitude in response to spiders on go trials as hypothesised, with both groups showing faster RTs to spiders, and high fears showing greater P1 amplitude in response to both flowers and spiders in the left hemisphere only. Contrary to predictions, high fears did not demonstrate decreased inhibitory control via slowed RTs to flowers flanked by spiders, or reduced N2 amplitude on nogo trials with spider distractors. Rather, they showed decreased accuracy on all trials with spider or flower distractors compared to low fears, and a trend towards increased N2 amplitude on trials with spider relative to flower distractors. Conclusions: Findings indicate preliminary evidence of a compensatory inhibitory mechanism in response to feared stimuli. However, fear-related responses and automatic attentional processing may not have been adequately elicited by the paradigm. There is a need for future research utilising paradigms that adequately engage both automatic and voluntary attentional processing. monique.williams@utas.edu.au
Electrophysiological Correlates of Extraversion: Arousal, Arousability and Activation

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Aims: Eysenck’s arousal theory suggests that extraverts manifest lower cortical arousal and arousability, however past investigation has lacked clear operationalisation regarding both physiological variables. The present study aims to evaluate Eysenck’s extraversion theory within an empirically validated conceptualisation of arousal, arousability and activation.

Method: A sample of 80 university students, aged 18-28 years (sex-balanced) was recruited to complete the 50-item International Personality Item Pool (IPIP). Patterns of cortical activity were measured using the electroencephalogram (EEG) at rest: with eyes open (EO1), eyes closed (EC) and eyes open (EO2). The EC state was considered the baseline measure and compared to the averaged EO activity (EO1 and EO2). Resting EEG data were Fast-Fourier transformed, and the four traditionally defined frequency bands were assessed: delta (0.5-3.5 Hz), theta (4.0-7.5 Hz), alpha (8.0-13.0 Hz) and beta (13.5-29.0 Hz). Participant measures of cortical activity were correlated with scores from the 50-item IPIP extraversion scale.

Results: EC alpha was tested and confirmed as the inverse measure of cortical arousal, and the change from EC to EO alpha assessed arousability. Focal shifts, from EC to EO, in delta, theta and beta marked activation processes that replicate prior research. There was no significant relationship between EC EEG band activity and extraversion scores, or between the change from EC to EO delta, alpha and beta. However, there was a significant relationship between right-parietal EC to EO theta activation and extraversion scores.

Conclusions: Overall, these findings do not support Eysenck’s theory, suggesting that alpha arousal and arousability mechanisms do not characterise extraversion. The novel finding regarding theta activation provides new insight regarding the biological basis of extraversion, and suggests future research. ejw456@uowmail.edu.au
POSTER PRESENTATIONS

Persistence of dysfunctional auditory information processing following pharmacotherapy in Internet gaming disorder: an event-related potential study

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Aims: Internet gaming disorder (IGD), defined as inability to control internet-based games, leads to serious impairment in psychological and social functioning, but few studies exist that identify neurophysiological characteristics in IGD. The aim of this study was to determine neurophysiological markers associated with symptom changes in IGD patients following pharmacotherapy with outpatient management. Methods: Eighteen patients diagnosed with IGD (22.61 ± 5.10 years), and 29 healthy controls (HCs; 24.66 ± 3.80 years) participated in this study. IGD patients completed a 6-month of serotonin reuptake inhibitors (SRIs)-based pharmacotherapy. Event-related potential (ERP) were acquired during an auditory oddball task in participants who were young adult males. For the IGD patients, ERP was recorded prior to and after treatment. Between-group differences and the pre-post treatment differences in P300 components were investigated using repeated measures analysis of variance. The primary treatment outcome was a change in score on the Young’s Internet Addiction Test from before and after treatment. Results: The IGD group showed significantly reduced P300 amplitudes at midline centro-parietal site compared with those in HC. Reduced P300 amplitudes in the IGD were not correlated with scores on Internet Addiction severity. After 6 months of treatment, there were no significant changes in P300 amplitudes between pre- and post-treatment of IGD, even though, the IGD patients exhibited significant improvements of their IGD symptoms measured by Young’s Internet Addiction Test. Furthermore, there were no significant ERP differences between responder and non-responder to a 6-month pharmacotherapy in patients with IGD. Conclusion: These results indicate that IGD has abnormalities of P300 index and reduced P300 amplitudes could be considered as a candidate trait marker of IGD. This study enhances our understanding of neurophysiological characteristics of IGD. choijs73@gmail.com

Clarifying the Relationship Between Intrinsic Brain Activity and Neurotic Personality

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Aim: Neuroticism is a major dimension of personality defined biologically in terms of lower nervous system thresholds for emotional stimulation. Previous research has established a link between neuroticism and electroencephalographic (EEG) activity, focussing on task-based analyses that evoke emotional responses to stimuli. However, the applicability of intrinsic cortical activity in examining neuroticism, particularly with regard to alpha arousal and frontal alpha asymmetry, remains a controversial issue that requires re-evaluation. Hence, this study aimed to clarify the relationship between intrinsic EEG and neuroticism. Methods: Continuous EEG was recorded from 80 adults (40 female; aged 18-28) during eyes-closed (ECL) and eyes-open (EO) resting-states. Maximal regions of activity in each condition for delta, theta, alpha, and beta were identified with multivariate analyses of variance. The use of alpha as a marker of cortical arousal was determined by correlating global baseline ECL levels with the ECL to EO change in alpha. Frontal alpha asymmetry was measured as the difference between the F3 and F4 electrodes. A novel exploration of EEG reactivity (i.e. the change from ECL to EO) in all bands was included. Participants completed the 50-item International Personality Item Pool to derive neuroticism scores that were then correlated with alpha arousal levels, frontal alpha asymmetry, and EEG reactivity. Results: Alpha was confirmed as a global measure of cortical arousal. No significant correlation was observed between parietal alpha arousal levels and neuroticism. All correlations between neuroticism and ECL EEG activity, frontal alpha asymmetry, and EEG reactivity were non-significant. Conclusion: Overall, the findings suggest that a meaningful relationship does not exist between intrinsic cortical activity and neuroticism. It is argued that while resting-state cortical activity does not reflect the biological basis of neuroticism, unique aspects of valence processing in response to emotional stimuli, rather than cortical arousal, may be triggering neurotic tendencies. elle.p.coleman@gmail.com
The Effects of Modafinil on Behavioural and ERP Measures of Attention
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Aim: Modafinil is a wakefulness-promoting medication that is increasingly used off-label for cognitive enhancement in healthy persons, despite conflicting empirical support. The present study aimed to investigate the effects modafinil (200mg) on behavioural and event-related potential (ERP) measures of attentional processing. Specifically, the study aimed to examine the effects of modafinil on alerting, orienting and executive control using an attentional network task (ANT). Method: In this double-blind, randomised, placebo-controlled study, healthy non-sleep deprived males (N=18) completed the ANT at baseline and at 2.5 hours post-ingestion. Congruent or incongruent flanker targets were preceded by no-cue, by a central alerting cue, or by an informative spatial cue. Participants also completed subjective ratings of mood, fatigue, performance, and drug effects. Results: Modafinil administration resulted in a reduction in reaction time (RT) at post-ingestion in comparison to placebo. There was evidence for enhancement in both tonic and phasic alerting, as indicated by reduced RT and enhanced N1 amplitude for no cue and central cue trials. There was no evidence of differential enhancement of the orienting network following informative spatial cues. Enhancement of RT was also greater for incongruent relative to congruent flanker targets, suggesting behavioural improvement in executive control. Conclusions: There was a small effect of modafinil on tonic/phasic alerting and executive control in healthy males. Improved alerting was indexed by a neural measure of early focal attention (N1 amplitude). However, these effects may have occurred through preventing fatigue rather than improving specific attentional mechanisms. In addition, the small effect sizes may limit the practical implications of results, and comparison with other stimulants such as caffeine is warranted. Further analysis is required to examine the effect of modafinil on neural correlates of executive control.

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EEG correlates of subjectively rated attention level
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Aims: The ability to maintain attention on an object or task is an important aspect of cognition and individual difference. Attention can mediate learning, and without it, individuals would struggle to achieve even the simplest of goals. Previous research has identified various electroencephalogram (EEG) correlates of attention; however most of the research has been on task-directed forms of attention. The aim of this study was to examine the EEG correlates of subjective attention states by inducing varied levels of attention in participants. Method: EEG was recorded from 53 participants during the presentation of pattern stimuli varying in complexity to which subjective ratings of attention level were obtained. This study presents a novel method of studying non-cognitive attention, allowing for its investigation in a laboratory setting. Results: The subjective ratings of 28 participants were analysed for correlations with their EEG. Results indicated that there were significant relationships between attention level and beta, alpha, and theta power. Theta, alpha, and beta power were found to significantly decrease as attention increased, indicating potential specific EEG markers for externally directed and non-cognitive attention. Furthermore, significant topographic changes were observed in the EEG that were dependent on attention level. Conclusions: This study provides new findings to the literature by using a novel method to investigate the EEG correlates of subjectively rated attention. The results have modest implications for neurofeedback training and can assist with the understanding of attention states and EEG.

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Intra-Individual Response Variability: Insights from ERP Topographies

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Aims: Event-related potential (ERP) studies of intra-individual reaction time variability (IRTV) consistently report associations with the P3b, attributing highly variable outcomes to lapses in attention and decision-making processes. The extent of these effects in stimulus-response processes are, however, unknown and so the present study investigated Go ERP component differences in individuals identified as having low or high response variability in a Go/NoGo task. Method: Continuous EEG data from 46 healthy participants (aged 18-27 years) were recorded during an auditory equiprobable Go/NoGo paradigm, where a button press was required for the Go but not for the NoGo tone. Mean RTs, IRTV (calculated as the within-subject standard deviation of RT), and error rates were assessed, with participants sorted and evenly divided into two groups according to Go IRTV results (n = 23 in each group). Go ERPs were epoched -100 to 700 ms around stimulus onset, and submitted to temporal PCA for component identification. The following ERP components were extracted: N1-1, Processing Negativity (PN), P2, N2c, P3b, Slow Wave (SW), and Late Negativity (LN). Component amplitudes were statistically compared between the low and high IRTV groups. Results: Significant group differences were evident behaviourally as those with high IRTV produced more Go/NoGo errors than the low IRTV group. In terms of ERP component topographies, N1-1, PN, and P2 amplitudes did not differ between groups. In the following components, however, high IRTV individuals showed greater centroparietal N2c negativity and reduced midline P3b amplitude, followed by larger central SW positivity. The LN did not differ between groups. Conclusion: Individuals with high IRTV exhibited poorer task performance outcomes and employed greater cognitive efforts for Go response facilitations, as reflected by the larger N2c amplitude, reduced P3b, and SW enhancement. How task- or stimulus-related preparatory activity contributes to these outcomes requires further investigation. dk744@uowmail.edu.au

Assessment of Smartphone Technology to Measure Electrodermal Activity: A validation study

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Aim: Measuring electrodermal activity (EDA) both in laboratory settings and in the field usually requires the use of sophisticated and costly recording equipment. The current study sought to examine whether EDA data recorded with a new Smartphone application and associated recording device would produce comparable results to those obtained by traditional laboratory-based equipment. Methods EDA was simultaneously recorded using the smartphone application, eSense (Mindfield Biosystems Ltd) and ProComp Infiniti (Thought Technology Ltd) while participants (n = 20) completed a number of tasks. After a resting baseline was recorded, participants engaged in a light exercise task, a deep breathing relaxation task, a visual discrimination task, an auditory habituation task, and a complex cognitive processing task. Results: A fairly strong correlation was found between the data obtained using the eSense smartphone application and data recorded using the ProComp Infiniti recording device, r(19) = .85, p < .000. While the general EDA trace appeared to be comparable between the two devices, the main factor contributing to the lack of a strong correlation between the two pieces of equipment appeared to be a slight time lag in the eSense recording application. Conclusions: The results of the current study showed reasonable success of the eSense smartphone application to be used in research settings. Further development of the application and equipment could greatly benefit EDA research by providing a low-cost and portable way of measuring EDA either in a laboratory or in the field. l.lole@cqu.edu.au
Enhanced FRN and P2 amplitudes in mid-to-late adolescents during the Balloon Analogue Risk Task

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Aim: According to dual-system models of risk-taking, heightened risk-taking behaviour in adolescents could be partly attributed to hyperactivity in the dopaminergic system implicated in reward-related processing (Steinberg, 2008). Using an affectively engaging risk-taking task, we investigated whether risk-taking and the processing of outcomes differ between adolescents and adults. Method: We examined behavioural indices of risk-taking, and the feedback-related negativity (FRN) and feedback P3 elicited during the Balloon Analogue Risk Task (BART, Lejuez et al., 2003) in mid-to-late adolescents (N = 26, M(age) = 15.57 years, SD(age) = 0.90 years) and adults (N = 24, M(age) = 21.17 years, SD(age) = 3.52 years). Results: Overall FRN and P2 amplitudes were larger in adolescents compared to adults. However, the magnitude of the FRN and feedback P3 effects (i.e. change in amplitude between positive and negative feedback) and behavioural indices of risk-taking did not differ significantly between groups. Conclusions: Similar FRN and feedback P3 effects suggest that the ability to discriminate between outcomes with respect to the current goal state is mature by mid-to-late adolescence. However, larger overall FRN and P2 amplitudes in adolescents suggest that adolescents allocated more attention to feedback stimuli than adults.

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EEG theta/beta ratio and spectral power correlates of executive functions in children and adolescents with AD/HD

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Aims: In past electroencephalogram (EEG) studies, elevated theta/beta ratio (TBR) in patients with AD/HD was thought to be an index of the disorder. However, recent studies suggest the index is not reliable and age may moderate the effect. Therefore, the current study firstly aimed to replicate a trend exposed by recent findings in children and adolescents. Secondly, as spontaneous brain activity is increasingly being considered as potentially informative as neural activity when engaged in a task, this study was to testify whether resting activity measured by EEG can be biomarkers for behavioural performance in participants with AD/HD. Method: Fifty three participants with AD/HD and 37 healthy controls were recruited in China, and were further divided into a child group and an adolescent group. Ten minutes’ EEG was recorded with eyes closed, and the EEG was Fourier transformed. Relative bands (delta, theta, alpha, and beta), TBR, and total power were calculated. Participants with AD/HD additionally completed sustained attention and executive function tasks in Cambridge Neuropsychological Test Automated Battery. Results: In contrast to early studies, TBR did not differ groups across age; however, TBR was positively correlated to inattentive symptom. Besides, other correlations were found between EEG activity and behaviours including inattention symptoms and cognitive tasks ranging from sustained attention to higher-order executive functions. Conclusions: The results did not support the diagnostic value of TBR. Instead, the correlations imply the prognostic value of EEG. Also, given the nature of EEG heterogeneous in AD/HD, the results suggest some directions for further exploring behavioural meanings of EEG.

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