We acknowledge the Traditional Owners and their custodianship of the lands on which we meet. We pay our respects to their Ancestors and their descendants, who continue cultural and spiritual connections to Country. We recognise their valuable contributions to Australian and global society.

contents

Sponsors 3

Schedule 6

ACNS Young Investigator Award: 11
The Springs of Action – The Neuroscience of Motivated Behaviour
Dr Trevor Chong

Ross Day Plenary Lecture: 11
Punishment: How risk and aversion shape our actions and choices
Prof Gavan McNally

OHBM Australia Keynote Address: 12
Identifying unique and shared brain alterations in mental disorders through large-scale data sharing
A/Prof Lianne Schmaal

General Presentations

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Day 2 32

Day 3 69

Day 4 104
Siemens Healthineers proudly supports Australia’s thriving research community at the ABPS2022 Meeting in Brisbane. Deep learning reconstruction is a very active field for researchers, demonstrating great potential for the future of MR imaging.

Our deep learning reconstruction technology Deep Resolve allows users to accelerate MR scans, making them faster than ever before. In our webcast “Boost your MRI productivity with Deep Resolve”, Saif Afat, M.D. from University Clinic Tuebingen, Germany and John Conklin, M.D. from MGH, USA share their experience on how Deep Resolve boosts workflow efficiency while improving their patient care.
ANT Neuro proudly announces the opening of ANT Neuro Australia as the newest Sales and Support organisation in Melbourne. We’re Looking forward to meeting you!

Complete Solutions for Clinical Neurodiagnostics and Neuroscience Research

Record mobile EEG anywhere with ease and convenience

The new eeg™ 24 amplifier is the go-to solution for mobile/portable EEG research applications with quick setup times for monitoring brain activity in real time.

Neuronavigation for every application

visor2™ is the neuronavigation solution for the most advanced neuroscience research and accurate clinical therapy with non-invasive transcranial magnetic stimulation (TMS).

The UQ School of Psychology ranked #23 in the 2020 QS World University Rankings

UQ School of Psychology
@UQPsynch

ANT Neuro
australia
Medilink has been supplying premium brand scientific instrumentation to clinical and research end users in Australia and New Zealand for over 25 years. Medilink distributes a selection of neuro products that supports neuroscience research, education and therapy through Neuro diagnostics, Neuro modulation, Neuro stimulation, Neuro-imaging. We currently distribute Magstim EGI - EEG, Gowerlabs - fNRS and Magstim - TMS.

Medilink Contact details are as follows –

**Contact**  Jenni Nowland  
**Mobile**  +61 419 251 167  
**Phone**  +61 2 9737 9892  
**Email**  jenni@medilinkaustralia.com  
  sales@medilinkaustralia.com

[www.medilinkaustralia.com](http://www.medilinkaustralia.com)
### Schedule (Brisbane Times)

**Bold text indicates an in-person presentation. Italic text indicates a Zoom presentation.**

#### Day 1: Monday July 11

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<td>9:00 - 12:30pm</td>
<td>Symbiotic Devices workshop – Introduction to fNIRS measurement and analysis</td>
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<td>Australian Characterisation Commons at Scale workshop – Neuroimaging Applications on CVL Platform</td>
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<td>ANT-Neuro workshop – TMS &amp; Neuronavigation</td>
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<td>1 - J. Thurbon (p1) *</td>
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<td>9 - A. Holmes (p9) *</td>
<td>13 - R. Lawrence (p13)</td>
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<td>2 - M. Gajwani (p2)</td>
<td>5 - L.A. Talipski (p5) *</td>
<td>10 - C. Marsh (p10) *</td>
<td>14 - D. Myles (p14) *</td>
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<td>3 - N. Parsons (p3) *</td>
<td>7 - S.M. Shadli (p7)</td>
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<td>4 - M. Hall (p4)</td>
<td>8 - A. Budd (p8) *</td>
<td>12 - T. Barich (p12) *</td>
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<td>31 - M. Le Pelley</td>
<td>37 - S. Ehrhardt</td>
<td>43 - X. He *</td>
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<td>33 - S. Parker</td>
<td>39 - D. Feuerriegel</td>
<td>45 - C. Dykstra *</td>
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**Poster Session #1 Bld. 24a, Rm 201 - 204**

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**Afternoon Tea Bld 24a Courtyard**

**ANT-Neuro - ACNS Young Investigator Award**

Dr. Trevor Chong (Monash)

(ABEL Smith Theatre)

**NEUROSPEC – Welcome Social Event – ‘Saint Lucy Caffe e Cucina’**
### Day2: Tuesday July 12

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<td>Bld. 24, Rm S304</td>
<td>Motor Control Chair: L-A. Leow</td>
<td>Decision Integration Chair: D. Sewell</td>
<td>Impaired Cognition Chair: Mark King</td>
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<td>Bld. 24a, Rm 306</td>
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#### 09:45 - 10:00
- Welcome Coffee Bld 24a Courtyard

#### 10:00 - 10:15
- **Unreal Faces**
  - Chair: J. Taubert
  - Support: Harry Paff
  
  - 47 - C. Becker *
  - 51 - G. Lamp
  - 55 - S. Loneragan *
  - 59 - B.N. Nguyen
  - 63 - S. Goyal

#### 10:15 - 10:30
- **Motor Control**
  - Chair: L-A. Leow
  - Support: Tessa Clarkson
  
  - 48 - E. Miller *
  - 52 - M. Huntley *
  - 56 - M. Jiwa *
  - 60 - C. Harris *
  - 64 - A Conn *

#### 10:30 - 10:45
- **Decision Integration**
  - Chair: D. Sewell
  - Support: Tara Rasmussen
  
  - 49 - V. Perrone *
  - 53 - S. Armstrong
  - 57 - L. Barnes
  - 61 - M. Falconbridge
  - 65 - A.L. Cobden

#### 10:45 - 11:00
- **Better Vision Science**
  - Chair: M. Nicholls
  - Support: K. Doherty-Bigara
  
  - 50 - J. Jeganathan *
  - 54 - L-A. Leow
  - 58 - D. Sewell
  - 62 - J. Salaman

#### 11:00 - 11:15
- **Impaired Cognition**
  - Chair: Mark King
  
  - 51 - G. Lamp
  - 55 - S. Loneragan *
  - 59 - B.N. Nguyen
  - 63 - S. Goyal

#### 11:15 - 11:30
- **Morning Tea Bld 24a Courtyard**

#### 11:30 - 11:45
- **Predictive Vision**
  - Chair: R. Rideaux
  - Support: Harry Paff
  
  - 66 - E. Livesey
  - 72 - M. Huang *
  - 78 - J. Day *
  - 84 - I-S. Bower
  - 90 - A.C. Thompson *

#### 11:45 - 12:00
- **Aging**
  - Chair: M. Irish
  - Support: Tessa Clarkson
  
  - 67 - W. Turner
  - 73 - A. Smith
  - 79 - D. Nicoll *
  - 85 - N. Taylor
  - 91 - Z. Liu *

#### 12:00 - 12:15
- **Attention**
  - Chair: L. Jeffries
  - Support: Tara Rasmussen
  
  - 68 - B.W. Saurels
  - 74 - L. Dewitte
  - 80 - H. Beale *
  - 86 - C. Leardons *

#### 12:15 - 12:30
- **Brain Systems**
  - Chair: L. Cocchi
  - Support: K. Doherty-Bigara
  
  - 69 - P. Johnson
  - 75 - J. Todd
  - 81 - A. Vella *
  - 88 - A. Cerins *

#### 12:30 - 12:45
- **Human Vision**
  - Chair: Jason Forte
  
  - 70 - C. Sexton *
  - 76 - F. Lan *
  - 82 - A. Renton
  - 87 - J. Pang

#### 12:45 - 01:00
- **Imagery**
  - Chair: K. Brooks
  - Support: Kena Fang
  
  - 71 - R. Rideaux
  - 77 - M. Irish
  - 83 - L.N. Jefferies
  - 89 - L.H.W. Hamilton

#### 01:00 - 01:15
- **Childhood Disorders**
  - Chair: C. Sherwell
  - Support: Rong Han
  
  - 72 - M. Huang *
  - 78 - J. Day *
  - 84 - I-S. Bower
  - 90 - A.C. Thompson *

#### 01:15 - 01:30
- **Emotional Responses**
  - Chair: N. Nelson
  - Support: Dylan Moloney-Gibbs
  
  - 73 - A. Smith
  - 79 - D. Nicoll *
  - 85 - N. Taylor
  - 91 - Z. Liu *

#### 01:30 - 01:45
- **Cannabis**
  - Chair: V. Lorenzetti
  - Support: Kiara Higgins
  
  - 74 - L. Dewitte
  - 80 - H. Beale *
  - 86 - C. Leardons *
  - 88 - A. Cerins *

#### 01:45 - 02:00
- **The changing brain**
  - Chair: M. Schira
  
  - 75 - J. Todd
  - 81 - A. Vella *
  - 88 - A. Cerins *
  - 91 - Z. Liu *

#### 02:00 - 02:15
- **Poster Session #2 Bld. 24a, Rm 201 - 204**

#### 02:15 - 02:30
- 92 - E-L Leong (p1)
- 96 - K. Voigt (p5)
- 100 - S. Loft (p10)
- 104 - A. Harris (p14)
- 108 - M. Roberts (p18) *

#### 02:30 - 02:45
- 93 - T.M. Haase (p2) *
- 97 - S. Evas (p6)
- 101 - T. Clarkson (p11) *
- 105 - L.M. Greenwood (p15)
- 106 - Cottier (p16) *

#### 02:45 - 03:00
- 94 - I. Andresen (p3)
- 98 - S.C. Andrews (p7)
- 102 - A. Jones (p12) *
- 106 - Cottier (p16) *
- 107 - J. Pham (p17) *

#### 03:00 - 03:15
- 95 - A.A. Sulfaro (p4) *
- 99 - M. Campbell (p8)
- 103 - K. Wykes (p13) *
- 107 - J. Pham (p17) *

#### 03:15 - 03:30
- 109 - T. Pace *
- 114 - C. Hood
- 119 - N.W. Holt *
- 124 - G. Day *
- 129 - D.J. Angus

#### 03:30 - 03:45
- 110 - D. Stoliker *
- 115 - M. Singh *
- 120 - D. Bennett
- 125 - H. Thomson *
- 130 - A.T. Hill

#### 03:45 - 04:00
- 111 - L. Kay
- 116 - L.M. Dipnall *
- 121 - S.B. Most
- 126 - V. Lorenzetti
- 131 - E. Robinson *

#### 04:00 - 04:15
- 112 - J. Clifton
- 117 - S.H. Soman *
- 122 - D. Varley *
- 127 - S. Meikle *
- 132 - J-J. Zouki *

#### 04:15 - 04:30
- 113 - K.R. Brooks
- 118 - C. Sherwell
- 123 - N. Nelson
- 128 - V. Lorenzetti

#### 04:30 - 04:45
- **Assembling**
  - Chair: M. Schira
  
  - 114 - C. Hood
  - 119 - N.W. Holt *
  - 124 - G. Day *
  - 129 - D.J. Angus

#### 04:45 - 05:00
- **Prof. Sally Andrews Memorium**
  - Abel Smith Theatre

#### 05:00 - 05:15
- **Siemens Healthineers - Ross Day Plenary Lecture**
  - Prof. Gavan McNally (UNSW)
  - Abel Smith Theatre

#### 05:15 - 05:30
- **ECR Social Event**
  - ‘The Charming Squire @ South Bank’
**Day 3: Wednesday July 13**

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<td>Movement Disorders D. Apthorp</td>
<td>Metacognition D.H. Arnold</td>
<td>Healthy cognition F. Karayanidis</td>
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<td>133 - J. Sun *</td>
<td>138 - M.I.N. Karim</td>
<td>142 - O. Burton</td>
<td>145 - S. Weber *</td>
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<td>139 - L.P. Selvadurai</td>
<td>143 - X. Lu</td>
<td>146 - K. Bianco *</td>
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<td>135 - R. Tyler *</td>
<td>140 - H.M. Cummins *</td>
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<td>141 - J. McBeath *</td>
<td>148 - F. Simpson *</td>
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<td>139 - Z. Howard</td>
<td>155 - C. Cadwallader *</td>
<td>161 - M. Bartlett</td>
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<td>152 - A.W. Harrison *</td>
<td>158 - E.F.P. Younger *</td>
<td>164 - K. Perrykjad</td>
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### Day 4: Thursday July 14

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<td>Pain</td>
<td>Knowledge &amp; Complexity</td>
<td>Psychological Wellbeing</td>
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<td>236 - F. Karayanidis</td>
<td>242 - B. Speranza</td>
<td>247 - C.E Kelly</td>
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<td>12:15 - 12:30</td>
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<td>238 - V. Vadinova</td>
<td>244 - D. Iskaf</td>
<td>249 - N. Badcock</td>
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<td>02:00 - 02:15</td>
<td>253 - B. Lowe (p1)</td>
<td>257 - A. Stein (p5)</td>
<td>261 - Z. Qiu (p10)</td>
<td>265 - E. Kearney (p15)</td>
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<td>02:15 - 02:30</td>
<td>254 - L. Hall (p2)</td>
<td>258 - J.B. Saward (p6)</td>
<td>262 - J. Choi (p12)</td>
<td>266 - B.N. Jack (p16)</td>
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<td>02:30 - 02:45</td>
<td>255 - L. Bouyer (p3)</td>
<td>259 - K. Murphy (p8)</td>
<td>263 - E. Luders (p13)</td>
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<td>02:45 - 3:00</td>
<td>256 - Y. Liu (p4)</td>
<td>260 - B. Muehlebach (p9)</td>
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<td>03:00 - 03:15</td>
<td>Applied Vision</td>
<td>Task Switching</td>
<td>Learning</td>
<td>Language &amp; Speech</td>
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<td>03:30 - 03:45</td>
<td>268 - R. Street</td>
<td>274 - M. Gordon</td>
<td>280 - D. Pearson</td>
<td>286 - H. Paff</td>
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<td>03:45 - 04:00</td>
<td>269 - C.J. Brooks</td>
<td>275 - R. Healey</td>
<td>281 - M. Nightingale</td>
<td>287 - J. Chow</td>
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<td>04:00 - 04:15</td>
<td>270 - N. Wyche</td>
<td>276 - M.R. Hinder</td>
<td>282 - X. Sun</td>
<td>288 - V. Tolkacheva</td>
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**Poster Session #4 Bld. 24a, Rm 201 - 204**
If travelling by public transport, you will arrive at one of the highlighted bus stops. From these points, you need to walk to the conference site.

Stream 1 is located in the Abel Smith lecture theatre (Bld 23)

Streams 2 to 3 are located in the Social Sciences Building (24) and Streams 4 – 5 and the Poster Hall are located in the adjoining McEllwain Bld (Bld 24a).

Morning teas, lunch and afternoon teas will be served in the courtyard of the McEllwain building.
Motivation is fundamental to goal-directed behaviour. Importantly, it is not a singular construct, but a complex and multifaceted phenomenon that varies widely across individuals – from highly motivated athletes, to patients with apathy whose motivational deficits significantly impair their quality of life. Here, I will discuss recent work to understand the neurobiology of motivation in health and disease. In particular, I will focus on the mechanisms underlying two important dimensions of motivation: (1) the capacity to overcome effortful costs in pursuit of reward, and (2) our innate curiosity for novelty and information.

An important goal for future research will be to dissect the core mechanisms underlying motivation across its multiple domains. This in turn has the potential to lead to more accurate ways to diagnose, monitor and treat the disorders of motivation that so profoundly affect a vast range of clinical populations.

Dr. Trevor Chong completed his undergraduate research and medical degrees at Monash, before undertaking doctoral training at the University of Melbourne and MIT. After completing his PhD in 2007, he returned to specialty training in neurology at St Vincent’ Hospital and The Alfred Hospital and was admitted to Fellowship of the Royal Australasian College of Physicians as a consultant neurologist. His lab seeks to understand the neurobiology of learning, memory and decision-making in healthy individuals, and how these processes are impacted by neurological illness.

Prof Gavan McNally is a behavioural neuroscientist. His research is concerned with the fundamental behavioural and brain mechanisms for learning and motivation and understanding how these apply to clinical conditions such as addictions, anxiety disorders, and mood disorders. He is interested in identifying these mechanisms, at the cellular, circuit, and systems level, and also in translating this fundamental information into new treatments of psychological conditions. To do so, he adopts a systems neuroscience approach, combining well controlled behavioural approaches with a variety of approaches (optogenetics, chemogenetics, in vivo calcium imaging, whole brain circuit mapping) in normal and transgenic animals to map and manipulate brain mechanisms at cellular and circuit levels.
A key objective in the field of translational psychiatry over the past few decades has been to identify brain biomarkers of mental disorders, to support the development of more effective interventions. However, various barriers have impeded the detection of clinically relevant neuroimaging markers and the translation of neuroimaging into clinical practice, including underpowered studies and a lack of reproducible findings. Large-scale data collection or pooling initiatives have been established to address the issue of small sample sizes. For example, the Enhancing NeuroImaging Genetics through Meta-Analysis (ENIGMA) was established to initially establish to boost statistical power in genome-wide association studies to find common genetic variants that affect brain measures as an intermediate phenotype for major mental illnesses. Since then, many disease working groups within ENIGMA were formed, in which researchers around the world share imaging, demographic, clinical and sometimes genetic data from people with and without mental disorders from their local studies. In this talk, I will present an overview of the work of the ENIGMA Major Depressive Disorder (MDD) working group, which currently includes data from 49 MDD study cohorts from 15 countries across 6 continents. Findings on structural brain alterations associated with MDD that are unique to different stages of life and stages of illness will be presented. In addition, I will highlight recent findings on shared and unique brain alterations in different mental disorders, including MDD, bipolar disorder, schizophrenia, post-traumatic stress disorder, obsessive compulsive disorder, attention deficit disorder and autism spectrum disorders. Finally, the clinical and scientific implications of these insights will be discussed.

Associate Professor Lianne Schmaal is a NHMRC Medical Research Future Fund Career Development Fellow (CDF) at the Centre for Youth Mental Health, and Orygen, The National Centre of Excellence in Youth Mental Health, where she leads the MAPP (Mood and Anxiety, Profiling and Prediction) lab; a research program focused on profiling and prediction of mood disorders, anxiety disorders and suicidality. Her research aims to understand the neurobiological mechanisms underlying the development and course of depression and suicidal thoughts and behaviours.
1. The Role of Natural Scene Statistics in the Restorative Potential of Nature Scenes

James Thurbon*, Honours Student
Mark Schira, University of Wollongong

Findings regarding a faster recovery of fatigued attention when viewing nature versus urban scenes are mixed. Here, we aimed to clarify attentional depletion and investigate whether natural and unnatural amplitude spectra could explain attention restoration effects. 211 participants completed six blocks of the Attention Network Test (ANT) online. Between blocks three and four, participants could (a) restore by viewing images with natural amplitude spectra, (b) unnatural amplitude spectra or (c) control group with no break. No significant effects of amplitude spectra or exposure time were observed, nor did performance decrease across ANT blocks. Experiment 2: 22 participants completed six successive blocks of the Modified Attention Network Test (MANT) in a laboratory. Mean accuracy within blocks did not change (95% accuracy). A block-by-block increase in mean response time from block 1 (485.22ms, SD = 54.63) to block 6 (561.28ms, SD = 119.32) was observed, with a significant 76.07ms, 95% CI [28.94, 123.20] difference between these blocks (p = .001). Results question the depletive ability of the ANT and partially support the MANT, challenging existing conclusions about attentional fatigue and restoration. Alternatively, depletion effects could be disguised by practice. Regardless, our findings highlight a need for control groups within attention restoration research.

2. The effects of different preprocessing steps and cortical parcellations on diffusion MRI connectomics

Mehul Gajwani, The Turner Institute for Brain and Mental Health, School of Psychological Sciences, and Monash Biomedical Imaging, Monash University
Stuart Oldham, Developmental Imaging, Monash Children’s Research Institute
James Pang, The Turner Institute for Brain and Mental Health, School of Psychological Sciences, and Monash Biomedical Imaging, Monash University
Aurina Amatkevičiūtė, The Turner Institute for Brain and Mental Health, School of Psychological Sciences, and Monash Biomedical Imaging, Monash University
Jeggan Tiego, The Turner Institute for Brain and Mental Health, School of Psychological Sciences, and Monash Biomedical Imaging, Monash University
Mark Bellgrove, The Turner Institute for Brain and Mental Health, School of Psychological Sciences, and Monash Biomedical Imaging, Monash University
Alex Fornito, The Turner Institute for Brain and Mental Health, School of Psychological Sciences, and Monash Biomedical Imaging, Monash University

Recent years have seen a surge in the use of diffusion MRI to map connectomes in humans and other species, paralleled by a similar increase in pre-processing and analysis choices. Yet these different steps and their effects are rarely compared systematically. Here, in a healthy adult population (n=294), we characterise the impact of a range of analysis pipelines on one widely-studied property of the human connectome; its degree distribution. We evaluate the effects of 40 pipelines (utilising common techniques in parcellation, track seeding, spatial constraint, and tractography reconstruction) and 55 group reconstruction schemes on highly connected ‘hub’ regions. We find that hub location is highly variable between pipelines, primarily related to the parcellation used. Moreover, hub connectivity is highly correlated with regional surface area in most of the assessed pipelines (rho>0.70 in 69% of pipelines), particularly when using weighted networks. Unweighted network analysis has different drawbacks, resulting in degree distributions that highly depend on the thresholding density, or have negative skewness (which are less biologically plausible). Our results demonstrate the need for prudent decision-making when processing diffusion MRI data, and for caution in the interpretation of findings where putative connectivity differences may (instead) be partially driven by inter-regional anatomical variation.

Nicholas Parsons*, PhD Student; Cognitive Neuroscience Unit, School of Psychology, Deakin University, Melbourne, VIC, Australia

Andrei Irimia, Ethel Percy Andrus Gerontology Center, Leonard Davis School of Gerontology, University of Southern California, Los Angeles, CA, USA

Anar Amgalan, Ethel Percy Andrus Gerontology Center, Leonard Davis School of Gerontology, University of Southern California, Los Angeles, CA, USA

Julien Ugon, School of Information Technology, Faculty of Science Engineering Built Environment, Deakin University, Melbourne, VIC, Australia

Kerri Morgan, School of Information Technology, Faculty of Science Engineering Built Environment, Deakin University, Melbourne, VIC, Australia

Sergiy Shelyag, School of Information Technology, Faculty of Science Engineering Built Environment, Deakin University, Melbourne, VIC, Australia

Alex Hocking, School of Information Technology, Faculty of Science Engineering Built Environment, Deakin University, Melbourne, VIC, Australia

Govinda Poudel, Mary MacKillop Institute for Health Research, Australian Catholic University, Melbourne, VIC, Australia

Juan F. Dominguez D., PhD Student; Cognitive Neuroscience Unit, School of Psychology, Deakin University, Melbourne, VIC, Australia

Karen Caeyenberghs, PhD Student; Cognitive Neuroscience Unit, School of Psychology, Deakin University, Melbourne, VIC, Australia

Structural (SC) and functional (FC) connectivity following mTBI are poorly characterized and seldom considered within a unified framework. Multilayer network analysis is an emerging technique to uncover how microstructure enables functional communication. Using our novel graph metric (SC-FC Bandwidth), we quantified the information capacity of brain regions in 53 mild TBI patients at the acute and chronic phases. We (1) mapped the spatial distribution of high SC-FC Bandwidth edges, (2) measured the association between processing speed and SC-FC Bandwidth at each phase and (3) examined whether change in SC-FC Bandwidth predicts change in Processing speed. Nonlinear principal components of direct (t = -1.84, p = .06) and indirect SC-FC Bandwidth (t = 3.86, p < .001) predict Processing speed with a moderate effect, controlling for Age (R² = 0.43, p < .001). A subnetwork of increased SC-FC bandwidth edges was identified at the chronic, relative to the acute mTBI phase (pFDR = 0.05). Increased interhemispheric SC-FC bandwidth within this network corresponds with decreased processing speed at the chronic, relative to the acute mTBI phase (partial r = 0.32, p = 0.02). mTBI triggers reorganization of brain connectivity optimized for maximum information flow, supporting improved cognitive performance as a compensatory mechanism.

4. Neurobiology of osteoarthritis: A systematic review and meta-analysis

Natalia Egorova-Brumley, University of Melbourne

Michelle Hall, University of Melbourne

Fiona Dobson, University of Melbourne

David Klyne, University of Queensland

Carmen Zheng, University of Melbourne

Yuri Lima Lopes, University of Melbourne

Osteoarthritis (OA) affects 240 million people worldwide. Neuroimaging has been increasingly used to investigate brain changes in OA, however, there is considerable heterogeneity in reported results. The goal of this systematic review and meta-analysis prospectively registered (PROSPERO #42021238735) and conducted in accordance with PRISMA guidelines was to synthesise existing literature and identify consistent brain alterations in OA. Full-texts of original human studies were included if they had: i) neuroimaging data by site of OA (e.g. hand, knee hip); ii) data in healthy controls (HC); iii) >10 participants. Activation likelihood estimation (ALE) was conducted using GingerALE software on studies that reported peak activation coordinates and sample size. Our search strategy identified 5,924 articles. Twenty-five studies fulfilled the eligibility criteria, of which 17 were included in the meta-analysis. The right insula was consistently associated with OA vs HC, with less activity, connectivity and brain volume in OA. This region was implicated in both knee and hip OA, with an additional cluster in the mPFC observed only in the hip OA subgroup, suggesting a possible distinction between the neural correlates of OA subtypes. The pattern of brain regions altered in OA is consistent with the disruption of the default mode and salience networks.
5. Can attention impair temporal resolution? A spatiotemporal-confusion account of temporal impairment following a brief cue
Louisa A. Talipski*, PhD Student The Australian National University
Stephanie C. Goodhew, The Australian National University
Mark Edwards, The Australian National University

Attention is known to enhance many aspects of visual perception. Curiously, however, some authors have claimed to find evidence that attention elicited by a briefly presented peripheral cue harms temporal resolution (i.e., the perception of variation in luminance across time; e.g., Yeshurun & Levy, 2003). In this study, we examined the possibility that this temporal impairment is not a consequence of attention, but of "spatiotemporal confusion": participants confusing the temporal signals produced by the cue with those of the target. In Experiment 1, we used four attentional cues that differed in their spatial proximity to the target—small and large peripheral cues, and centrally presented arrow and gaze cues—and examined their effects on temporal gap-detection performance. Here, only the two peripheral cues—that is, the cues that were most proximal to the target, and therefore the most likely to generate spatiotemporal confusion—produced a temporal impairment. In Experiment 2, we reduced the amount of high temporal-frequency information in the peripheral cues, and therefore the potential for confusion to occur, by having them remain visible until response. Here, we observed no effect of cueing on temporal resolution. Together, our results provide evidence that involuntary attention does not affect temporal resolution.

6. Scopolamine's effect on heart rate variability and electroencephalography measures in healthy participants and participants with depression
Joseph Chen, University of Auckland
Rachael Sumner, University of Auckland
Venkat Krishnamurthy Naga, Waitemata District Health Board
Nicholas Hoeh, University of Auckland
Hafis Adetokunbo Ayeni, Auckland District Health Board

Antidepressants appear to decrease EEG alpha power and modulate heart rate variability (HRV). Given scopolamine decreases alpha in healthy individuals and modulates HRV, this trial assessed the antidepressant, EEG, and HRV effects in individuals with depression. Forty individuals with depression were administered 15-minute infusions of scopolamine or glycopyrronium. Glycopyrronium was chosen as the active placebo due to its similar antimuscarinic properties to scopolamine, but its inability to cross the blood-brain barrier. Mood outcomes via the Montgomery–Åsberg Depression Rating Scale (MADRS) were assessed pre-infusion to 6-weeks post-infusion. Furthermore, 12 healthy individuals were administered scopolamine. All 52 individuals underwent EEG and ECG recordings from pre-infusion to 4-hours post-infusion.

Scopolamine improved MADRS scores in a similar magnitude to glycopyrronium yielding a non-significant antidepressant effect size (d=0.17) at day 3. Scopolamine modulated HRV with the high frequency metric exhibiting a main effect (F(2,356)=8.8, p=0.012). No differences in alpha were reported, however, theta exhibited significant interaction effects between time and group in central (F(32,403)=76.5, p=1.6e-5) and occipital F(32,307)=106, p=6.9e-10) electrodes.

The mood results raise questions about the placebo response. Furthermore, the different effects of scopolamine on healthy individuals and individuals with depression suggest both a central and peripheral antimuscarinic contribution to depression.

7. Conflict-specific EEG ‘theta’ rhythm that predicts anxiolytic action is elevated in clinical anxiety: validation of a theory-based biomarker
Shabah Mohammad Shadli, Dept. of Psychology, University of Otago, New Zealand and Brain-Behaviour Research Group, School of Science and Technology, University of New England
Changes in rodent ‘theta’ rhythm (4-12Hz) reliably distinguish anxiolytic drugs from other centrally acting drugs. ‘Theta’ is key element of a detailed neuropsychology of anxiety that is also the foundation for the Reinforcement Sensitivity Theory of human personality. Using this neuropsychology, we developed a human goal-conflict ‘theta’ measure that is sensitive to different classes of anxiolytic drug and correlates with STAI-T scores. Here we show that this ‘theta’ is high in those with clinical anxiety. Two separate populations were tested for anxiety-related ‘theta’ variation. Student volunteers were divided into three gender-matched. Community volunteers were divided into two separately recruited groups – control and patient. High, medium, and low STAI-T score students had high, low, and zero ‘theta’, respectively. Patients differed maximally from controls at ~7Hz (post hoc 3-10Hz, group x frequency[quad], F1,85 = 8.77; P= 0.004). Maximum power in the 4-7Hz range varied somewhat with diagnosis: control < generalized anxiety < comorbid generalized anxiety and depression < mixed other diagnoses < social anxiety; but high ‘theta’ was not diagnosis-specific. Goal conflict-specific EEG ‘theta’ (4-12Hz) rhythmicity appears to underlie a form of clinical anxiety that cuts across conventional diagnosis. It is the first theoretically-derived biomarker for a form of psychiatric dysfunction.

9. Disturbed hierarchical function in schizophrenia and early psychosis

Alexander Holmes*, PhD Student, Turner Institute for Brain and Mental Health, Monash University
Priscila Levi, Honours Student, Turner Institute for Brain and Mental Health, Monash University
Kevin Aquino, Postdoctoral Researcher, School of Physics, University of Sydney
Yu-Chi Chen, PhD Student, Turner Institute for Brain and Mental Health, Monash University
Sidhant Chopra, Postdoctoral Researcher, Department of Psychology, Yale University
James Pang, Postdoctoral Researcher, Turner Institute for Brain and Mental Health, Monash University
Alex Fornito, Professor, Turner Institute for Brain and Mental Health, Monash University

The cerebral cortex is organised hierarchically, spanning unimodal sensorimotor networks to transmodal association areas. This hierarchy is often characterised using low-dimensional manifold embeddings of inter-regional functional coupling estimates, termed gradients. Such analyses may offer insights into the pathophysiology of schizophrenia, which is frequently linked to dysfunctional interactions between association and sensorimotor areas. To investigate hierarchical organisation in schizophrenia, early psychosis, and health, we applied diffusion map embedding on 162 subjects from the Human Connectome Project-Early Psychosis (HCP-EP; 48 controls, 114 psychosis) and 171 subjects from the Consortium for Neuropsychiatric Phenomics (CNP; 121 controls, 50 schizophrenia). This method produced a primary sensory-fugal gradient, alongside a secondary visual-to-sensorimotor gradient. In CNP, schizophrenia patients and controls significantly

8. Belief beyond logic: The effect of repetition, delusion-relevance and schizotypy on perceived truth

Alycia Budd*, PhD Candidate, Flinders University
Prof Mike Nicholls, Flinders University
Dr Salvatore Russo, Flinders University
Dr Oren Griffiths, Flinders University

The truth effect refers to the phenomenon whereby repeated stimuli are more likely to be judged as true than novel stimuli (Hasher, Goldstein, & Toppino, 1977). While erroneously high conviction is a diagnostic feature of clinical delusions, there is little research exploring the metacognitive processes that elicit a perception of truth, and how this might vary across traits and stimulus content. One hundred participants were shown a series of statements in an online experiment and were asked to rate how true each statement was on a Likert scale. Half of the statements were true (versus false), half were delusion-relevant (versus control items), and half were repeated once during the experiment (versus not repeated). Participants also completed measures of schizotypy and delusion-proneness. Results revealed a truth effect: repeated statements were rated more true than novel statements. Statements thematically consistent with delusional beliefs received higher truth ratings than control items at initial presentation, although did not elicit a larger truth effect. Truth ratings for delusion-relevant statements were positively correlated with positive schizotypy, however, schizotypal traits did not predict larger truth ratings with repetition. It is suggested that statement emotionality, familiarity and word length may account for higher baseline ratings for delusion-relevant items.
differed along the secondary, but not the primary gradient. Within-network gradient dispersion in schizophrenia was lower in Dorsal Attention (pFDR < .001), Visual (pFDR = .003), Frontoparietal (pFDR = .018), and Limbic (pFDR = .020) networks, while between-network dispersion was lower between the Visual network and other networks (pFDR < .001). HCP-EP revealed no gradient differences between psychosis patients and controls. These findings indicate hierarchical differences in schizophrenia occur along the visual-sensorimotor axis, rather than the classical sensory-fugal axis. The absence of differences in early psychosis suggests visual-sensorimotor abnormalities only emerge as the illness progresses.

Chelsea Marsh*, PhD Candidate, School of Applied Psychology, Gold Coast campus
Sharon Scraffon, School of Applied Psychology, Gold Coast campus

Current understanding of the fundamental mechanisms and strategies underpinning visual search primarily stem from lab-based settings using simple screen-based displays (e.g., arrays of characters or photographs of real-world scenes). It remains unclear whether the same search strategies extend to real-world search. This study examined visual search in a real-world environment under two constraints typically experienced in the real-world (time pressure and novel versus familiar environments) to examine visual search strategy and target detection. In terms of performance (finding the target), familiarity with the environment seemed to facilitate search, with targets found more often in the familiar environment without time pressure. Correspondingly, significantly more re-inspections of previously viewed locations occurred in novel environment search, however, this was most pronounced for the time-pressure search. When the environment was novel and time pressure was imposed, a global search strategy preceded local search strategy, perhaps reflecting the need to quickly encode the layout of the environment before focussing search in one particular area. The results indicate that visual search strategies dynamically respond to the demands and constraints of the environment and that being familiar with an environment facilitates search. These factors are not commonly explored in scene-based research but are common in everyday search.

11. Interaction and embodiment in virtual reality
Ken McAnally, University of Queensland
Guy Wallis, University of Queensland

Current virtual reality (VR) systems are limited in their ability to present tactile and proprioceptive cues normally present when interacting with the world. We investigated whether veridical tactile and proprioceptive cues lead to more efficient interaction with a virtual environment. Interaction in the world results in spatial and temporal correlation of tactile, proprioceptive and visual cues. When cues in VR are similarly correlated, observers experience a sense of embodiment and agency of their avatars. We investigated whether sensorimotor performance was mediated by embodiment of the avatar hands. Participants performed a Fitts’ tapping task on a touchscreen and in VR with abstract tactile cues or veridical tactile and proprioceptive cues to touch. Movement efficiency and embodiment were higher for the veridical cues than for the abstract and no-haptics conditions. However, components of embodiment (perceived agency and ownership) did not predict unique variance in efficiency. Improved sensorimotor performance and ratings of presence and realism support the use of veridical haptic cues in VR environments where objects are in known and stable locations, regardless of whether performance was mediated by the sense of embodiment.

12. It’s all right: target detection in space
Tess Barich*, Flinders University - PhD Student

Novel target detection plays an important role in our everyday lives and influences our attentional resources and behaviour. As part of a larger ongoing project in threat detection lateralization, we investigated the effects of controlling visual field presentation on novel target detection through gaze-contingent paradigms. In both experiments, participants attended to a fixation cross in the middle of a display window. If participants fixated outside the tolerated area for more than 150ms, all stimuli would disappear. The display window contained animated neutral target and distractor stimuli (triangles and squares) that moved across the display in a randomised direction.
Participants clicked on detected targets as quickly and accurately as possible. Contrary to our predictions, both experiments’ data demonstrate that reaction time and error rate were lower for targets that appeared in the right than the left visual field. These results indicate the possibility of a right visual field advantage for the detection of animated novel stimuli. Both experiments serve as the baselines for comparison to future threat stimuli studies. Future threat studies will then explore whether conditioned threat categories follow the typical left visual field lateralisation pattern for spatial attention.

13. Shining the spotlight on personality: Is there a relationship between the distribution of attention and the big five?
Rebecca Lawrence, Griffith University
Karlien Paas, Griffith University
Lisa Jefferies, Griffith University

The distribution of visual attention can be narrowed or broadened. Recent work suggests that personality is associated with visual attention. Specifically, using a cueing task to map attention, higher levels of openness were related to a broad attention distribution (Wilson et al., 2016). Here, we aimed to conceptually replicate this finding by measuring the Big Five personality traits as well as the distribution of attention using an alternate measure: a flanker task. Preliminary analyses suggest that personality may be related to performance on the flanker task, but in an unexpected way. Specifically, higher levels of openness appear to be associated with smaller flanker effects and narrowly focused attention. It is therefore possible that the relationship between personality and the distribution of attention is task specific. This preliminary finding reinforces the importance of carefully considering when (and how) individual and environmental factors interact to shape attention in each situation. This research was funded in part by an ARC Discovery Grant to LNJ.

14. Losses disguised as wins in electronic gambling machines
Dan Myles*, PhD student, Monash University

“Pokies” or Electronic Gambling Machines (EGMs) are associated with an accelerated onset of gambling related harm. This has been partially attributed to salient design features that take advantage of fundamental learning processes or misperceptions about probability to encourage extended or repetitive use of EGMs (Yücel et al., 2018). “Losses disguised as wins” (LDWs) (Dixon et al., 2010), are a pernicious example that occurs when a bet across multiple lines results in a combination of wins and losses that returns less than an initial wager. This net negative return is then accompanied by the same reinforcing stimuli as genuine wins. LDWs have been associated with an overestimation of win-frequency, and autonomic arousal (electrodermal activity) similar to that associated with small wins (Barton et al., 2017). My poster will present some online data that concern on this design feature, and replicate prior findings that suggest that when exposed to LDWs, participants appear to over-estimate the genuine win rate. My results replicate this aggregate effect but appear to demonstrate a striking bimodal pattern in responding. I have fit an exploratory model to these data which I hope to present for discussion with attendees at ABPS 2022.

15. EEG signatures of decision formation in motion direction estimation.
Elaine Corbett, Trinity College Dublin
Philip Smith, University of Melbourne
Harvey McConne, Trinity College Dublin
Simon Kelly, University College Dublin
Redmond O’Connell, Trinity College Dublin

In perceptual decisions with continuous outcomes, response variability is often influenced by categorical biases as well as attentional fluctuations. Here we investigated whether directional biases and trial-to-trial variability in accuracy were reflected in EEG signatures of decision formation in a random-dot-kinematogram direction estimation task spanning the full 360°. We measured the centroparietal positivity (CPP), associated with evidence accumulation, and a steady-state visual motion evoked potential (SSVMEP) reflecting the strength of sensory evidence encoding. In six participants, both signals were strongly modulated by coherence and were significant predictors of response accuracy. We fit response angles and times with the circular diffusion model, accounting for individuals’ idiosyncratic directional biases through biases in the drift rate, defined as a vector sum of the true and participant-favoured stimulus directions.
The model-estimated drift rate was a significant predictor of the CPP, but not the SSVMEP, suggesting that while directional biases may be reflected in neural processes of evidence accumulation, the modulation of the sensory-level signal reflects trial-to-trial influences on response accuracy unrelated to directional biases. This study was funded by the European Union’s Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 842143 and the European Research Council Consolidator Grant IndDecision - 865474.

16. A Cognitive Modelling Approach to Understanding the Nature of Task-Switching

Nathan Tran, Functional Neuroimaging Laboratory, School of Psychological Sciences, University of Newcastle, Australia
Guy Hawkins, Newcastle Cognition Lab, School of Psychological Sciences, University of Newcastle
Montana Hunter, Functional Neuroimaging Laboratory, School of Psychological Sciences, University of Newcastle, Australia
Ashleigh Smith, Alliance for Research in Exercise, Nutrition and Activity (ARENA), University of South Australia
Mark Steyvers, Department of Cognitive Sciences, University of California, Irvine
Frini Karayiannis, Functional Neuroimaging Laboratory, School of Psychological Sciences, University of Newcastle, Australia

The cued task-switching paradigm is often used to measure individual variability in cognitive control and detect changes associated with neuropathological changes in ageing or clinical groups. However, the key behavioural measures of task-switching (switch and mixing cost) are not sufficiently sensitive to capture individual differences in cognitive processes postulated to underlie task switching performance. Previous attempts at applying cognitive models of decision-making to task-switching data have failed to account for task-switching specific processes (e.g., task preparation, cueing effects). We aim to develop a cognitive model of task-switching that characterises the cognitive processes that enable switching between tasks or repeating the same task under high load conditions, while also accounting for decision-related processes. We will use task-switching data from 181 participants aged 60-70yrs to identify the key behavioural trends the model must explain. Model development will begin with an evidence-accumulation architecture (Steyvers et al., 2019), which accounts for dynamics of task activation, and will be extended to incorporate cognitive processes in the cue-target-interval. The model will be applied to other data sets to determine its ability to characterise individual variability in cognitive control ability. This is an important first step towards a measure for earlier detection of cognitive decline.

17. Children allocate reminders in proportion to cognitive load

Lily Dicken*, PhD student at the University of Queensland
Thomas Suddendorf, University of Queensland
Adam Bulley, University of Sydney and Harvard University
Muireann Irish, University of Sydney
Jonathan Redshaw, University of Queensland

The current study examined how children choose to distribute a limited number of external reminders to assist their performance in easy and difficult memory tasks. Across three experimental phases, children aged 6 to 9 years (N = 120) were tasked with remembering the hiding locations of 1, 3, 5 and 7 targets under an array of 25 cups. In Phase 1, children had to rely on internal cognitive processing alone to encode and recall the target cups. In Phase 2, children were instructed to use physical tokens as reminders, by placing them on every target cup. Critically, in Phase 3, children were provided with a limited number of tokens and advised to distribute them among the upcoming four trials. Results showed that 8- to 9-year-old children allocated proportionately more tokens to more difficult trials, whereas 6- to 7-year-old children did not. When given the opportunity to revise their token allocation, however, many younger children and children who performed poorly in Phase 3 adjusted the allocation in line with task demands. These findings show how children begin to rationally allocate external resources to maximise cognitive task performance.

18. Post-trial responsibility in trials of invasive neural devices

Nathan Higgins, Monash University
The growth of the commercial neurotechnology industry has seen a rapid increase in the number of trials of invasive neural devices. Owing to the invasiveness of these procedures, participants must demonstrate resistance to all available therapies and a capacity to meet the onerous demands of the trial. However, there is a paucity of empirical data on whether participants receive appropriate access to post-trial care and device maintenance. Case studies of past participants suggest that continued access is not guaranteed, often depending on the overall success of the trial, the financial standing of the sponsor, the commercial availability of the device, and the willingness of insurance companies to provide coverage. Principal investigators have reported a lack of institutional guidance, with the process of ensuring post-trial care being described by one eminent neurologist as “playing a game of chess many moves ahead”. In an endeavour to elucidate the current landscape of post-trial arrangements, and to better understand the financial and logistical challenges, we distributed a survey to \( n = 444 \) trial professionals from recent clinical trials of brain implants identified by a systematic search of the WHO clinical trial registry and the PUBMED publication database. Findings will identify common practices within the field.

19. How do children view the world? The temporal dynamics of visual perception in preschool age children

Sophia Shatek*, The University of Sydney (PhD Student)
Genevieve Quek, Western Sydney University
Selene Petit, MRC Cognition and Brain Sciences Unit, School of Clinical Medicine, University of Cambridge
Thomas Carlson, The University of Sydney

The human brain can process objects, from individual images to abstract concepts, in fractions of a second. Most of our understanding of neural object recognition comes from studies in adults, but children interact differently with the world. For example, preschool children are more likely to attribute aspects of animate things, like thinking and feeling, to non-living things like toys. Despite these differences, we know very little about how the developing brain encodes objects. The current study investigates how objects are represented in the developing brain by examining electroencephalography (EEG) recordings in children aged four to five-and-a-half years old. Children were shown rapid streams of images depicting objects. These stimuli included ordinary objects, such as tools, animals, and plants, but also more ambiguous categories such as robots and animal-shaped toys. We used multivariate pattern analysis to examine the time course of categorical representations like animacy, as well as dimensions such as ‘humanness’. Our findings suggest that object representations in preschool-aged children are similar to adults, but with some delay in processing of higher-order categories and dimensions. Additionally, we demonstrate that rapid serial visual presentation (RSVP) is effective in optimising neuroimaging data collection in young children and populations with limited attention spans.

20. Repetition suppression of perceptually novel objects is reduced in perceptually curious individuals

Patrick S. Cooper, Turner Institute for Brain and Mental Health, Monash University
Emily Colton, Turner Institute for Brain and Mental Health, Monash University
Stefan Bode, School of Psychology, University of Melbourne
Trevor T-J. Chong, Turner Institute for Brain and Mental Health, Monash University

Perceptual curiosity reflects the desire to seek out novel sensory stimulation. Despite its relevance to human goal-directed behaviour, it has received little attention in cognitive neuroscience, and its neural mechanisms remain unclear. Here, we asked whether the intrinsic motivation to view novel stimuli is related to the neural mechanisms that support the perceptual processing of those stimuli. In an EEG-based task, participants first decided how much effort they were willing to invest to view a novel vs familiar object. We then measured the perceptual processing of their chosen stimulus using an EEG measure of repetition suppression. Our data revealed three main findings. First, the magnitude of repetition suppression was attenuated for novel vs familiar objects. Second, the degree of this attenuation was greater in individuals who were more willing to invest greater amounts of effort to view novel vs familiar stimuli (i.e., were more perceptually curious). Finally, our EEG measures of repetition suppression were correlated with self-report trait measures of day-to-day,
perceptual curiosity. Together, these data demonstrate how the subjective experience of curiosity is linked to the neurophysiological encoding of perceptually novel stimuli, and provides a basis for explaining how curiosity drives behaviour.

21. That’s not a knife: using synthetic images to drive object responses in the human brain

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Genevieve Quek, The MARCS Institute for Brain, Behaviour and Development, Western Sydney University, NSW, Australia
Jessica Chin, The MARCS Institute for Brain, Behaviour and Development, Western Sydney University, NSW, Australia
Deena Sharabas, The MARCS Institute for Brain, Behaviour and Development, Western Sydney University, NSW, Australia
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The human brain effortlessly categorises objects at different levels of abstraction. An important question for our understanding of visual processing is to what extent this categorisation capacity is underpinned or driven by mid-level visual features (e.g., shapes and texture) that co-vary across different categories (e.g., animals or vehicles). Here we addressed this by training two independent Generative Adversarial Networks to generate two categories of novel synthetic stimuli that match the low- and mid-level visual features of either animate or inanimate real objects. Crucially, where these synthetic stimuli have the low- and mid-level visual properties of real objects, they have no associated high-level category labels. We recorded electro-encephalography responses to the synthetic stimuli along with their real counterparts in a naïve participant sample. Results revealed animacy-like neural signatures for the synthetic objects that emerged earlier than neural signatures distinguishing the same stimuli from images of real objects. The temporal dynamics of our results suggest that successful animacy categorisation of our novel synthetic images was driven by their mid-level visual features. These results contribute to a precise picture of how image statistics support successful object recognition.

22. The contribution of ensemble representations to natural object and material recognition

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Thomas S. A. Wallis, Technical University of Darmstadt, Institute of Psychology and Centre for Cognitive Science
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William J. Harrison, Queensland Brain Institute & School of Psychology, The University of Queensland

Humans can quickly make sense of complex visual information. Several recent studies suggest that observers form ensemble representations when encoding complex displays by aggregating low-order statistical information (e.g., mean, variance) across individual features. Such ensemble representations may help to understand how the visual system can encode large volumes of data efficiently. It is unclear, however, whether ensemble representations serve a function in less artificial stimuli. The aim of this study, therefore, was to test if ensemble representations may support natural image recognition. In Experiment 1, we measured observers’ accuracy at recognising targets that were constructed by decomposing images of natural objects into small edge-like features. We manipulated these features across conditions so that they retained either the lower-order or higher-order statistical structure of the original image. Observers were unable to recognise objects using lower-order structure alone, whereas a simple model that has access to only this information performs above chance. In Experiment 2, we compared recognition of objects versus materials (or textures), but again found that observers were unable to recognise images based solely on lower-order information. Our data provide important boundary conditions to the claim that ensemble representations play an important and ubiquitous role in visual perception.
23. This is like that: Unique contributions of perceptual and conceptual attributes in the neural response to objects

Genevieve L. Quek, The MARCS Institute for Brain, Behaviour and Development, Western Sydney University, Australia
Olivia Gorton, School of Psychology, The University of Sydney, Australia
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Amanda Robinson, Queensland Brain Institute, The University of Queensland, Australia
Thomas Carlson, School of Psychology, The University of Sydney, Australia

The remarkable efficiency of human visual categorisation belies the complex nature of category definitions, which capture associations among both observable properties (e.g., surface, shape) and conceptual knowledge (e.g., functions, context). Here we examined how different category dimensions contribute to object processing by having online observers judge the similarity of 190 object categories (e.g., butter - knife) with respect to either appearance (not similar), real world context (similar), or concept (not similar). Separate observer groups judged similarity for either images of the object categories or their word labels, enabling us to disentangle how stored category knowledge and visual feature input interact during categorisation. These ratings gave rise to image-based and word-based (dis)similarity models of perceptual, contextual, and conceptual similarity, which we then compared to previously published EEG responses evoked by viewing images of the same 190 object categories. We found distinct timescales over which the different category dimensions could predict the neural response to objects: Where perceptual attributes dominated the early stages, conceptual associations did not arise until at least 170ms after stimulus onset. Notably, we found unique contributions of conceptual category information as derived from word vs. image judgements, a finding that underscores the multifaceted nature of real-world category definitions.

24. The dynamics of object coding within and across the hemispheres

Amanda K Robinson, Queensland Brain Institute, The University of Queensland

The human brain integrates information between the hemispheres to construct a coherent representation of the world. Characterising how visual information from the left and right visual fields is coded in each hemisphere can inform the nature of information transfer in the brain. Here, we investigated information processing within each hemisphere and the distinctiveness or redundancy across hemispheres. We presented participants (n = 20) with images of faces, words and objects in rapid sequences while neural responses were measured using electroencephalography (EEG). To drive distinct responses in each hemisphere, stimuli were presented either centrally or lateralised to the left and right visual fields. Participants performed an orthogonal colour change task on dots that marked possible image positions. Multivariate pattern analyses were applied to neural data to assess coding of object information in the brain, separately for electrode clusters over each hemisphere. As expected, stimulus information was more robust and emerged earlier in the contralateral than the ipsilateral hemisphere. Interestingly, the temporal dynamics within the two hemispheres followed different trajectories. Representational structure aligned across the hemispheres with delays approximating interhemispheric transmission time. These results provide insights into the dynamics of object perception and the competitive versus cooperative nature of hemispheric processing.

25. A detailed examination of pitch discrimination deficits associated with auditory verbal hallucinations in schizophrenia

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Susan L. Rossell, Centre for Mental Health, School of Health Sciences, Swinburne University of Technology; Department of Mental Health, St Vincent’s Hospital, Melbourne
Pitch discrimination is critical when processing auditory information. Individuals with schizophrenia spectrum disorder (SSD) and a history of auditory verbal hallucination (AVH) reportedly exhibit poor pitch discrimination relative to those with SSD but no AVH history. The present study continued this research with a large and well-characterised AVH sample, assessing behavioural responses to pitch discrimination in depth. Random-intercept linear mixed-modeling was used to overcome the ceiling effects consistently seen in pitch discrimination tasks. Pitch discrimination accuracy, sensitivity, reaction time (RT) and intra-individual RT variability (IIV) were examined in SSD individuals with (n=46) and without (n=31) an AVH history, alongside healthy controls (HC; n=131). Secondary analyses split the AVH group into state (i.e., actively experiencing AVH; n=32) and trait hallucinators (i.e., a history of, but not actively experiencing, AVH; n=16). Relative to HC, significantly poorer accuracy and sensitivity was detected in SSD individuals at 2% and 5% pitch deviants, and in hallucinators at 10%, with no differences between SSD groups. Neither RT or IIV revealed group differences. No state/trait differences were observed. A general SSD deficit drove findings, signifying the importance of statistical rigour in pitch discrimination tasks.

26. A meta-analytic test of emotion processing in Schizophrenia Spectrum Disorder (SSD): Specific deficit or difficulty confound?
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Dr Amy Dawel, Research School of Psychology, College of Health and Medicine, Australian National University
Dr Yiyun Shou, Research School of Psychology, College of Health and Medicine, Australian National University
Elizabeth J Miller, Research School of Psychology, College of Health and Medicine, Australian National University
Professor Bruce Christensen, Research School of Psychology, College of Health and Medicine, Australian National University

People with Schizophrenia Spectrum Disorder (SSD) have deficits in face processing. Although, it is unclear whether these deficits are specific to judging emotional expressions, or reflect a general face processing deficit (e.g., emotion, gender, identity). The literature provides conflicting evidence, which may be explained by the general cognitive deficit in SSD interacting with task difficulty and confounding results. Tasks that are too easy or difficult dilute the general cognitive deficit in SSD, which can be misinterpreted as preserved abilities. Here, we present a meta-analysis (n=103 studies) that assesses SSD-related performance across emotional and non-emotional face processing tasks. We consider: 1) the relative size of SSD-related deficits across tasks, and 2) whether the pattern of deficits can be explained by systematic differences in task difficulty. Results show SSD is associated with a greater deficit for emotional than non-emotional face processing tasks. Task difficulty did not differ significantly between task types, and did not explain SSD-related deficits across tasks. This is the first meta-analysis to statistically compare the relative size of emotional to non-emotional face processing deficits associated with SSD. We show SSD is associated with a specific, greater deficit in emotional face processing, which cannot be accounted for by task difficulty.

27. Cortico-cognition Coupling in Treatment Resistant Schizophrenia
Warda Syeda, Melbourne Neuropsychiatry Centre, The University of Melbourne (3 years post PhD)

Cassandra Wannan, Melbourne Neuropsychiatry Centre, The University of Melbourne
Center for Neuropsychiatric Schizophrenia Research and Center for Clinical Intervention and Neuropsychiatric Bjørn H. Edbrup, Schizophrenia Research, Mental Health Centre Glostrup, University of Copenhagen, Glostrup, Denmark
Christos Pantelis, Melbourne Neuropsychiatry Centre, The University of Melbourne

Brain structural alterations and cognitive dysfunction are predictors for poor clinical outcome in schizophrenia, and the associations between these domains remains unclear. We employed a novel, multiblock partial least squares correlation (MB-PLS-C) technique and investigated multivariate cortico-cognitive patterns in patients with treatment-resistant schizophrenia (TRS) and healthy controls (HC). Forty-one TRS patients (age 38.5 ±9.1, 30M), and 45 HC (age 40.2±10.6, 29M) underwent 3T structural MRI. Volumes of 68 brain regions and seven variables from CANTAB (memory and executive domains) were included.
Univariate group differences were assessed, followed by MB-PLS-C analyses to identify group-specific multivariate patterns of cortico-cognitive coupling. Supplementary three-group analyses including non-affected first-degree relatives (NAR) were also conducted. MB-PLS-C revealed two significant latent variables (LVs) explaining >90% of the sum-of-squares variance. LV1 (explained-variance: 78.86%) described a shared, widespread structure-cognitive pattern relevant to both TRS patients and HCs. LV2 (explained-variance: 13.47%) comprised a differential cortico-cognitive pattern including frontal and temporal lobes, and paired associates learning (PAL) and intra-extra dimensional set shifting (IDED). Three-group analyses identified two significant LVs, with NARs more closely resembling healthy controls than TRS patients. MB-PLS-C analyses identified multivariate brain structural-cognitive patterns in the latent space that may provide a TRS signature.

28. Investigating the diagnostic utility of quantitative speech assessment in schizophrenia spectrum disorders

Eric Tan, Swinburne University of Technology

Erica Neill, Swinburne University of Technology
Denny Meyer, Swinburne University of Technology
Susan Rossell, Swinburne University of Technology

Aberrant patterns of speech and word use are a recognized feature of schizophrenia. Traditionally assessed via clinical interviews, newer methods of quantitative speech assessment are increasingly being used. This study examined the utility of speech measures for classifying individuals with schizophrenia spectrum disorders (SZ). Speech recordings from 43 SZ (mean age=41.67) patients and 46 healthy controls (mean age=38.89) were transcribed to extract 6 types of quantitative speech variables: utterances, single words, speaking rate, turns, pauses and formulation errors. Schizophrenia symptoms were assessed using the PANSS. Gradient boosting and random forest machine learning algorithms were used to explore the diagnostic utility of quantitative speech variables, while Spearman’s correlations were used to examine the relationship with PANSS symptom domains. Twenty-one speech variables across five speech types (not including pauses) were identified as significant classifiers for a SZ diagnosis with 90-100% specificity and 80-90% sensitivity for both models. Selective relationships were also observed between these speech variables and positive, disorganization, and excitement symptoms. The findings support the potential diagnostic utility of speech disturbances in SZ. The potential of quantitative speech assessment as a future objective assessment tool for schizophrenia holds the promise of improved measurement accuracy, increased treatment efficacy and better patient outcomes.

29. Neurophysiological evidence of corollary discharge dysfunction in inner speech in schizophrenia

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Suzanne Ho-wai So, The Chinese University of Hong Kong
Thomas J Whitford, University of New South Wales (UNSW Sydney)

Background: Prominent neurocognitive models suggest that auditory verbal hallucinations (AVHs) in schizophrenia arise from failure of corollary discharge mechanisms to correctly suppress self-initiated inner speech. Using a novel electroencephalographic (EEG) paradigm, we tested this long-held notion in patients with schizophrenia. Methods: Hallucinating (n=52) and non-hallucinating (n=45) patients with schizophrenia, along with matched healthy controls (n=43), were asked to imagine a single phoneme while, precisely at the same time, to listen to the same (match) or a different auditory probe (mismatch)
through the headphones. A passive-listening condition was also presented. The amplitude of the auditory-evoked potential (AEP) component N1 was examined. Results: Healthy controls showed a smaller N1 amplitude in the match condition compared to the mismatch and passive conditions, replicating previous results of N1-suppression to inner speech. Critically, hallucinating patients showed a larger N1 amplitude in the match condition compared to the other conditions. Non-hallucinating patients showed a smaller N1 amplitude in the mismatch condition compared to the other conditions. Discussion: The results indicated that cortical suppression of inner speech in schizophrenia was disrupted. Intriguingly, the differential results in the patient groups suggest specificity of inner speech suppression deficits with AVHs. This study provides evidence in support of atypical inner speech monitoring in schizophrenia.

30. Making the case for brain vulnerability to delirium: a series of reviews on the neurophysiological, neuropsychological and clinical correlates

Hannah Keage, UniSA
Monique Boord, UniSA
Erica Ghezzi, UniSA

Delirium is a distressing condition associated with significant long-term decline in older adults. It affects 20-40% of older patients and costs over $8b/year. We will dovetail three recent reviews and meta-analyses focusing on those at high risk for incident delirium (vulnerability for delirium). They propose that (i) neuropsychological, neurophysiological and clinical factors discriminate those at high risk, and (ii), risk profiles are subtype dependent. In the first, we aimed to understand the neuropsychological profile of delirium vulnerability. Across 44 studies, poor performance in all cognitive domains except perception was significantly associated with incident delirium. Largest effects were seen for orientation and construction/motor performance. In the second, we aimed to assess how predisposing factors differed between delirium motor subtypes. Across 61 studies, factors such as sex and cerebrovascular disease discriminated between subtypes. In the third review, we aimed to summarise EEG correlates of delirium and identified 31 studies, which consistently related delirium to EEG slowing and reduced functional connectivity; however, only two of these studies assessed vulnerability to delirium (as compared to delirium per se or long-term effects). Findings can improve the stratification of delirium risk pre-operatively and extend current neurophysiological theories of delirium, especially in the context of delirium subtypes.

31. Attention and choice: Exploiting gaze dynamics can shift perceptual decision making and risky choice

Mike Le Pelley, UNSW Sydney
Ben Newell, UNSW Sydney

We have previously shown that, by exploiting the dynamics of people’s eye movements, it is possible to nudge perceptual decisions when there is no objective evidence on which to base choice, but not when there is clear pre-existing evidence in favour of one option (Newell & Le Pelley, 2018). This raises the possibility that manipulations of gaze may be restricted to inconsequential situations in which there is no other basis on which to make a decision, which would undermine - or at least limit - general-purpose models of decision making which propose a causal influence of attention on evidence accumulation (e.g. Krajbich & Rangel, 2011). In the current study we probed this issue by investigating whether manipulations of gaze can be used to influence consequential choices that are based on meaningful evidence, in the context of risky choice. Consistent with models suggesting a causal influence of attention on choice, across two experiments we demonstrate a significant effect of the gaze-dependent timing of a response prompt on risk preference.

32. Both negative and positive task-irrelevant stimuli contract attentional breadth in individuals with high levels of negative affect

Stephanie C. Goodhew, The Australian National University
Mark Edwards, The Australian National University

Emotionally-salient stimuli can capture attention to their spatial location, even when they are not relevant to a
prescribed task. Here we tested whether they can influence the spatial breadth of attention. Experiment 1 tested whether small task-irrelevant emotionally-salient stimuli contracted attentional breadth when the task required a broad focus, while Experiment 2 tested whether large task-irrelevant emotionally-salient stimuli expanded attentional breadth when the task required a narrow focus. Both experiments compared the effect of negative and positive emotionally-salient images against neutral, and examined the role of participants’ self-reported experiences of negative affect. Both experiments revealed slower responses following large emotionally-salient images, an effect unrelated to attentional breadth. Experiment 1 demonstrated an interaction between accuracy and negative affect, such that individuals with high levels of negative affect were less accurate at identifying global targets following both negative and positive small images, but not following neutral small images. This suggests that these small task-irrelevant emotionally-salient images contracted attentional breadth. Experiment 2 suggested that large task-irrelevant emotionally-salient images did not expand attentional breadth. We discuss how these results cannot be explained by existing models of emotion-based effects on attention and cognition, and the important implications they have for the practicalities of model-testing.

33. Exploring the Relationship Between Gaze and Covert Attention in Social and Non-Social Contexts

Samantha Parker, School of Psychological Sciences, Macquarie University (Postdoctoral Fellow)

Richard Ramsey, School of Psychological Sciences, Macquarie University

Gaze plays dual perceptual and social roles in everyday life. Eye movements allow us to select information in the visual environment, whilst simultaneously communicating to others where we are attending. There are many social situations, however, where it is not adaptive to reveal to others the focus of our attention, such as when monitoring an aggressor or playing sport. In these circumstances covert attention is thought to play an essential role. Despite this assumption, few studies have explored the relationship between gaze and covert shifts in attention within social contexts. In the present study we combined a saccadic dual-task with a gaze-cueing paradigm for the first time. Across four experiments the preparation and fixation of eye movements were manipulated. At the same time, a gaze or arrow cue directed covert attention to an orthogonal location. Computational modelling was then used to compare the contribution of each type of orienting to a perceptual decision. Our results suggest that relative to both gaze and arrow cues preparing an eye movement has a larger influence on perception. These findings speak not only to whether gaze and covert shifts in social attention are dissociable, but also shed light on the mechanisms that underlie attention.

34. The Multiple Object Monitoring (MOM) task: a new method for measuring sustained and vigilant attention.

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Hamid Karimi-Rouzbahani, Medical Research Council Cognition and Brain Sciences Unit, University of Cambridge, UK

Jeremy Wolfe, Visual Attention Lab, Brigham & Women’s Hospital/ Harvard Medical School, USA

William S. Helton, Department of Psychology, George Mason University, USA

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Many real-world situations require sustained attention over time with only infrequent responses (e.g., train and aircraft network control, semi-automated vehicles). When targets are rare, however, people tend to be slow to respond or miss them entirely. We developed the Multiple Object Monitoring (MOM) task to provide a measure of sustained attention in a dynamic environment that can distinguish time-on-task effects from target frequency effects. The MOM task involves multiple dots that move towards a central object, with automatic correction away from a collision on a variable proportion of trials. In the active condition, participants manually deflect 50% of dots. Under these conditions, participants are good at sustaining attention, with performance typically staying consistent over periods of up to 30 minutes. In the monitoring condition, participants only manually deflect a small proportion of dots (~6% in our original study, 9% in
replications). Under these conditions, performance drops sharply over time-on-task, with both a decrease in hits (increase in miss rates) and a slowing of response times for correctly detected targets. The MOM task therefore provides a reliable index of vigilance decrements in dynamic displays, dissociated from general sustained attention effects. Funding: Australian Research Council DP170101780 & DP220101067.

35. The mechanisms of inhibition of distractor features in visual search
Zachary Hamblin-Frohman, University of Queensland (PostDoc)
Stefanie I. Becker, University of Queensland (A/P)

Attention can be automatically attracted to salient items. Yet sometimes it is possible to avoid distraction by a salient item (with a known feature), leading to facilitated search. The current studies unpack several aspects of facilitatory attentional guidance from distractor features. In Study 1, early attentional guidance (measured via eye-movements) was driven towards repeated target colours and away from distractor colours. Importantly, in rare probe trials, target and distractor colours were presented amongst colours unseen in the search trials. In this scenario attention was biased towards the target-colour value and away from the distractor-colour. This reveals distractor inhibition was reacting to feature values, and not salience. Study 2 examined whether inhibitory processes relied upon visual working memory (VWM) resources to guide attention. In Experiment 1 early attention was biased away from distractor values under low and high VWM loads, however to a weaker extent than no load. Experiment 2 probed both target and distractor colours individually under load in rare search trials. Results revealed that under load, attention continued to be biased away from the distractor colour, however the guidance towards the target colour was reduced. This suggested that suppression of the distractor-feature was unrelated to VWM load.

36. Two Target Templates for Attentional Guidance and Decision-Making: Relational and Optimal
Stefanie Becker, The University of Queensland
Zachary Hamblin-Frohman, The University of Queensland

The target template is often described as the mental representation that drives attentional selection, for instance, in visual search. However, this template is not necessarily a veridical representation. According to Optimal Tuning, the attentional template shifts to an exaggerated target value to maximise the signal-to-noise ratio. By contrast, the Relational Account states that attention is tuned to the relative target feature that specifies how the target differs from the other items in the context (e.g. the reddest item). Both theories are empirically supported, but used different paradigms and measures (accuracy in perceptual decision tasks vs. gaze behaviour in visual search). Here, we provide a critical test of these accounts by combining the two approaches. The results revealed Optimal Tuning shifts in probe trial accuracy, but this did not drive early attention or gaze behaviour in visual search. Instead, attentional guidance followed the Relational Account, selecting all items with the relative target colour (e.g., redder). Moreover, we found that the shift to an exaggerated target colour may be due to a simultaneous contrast effect, which makes the target appear in a more extreme colour, indicating that optimal tuning shifts may be a perceptual artefact rather than a strategic adaptation.

37. tDCS augments decision-making efficiency in an intensity dependent manner: a training study
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Timothy Ballard, The University of Queensland
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Jason Mattingley, The University of Queensland
Paul Dux, The University of Queensland
Hannah Filmer, The University of Queensland

Transcranial direct current stimulation (tDCS) applied to the prefrontal cortex can improve training performance and generalise/transfer to untrained tasks/processes. To date, we have shown that stimulation intensity has non-linear effects on augmenting cognitive training outcomes. However, it is currently unclear how such stimulation intensity manipulations augment cognitive processing to impact training and transfer effects. Here, we applied decision-making modelling, via the linear ballistic
accumulator framework, to understand what aspects of cognitive processing, underlying speeded single-/dual-task decision-making performance, are impacted with tDCS intensity. One hundred and twenty-three participants - split over 4 groups: sham, 0.7 mA, 1.0 mA and 2.0 mA - completed four training sessions whilst tDCS was delivered. The latent decision components (predominantly drift rates) showed an ‘inverted u-shaped’ function of stimulation intensity and cognitive performance for the trained-on task, where no stimulation or too much stimulation were both sub-optimal for performance. By contrast, 1.0 mA and 2.0 mA benefited an untrained (transfer) single task (again shown in drift rates). In sum, tDCS intensity non-linearly modulates cognitive processes related to decision-making performance.

38. Neural processes and consequences of generating novel concepts from known objects in the human brain

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Humans can combine existing concepts in completely novel ways (e.g., a newly discovered ‘lemon flamingo’ might be a yellow flamingo or a flamingo that consumes lemons). The organization of the human conceptual system leads some combinations to be ambiguous, while others are unambiguous. In a recent functional magnetic resonance imaging (fMRI) investigation, we have examined the neural consequences of combining concepts by comparing associated activity patterns before and after successful combination. We have shown that combining existing concepts draws on a network of semantic memory regions, with observable changes in the visual system afterward. Certain regions of the semantic network, such as left parahippocampal gyrus, have activity patterns that distinguish properties of combinations. In a separate behavioral investigation, we have examined how performance variation across cognitive processes - semantic processing, cognitive control, divergent and convergent creative thinking, visualization - can predict combination success in younger and older adults. We find that greater cognitive control predicts superior ease of combining in both younger and older adults, while visualization and semantic computation abilities predict combination-ease only in older adults. This suggests that age-related reductions in the organization of semantic memory may impair creative semantic processing, with downstream effects on the brain’s semantic network.

39. Neural correlates of decision evidence accumulation when making judgments across continuous dimensions

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Paul Garrett, The University of Melbourne

Stefan Bode, The University of Melbourne

Philip Smith, The University of Melbourne

The process by which we transform sensation into action is known as perceptual decision-making. This capacity has been predominantly investigated using discrete choice tasks, in which observers choose between multiple, distinct options. We can also make judgments along continuous dimensions, such as determining the exact colour of a paint swatch or the movement direction of a ball. However, the processes underlying these types of decisions are not well-understood. We recently developed a Circular Diffusion model that accounts for joint distributions of accuracy and response times in continuous report tasks, using analogous parameters to the discrete choice Diffusion model. In the current study we mapped the event-related potential (ERP) correlates of decision evidence accumulation as specified in this model. Participants viewed a briefly-presented colour patch and reported the colour of that patch on a colour wheel using a ballistic mouse movement. We identified an ERP component over parietal channels, and rhythmic EEG activity over motor cortex, that closely resembled evidence accumulation trajectories in the Circular Diffusion model. Our findings establish clear neural correlates of evidence accumulation in continuous report tasks, and pave the way for joint modelling of behavioural and neural data for this broad class of decisions.

40. Effects of beta- and gamma-band rhythmic stimulation on response inhibition

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Voluntary movements are accompanied by an increase in gamma-band oscillatory activity (60-100Hz) and a strong desynchronization of beta-band activity (13-30Hz) in the motor system. Conversely, successful motor inhibition is associated with increased beta power in a fronto-basal-ganglia network. To investigate whether beta oscillations are causally related to response inhibition we designed an experiment involving a stop-signal task with concurrent transcranial alternating current stimulation (tACS) and electroencephalography (EEG). Over two sessions either beta (20Hz) or gamma (70Hz) stimulation was applied on 40% of trials. We found that 20Hz stimulation targeted at the pre-supplementary motor area enhanced inhibition and increased beta oscillatory power around the time of the stop-signal. The increase in inhibition on stop trials followed a dose-response relationship with the strength of the individually simulated electric field. Computational modelling using the race against diffusion model revealed that 20Hz and 70Hz stimulation had opposite effects on the braking process. The results of this study highlight that the effects of tACS are state-dependent, and demonstrate that fronto-central beta activity is causally related to successful motor inhibition, supporting its use as a functional biomarker.

42. Perceptual decision making relies on reducing uncertainty about neural sensory representations

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Fast and accurate decisions are necessary for many adaptive behaviours. Evidence accumulation models postulate that decisions unfold gradually as evidence for different choices accumulates into an abstract decision variable. Here we modelled the content of the decision variable by manipulating uncertainty about the properties of sensory input in a speeded motion discrimination task. A group of human observers (N=36) performed the task while their brain activity was recorded using electroencephalography. Behavioural data were modelled using a drift-diffusion model, which is agnostic about the content of the decision variable and a more recent Bayesian attractor model which postulates that the decision variable accumulates uncertainty about sensory representations. The Bayesian attractor model predicted the observed data better than the drift-diffusion model, supporting the notion that the decision variable represents sensory uncertainty in simple perceptual tasks. Using multivariate analyses of observers’ brain activity, neural
uncertainty was estimated as time-resolved motion tuning to the presented motion stimuli. Using this estimated neural uncertainty instead of simulated uncertainty, a restricted Bayesian attractor model was fitted to the behavioural data. This model predicted the observed data as well as the unrestricted version, suggesting that perceptual decision making relies on reduction of uncertainty about neural sensory representations.

43. A systematic review of task switching in healthy older adults

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Task switching is the ability to perform multiple tasks simultaneously. Due to the crucial role of task switching, which allows older adults to maintain complexity in their daily life, it is important to understand this executive function in older adults. There were two key questions in this systematic literature review: How do the different manipulations used in task-switching experimental paradigms affect performance in healthy older adults? What other factors (lifestyle, bilingualism) are associated with task-switching performance? The search was conducted in three databases (Scopus, Ovid, Web of Science), and 1385 results were found with 63 journal articles selected for final review; all of which included experiments based on a task-switching paradigm with healthy older adults aged 59-to-90 years. The findings indicated that from 1997 to 2021 there was an increase in complexity within paradigms, and a large number of new paradigm manipulations were introduced. Task-type, task-environment, switch-rules, preparation-time and measurement-used led to different outcomes for healthy older participants. We provide an overview of the effects of paradigm manipulations (and other factors), with support from effect size analyses. We also discuss the implications for future paradigm design in better understanding the role of task switching in late-life functioning.

44. Examining the Relationship Between Media Multitasking Behaviour and Inhibition Performance in a Parametric Go/No-Go Task

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The use of multiple media forms simultaneously or rapidly switching between media is known as media multitasking (MMT). Due to the multiple cognitive demands of MMT, studies have examined the link between MMT and Executive Functions (EFs). This study extended previous research by employing a variant of the Parametric Go/No-Go Task (PGNG) to assess processing speed, attentional control, set-shifting and inhibitory control in relation to MMT behaviour. Participants completed a measure of cognitive capacity (Cognitive Reflection Test; Fredrick, 2005), impulsivity (Patton et al., 1995), the Media Multitasking Inventory (MMI: Ophir et al., 2009) and the PGNG (Langenecker et al., 2007). After controlling for gender, age, impulsivity, and cognitive capacity, MMI scores were not associated with processing speed, set-shifting or attentional maintenance outcomes from the PGNG task. There was no relationship between MMI scores and inhibitory control performance in the two-target load conditions. For the three-target load conditions of the PGNG task, MMI scores predicted poorer accuracy in the context and stop-signal conditions, indicating poorer inhibitory control under higher cognitive load. Thus, there is variability in the association between EFs and MMT that is dependent upon cognitive load within the task.

45. Comparing the Spatiotemporal Dynamics of Attention in Adults with Different Types of Dyslexia

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The nature of the visual attention deficit in Dyslexia is strongly debated. The present research compared the spatiotemporal dynamics of focused attention in two groups of adults with Dyslexia, one with word identification accuracy in the low-average range (accuracy-
remediated), and one with persistently-poor word identification accuracy. In a series of experiments, we used tasks that required the identification of transient letters in the left and right visual fields to assess the distribution of attention. Normally-reading Controls and Accuracy-Remediated Poor Readers showed a broad attentional focus that was first allocated to the left visual field, before shifting to the right visual field. In contrast, Persistently-Poor Readers showed a narrow attentional focus that was first allocated to the right visual field before shifting to the left visual field. When presented with a spatial cue to facilitate the deployment of attention, the Persistently-Poor Readers shifted attention from the left to the right visual field, like the other reader groups, but only at central and not peripheral locations, suggesting that their breadth of attention is inherently narrower. These results suggest atypical spatiotemporal dynamics of visual attention could be one neural characteristic associated with the difficulties found in persistently-poor but not accuracy-remediated adults with Dyslexia.

46. Sleep’s influence on novel word learning through context in healthy young adults

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Research indicates that sleep may facilitate certain forms of novel word learning in healthy adults, however the effect of sleep on new word learning through reading context is unknown. In this between-group randomised study, 74 healthy young adults participated in two testing sessions, with overnight sleep (sleep group) or daytime wakefulness (wake group) occurring between the sessions. At the initial session participants learned the meanings of novel words embedded within sentence contexts and were tested on their recognition of the novel word meanings at both sessions. Additional measures were employed to account for participant alertness, working memory, attention, chronotype, sleep quality, and total sleep time as estimated with actigraphy. Novel word recognition accuracy and reaction time data were analysed using repeated-measures ANOVA. Analyses revealed that the recognition of novel word meanings was comparable for the sleep and wake groups at both the initial and delayed session. Overall, the results suggest that sleep does not facilitate the recognition of novel word meanings acquired through semantic context, indicating that some forms of word learning may not benefit from sleep for consolidation.
47. Videos, Deepfakes, and Dynamic Morphs: Perceptual Differences for Real and Artificial Faces.

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Dynamic facial expressions can be created by morphing neutral and expressive photographs together. Linear Morphs are popular in neuroscientific research, as they offer increased experimental control compared to video recordings. However, emerging research suggests such artificial motion may not capture the complicated temporal dynamics of facial motion. The deepfake uses deep learning algorithms to transpose different facial identities onto a destination face, blending the temporal dynamics of both. This new technology poses a potential solution to balancing experimenter control with ecological validity. Across two online studies, we compared perceptions of strength and genuineness to emotional expressions exhibited in static photographs, video recordings, linear, morphs, and deepfakes. Results from our first study revealed that morphed expressions of emotion (happiness, anger, fear, and sadness) were perceived as less strong compared to video recordings and static facial expressions. The same pattern was observed for genuineness ratings for happy expressions. Our second study hypothesises that while strength and genuineness ratings differ between video recordings and morphs, videos and deepfakes will be perceived similarly. Deepfakes may offer researchers realistic dynamic stimuli that can be manipulated to suit specific experiments.

48. Human behavioural and neural responses to computer-generated versus human faces: A meta-analysis

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Computer-generated (CG) faces are rapidly infiltrating our social world (e.g., social companionship, e-therapy, virtual influencers such as Lil Miquela: instagram.com/lilmiquela). Yet evidence about whether behavioural and neural responses differ for CG compared to human faces is mixed. We present evidence of an emerging trend in empirical face research: increasing use of CG faces to investigate questions about human face processing. This trend is concerning because research findings sometimes differ when CG rather than human faces are used as stimuli. To understand how people’s responses to CG and human faces differ, we conducted a meta-analysis across several key face processing domains. Results highlight important differences in responses to CG relative to human faces (e.g., poorer face memory and reduced emotion perception). However, first impressions (e.g., trustworthiness, attractiveness) were as favourable for CG faces as they were for human ones. We also found a lack of studies investigating whether CG faces elicit hallmark face effects such as inversion and the N170 ERP. These findings imply CG faces may be appropriate in some settings (e.g., “employed” for sponsored Instagram advertising). However, our findings do not support the replacement of human stimuli with CG faces in face research.
49. Looking at faces in the wild
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Faces are key to everyday social interactions, but our understanding of social attention is based on experiments that present images of faces on computer screens. Advances in wearable eye-tracking devices now enable studies in more natural settings, but this approach has been limited by manual coding of fixations in natural scenes. Here we introduce an automatic ‘dynamic region of interest’ (dROI) approach that registers eye-fixations to bodies and faces seen while a participant moves through the environment. We show that just 14% of fixations are to faces of passersby. This is in marked contrast to earlier screen-based studies, which suggested that faces automatically capture attention. We also report reliable individual differences in participants’ social attention measured by fixations to passersby and eye contact during social interaction. Our findings shed new light on social attention ‘in the wild’ and introduce a novel method that allows more natural studies of social attention.

50. Quantifying dynamic facial expressions under naturalistic conditions
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Facial affect is expressed dynamically - a giggle, grimace, or agitated frown. However, the characterization of human affect has relied almost exclusively on static images. This approach is unable to capture the nuances of human communication or support assessment of affective disorders. Using the latest in machine vision and systems modelling, we study dynamic facial expressions of people viewing emotionally salient film clips. We find that the apparent complexity of dynamic facial expressions can be captured by a small number of simple spatiotemporal “atoms” - composites of independent facial actions, each expressed with a unique spectral fingerprint. We then apply the method to a melancholic depression dataset. Sequential expression of these states is common across individuals viewing the same film stimuli but varies in those with melancholic depression. Depressed participants had ambiguous facial expressions and anomalous patterns of switching between affective states. This approach provides a platform for translational research, capturing dynamic facial expressions under naturalistic conditions and enabling new quantitative tools for the study of melancholic depression and other psychiatric disorders.

51. The eye, hand and brain behind visuomotor inhibition: Differences between individuals and trials
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Inhibition of reaching and grasping actions as an element of cognitive control and executive function is a contentious area in human neuroscience. Little is understood of the specific temporal aspects of such behaviours. Using highly sensitive measures of kinematic behaviour, eye movements and associated brain activity, we aimed to further knowledge of how the eye, hand and brain interact concurrently to inhibit the impulse to reach for a target. Two studies were conducted, one synchronizing eye and hand recordings on three different motor Go/No-Go tasks with 29 young, healthy participants. The results demonstrated consistent visual strategies apparent regardless of the location of the inhibition target, and these in turn impacted motor responses. The second study of 20 young, healthy participants, combined these recordings with magnetoencephalography (MEG), to create a timeline of eye, hand and brain behaviour in response to different aspects of the motor response of the go/no-go task. These timelines differed depending on visual strategy used and number of errors made.
While the results are preliminary, they demonstrate the importance of examining not only individual differences in neuroimaging, but also trial dependent differences, that have the potential to explain brain activity associated with temporally sensitive behaviour.

52. Multisensory information: Does it help or hinder motor execution?
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An Nguyen, Curtin University
Matthew Albrecht, Curtin University
Susan Morris, Curtin University
Welber Marinovic, Curtin University

Many tasks require us to precisely synchronise our movements with external sensory stimuli and to maintain a rhythm (e.g., playing in a band, driving a car). This study investigated the influence of multisensory stimuli on movement synchronisation. Experiment 1 examined the effect of stimulus modality (visual, tactile, visual-tactile) on movement synchronisation. Results showed movement synchronisation ability was greater when tapping in synchrony with the visual-tactile and tactile only stimuli, compared to visual only. These results suggest tactile stimuli may be prioritised during rhythmic tasks, and that the increased stimulation provided by bimodal stimuli may not benefit movement synchronisation. Experiment 2 examined movement synchronization ability at different timing intervals (within vs. outside the Temporal Binding Window, ~120ms). Results showed that movement synchronisation was more accurate when one stimulus in a bimodal pair was presented outside the temporal binding window than when both stimuli were presented within the temporal binding window. Consistent with Experiment 1, performance was also greater when synchronising with tactile stimuli, regardless of the timing of stimuli. Taken together, these results indicate that tactile information tends to be weighted more heavily for tasks that involve movement, and that in some circumstances additional sensory stimuli can hinder movement execution.

53. Motor cortical excitability is modulated by the phase of slow-wave brain stimulation
Samuel Armstrong, University of Queensland

Cortical excitability of the human motor system, the degree to which populations of neurons will readily fire, is thought to be critical in producing movement. Slow-wave transcranial alternating current stimulation (SW-tACS) can modulate the phase of endogenous slow-frequency (<2 Hz) brain oscillations and bias the temporal onset of voluntary self-initiated movement, suggesting a link between the phase of endogenous slow-wave rhythms and cortical excitability. We directly examined the neural excitability of frontocentral motor regions across different phases of SW-tACS to determine whether slow-wave oscillatory activity plays a causal role in neural excitability. Participants’ (n = 42) motor cortical excitability was assessed using neuro-navigated transcranial magnetic stimulation (TMS) of the hand region of the left primary motor cortex to induce motor evoked potentials (MEPs) in the contralateral thumb. These MEPs were acquired at intervals that were pseudorandomly distributed across eight phases of SW-tACS. We found that MEP amplitudes varied as a function of the phase of SW-tACS, with the largest difference emerging between peaks and troughs measured over the frontocentral site. This novel finding provides causal evidence in support of existing theories that suggest motor cortical excitability is influenced by the phase of slow-oscillating brain states.

54. Effect of dopamine and cognitive effort on movement vigor.
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Lena Bernheine, The University of Queensland
Timothy J Carroll, The University of Queensland
Paul Dux, The University of Queensland
Hannah Filmer, The University of Queensland

Although increasing evidence implicates dopamine in effort-based decision-making in cognitive and motor tasks, we know little about how cognitive effort affects movement vigor, and how dopamine affects movement vigor when engaging cognitive effort. Here, we used a motor version of the mental rotation task, to quantify how movement vigor is affected by cognitive effort, and how
dopamine affects movement vigor during engagement of cognitive effort. Instead of making binary same-different decisions with stimuli rotated from each other at different angles, neurotypical participants (aged 18-35 years) who consumed either 100mg of Levodopa (n=19) or placebo (n=19) were instructed to aim-away from a presented target at different angles, to achieve the task goal of catching targets that jumped mid-movement by the instructed angle. Increasing dopamine availability via Levodopa slowed reaction times and reduced movement velocity whilst increasing accuracy for difficult task conditions compared to placebo. Thus, increasing dopamine availability appears to increase prioritization of accuracy over speed, particularly under cognitively effortful task conditions at risk of failure to achieve task goals.

55. Should I stay or should I go?
Characterising the temporal dynamics of decision making in a visual foraging task
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Foraging is a ubiquitous animal behaviour, from bees searching for nectar to humans perusing social media. Foragers must repeatedly decide whether to stick with their current choice or go exploring for better options. Here we used computational modelling to characterise human observers’ behaviour in a novel visual foraging task. In each 10 s trial, participants (N = 40) made eye-movements to freely explore a pair of random-dot motion patches, and were asked to indicate the patch with the larger overall rate of brief coherent motion events. These events appeared independently in each patch, at random intervals generated by a Poisson process. Task difficulty was manipulated by varying the difference (large vs small) in the average signal rate between patches. We characterised the temporal dynamics of estimating average signal rates for each patch during fixation periods using iterative Bayesian inference, which modelled the estimated rate as a distribution defined by a mean and variance. The estimated variance decreased during a trial, and reached a minimum at the time of response. At this time, the difference in the estimated means for the two patches predicted participants’ responses. These findings suggest that decision making in foraging minimises perceptual uncertainty using Bayesian inference rules.

56. Hedonism in information search - biased information-seeking leads to biased beliefs
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Stefan Bode, University of Melbourne
Trevor Chong, Monash University
Patrick Cooper, Monash University

Selection bias in information-search contributes to the polarisation of beliefs. However, the cognitive mechanisms underlying this behaviour remain poorly understood. We aimed to isolate the role of affective content on information source selection. In Experiment 1, participants won financial rewards depending on the outcomes of lotteries. They were not shown these outcomes, but instead could choose to view a prediction of each outcome made by one of two sources. Before choosing, participants were first shown a series of example predictions made by each source. The sources systematically varied in the accuracy and positivity of their predictions. Both source accuracy and positivity impacted participants’ choices. Importantly, those seeking more positively-biased information believed that they had won more often and had higher confidence in those beliefs. In Experiment 2, we assessed the effect of positivity on the perceived credibility of a source. Participants watched a single source making predictions of lottery outcomes and provided ratings corresponding to the strength of their beliefs in each source. Positively-biased sources were not seen as more credible. Together, these findings suggest that positively-biased information is sought partly due to the desirable emotional state it induces. Information sought on this basis produced consequential, biased beliefs about the world-state.
57. Fractionating distraction: how past- and future-relevant distractors influence integrated decisions
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Dragan Rangelov, Queensland Brain Institute, The University of Queensland
Jason Mattingley, Queensland Brain Institute, The University of Queensland; School of Psychology, The University of Queensland
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Many everyday tasks require us to integrate information from multiple steps to make a decision. Dominant accounts of flexible cognition suggest that we are able to navigate such complex tasks by attending to each step in turn, yet few studies measure how we direct our attention to immediate and future task steps. Here, we used a two-step task to test whether participants are sensitive to information that is currently irrelevant, but will be relevant in a future task step. Participants viewed two displays, each containing superimposed moving dot clouds in target and distractor colours, then reported the average direction of target motion. In a subset of trials, the second target colour appeared as the distractor in the first display. We used linear regression to trace how this future-relevant “decoy” distractor influenced the reported average target direction. We compared the decoys to never-relevant, recently-relevant, and globally-relevant distractor baselines. Across four experiments, we found that responses reflected what was immediately relevant, as well as the historical relevance of the distractors. However, relevance for a future task step did not reliably influence attention. We propose that integrated decisions are shaped by what has been relevant, alongside the immediate demands of each task step.

58. Combining Information from Multiple Cues: Simplest is Best
David Sewell, The University of Queensland
Gina Fisher, The University of Queensland
Mia Thannhauser, The University of Queensland
Thomas Palmeri, Vanderbilt University

We investigate how people combine information from multiple learned cues to predict a category outcome. In two experiments people are trained to learn probabilistic relationships between cues and outcome categories. People then predict outcome categories for compounds formed by all possible pairwise combinations of stimuli while either receiving normative feedback (Experiment 1) or when feedback for compounds is withheld (Experiment 2). In each case, behavioral responses are well described by averaging information across cues in a compound. We factorially compare a large number of different response strategies within a diffusion model framework and find that (1) compound response data can be predicted in a parameter-free way by averaging drift rates estimated from single-cue data, (2) this simple drift averaging process describes both individual and group-level data, and (3) the simple averaging model outperforms other models that allow for biased sampling of cues across trials, unequal subjective weighting of cues within a compound, and models that allow cue redundancy to influence responding.

59. Perceptual centre-surround contrast suppression in adolescents
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Centre-surround contrast suppression - where the perceived contrast of a target is reduced by a surrounding pattern - is considered a perceptual analogue of neuronal centre-surround mechanisms that are ubiquitous in the visual system. Perceptual surround suppression strength in adolescents has not been measured to date, despite being extensively studied in adults across a range of brain conditions affecting young people (e.g. schizophrenia, bipolar disorder, migraine). In this study, we measured perceptual surround suppression in 196 participants at
every age from 10 to 17 years, compared to 30 adults (21-34 years). Suppression strength was calculated taking into account the perceived contrast of the target with and without a surround. Contrast matching thresholds for the no surround condition were always obtained first. After excluding 7% of participant data due to unreliable performance on the two-alternative forced choice staircase tasks, a one-way ANOVA showed an effect of age ($F(8,201)=2.30$, $p=0.02$), with weaker perceptual surround suppression in the youngest adolescents relative to adults (post-hoc Bonferroni multiple comparisons between adults vs 12-year-olds $p=0.01$; adults vs 13-year-olds $p=0.002$). Our data demonstrates a turning point in the development of centre-surround interactions, a key building block for visual perception, in early adolescence.

60. Running real-time replications of experimental psychology studies: a project aiming to shift incentives toward more open, replicable psychological science

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Spencer Greenberg, Clearer Thinking; Spark Wave

Our team is testing a new approach to promoting open science and replicable research practices in experimental psychology: we are rapidly replicating randomly-selected, newly-published papers from a predefined set of prestigious journals, as well as all newly-published psychology studies in Nature and Science. Prior to each replication, we share our materials with the original authors and request feedback. We also produce Transparency Ratings (using predefined criteria) for each study, with the goal to reward and promote the many teams already engaged in open science practices. In this poster/talk, we will report on the first three replications undertaken for this project and discuss the implications of our findings. Though findings mostly replicated in the first three studies of this project, the original studies had varying levels of transparency, and some were better at communicating their results to readers than others. We wish to emphasize the importance of authors not only conducting replicable research, but also unambiguously communicating if and how their conclusions necessarily follow from their results. Finally, we conclude by outlining how we plan to apply our real-time replication and study review methods at scale.

61. Speeding up Psychophysics; a Bayesian Brain Approach to Continuous Experiments

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Psychophysics takes a black-box approach to studying the brain in the sense that you put something in (stimulus), you record what comes out (response) and you make guesses about what is happening in between. Normally you collect stimulus-response pairs on a trial-by-trial basis. Some have argued that this discrete approach to studying the brain is unnatural and any psychophysicist will tell you it generally takes a long time to collect data in this way. Here I present a new approach developed in our lab for creating continuous data-collection experiments and for making sense of the results. It is rooted in the concept of the brain operating in a similar way to a Kalman Filter; making Bayes-optimal guesses about the state of the world in the face of noisy internal and external processes. I show, using an example, that it is possible to conduct a fast and engaging continuous experiment then to refine the data, using our model, so that it is equivalent to that from a traditional trial-based experiment.

62. Decision aids that support learning, not performance

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When interpreting SONAR time-frequency “waterfall” displays, submariners must make rapid classifications of unknown vessels. Performance on this task may be aided by visual cuing, but little is known about the effects of such cues on operator performance when the cue is subsequently removed. We therefore examined the possibility of presenting cues that optimise for operator learning, not performance. In three experiments performed both in person and online, participants were tasked to classify vessels using a simulated SONAR display. Three different decision aid designs were presented to discover which types of visual cue best facilitated learning by measuring operator performance once those aids were removed. The presence of cues that significantly increased operator performance also caused a significant reduction in performance when removed, compared to unsupported performance. Psychophysiological measures indicated that when present, cues which better facilitated learning also increased cognitive load. We demonstrate here that cues which enhance performance but render human operators redundant can inhibit learning, negatively impacting performance when cues are removed. We suggest models of associative learning might be leveraged to design cues that avoid this outcome. This research was funded in partnership with the Australian Government Department of Defence (RN-UDS Agreement No.10012; awarded to OG).

63. Global complement c3 knockdown attenuates synapse loss, long-term potentiation impairment and alleviates cognitive decline in aged mice.

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Complement component C3 is an innate, host–defense immune protein involved in synapse elimination. Cerebral C3 is elevated with aging and Alzheimer’s Disease (AD). We reported that germline C3-deficiency protected aged wildtype and APPswe/PS1dE9 mice against hippocampal synapse loss and cognitive decline. We crossed C3f/f mice with an inducible, global Cre-line (Rosa26-Cre-ERT2+/−) to generate C3iKO mice. C3iKO mice were injected intraperitoneally with tamoxifen (TAM, 75 mg/kg) or corn oil daily for 5 days. Behavioral testing for hippocampal-dependent spatial memory, object memory, and object location was performed at 16–17 months of age. In another study, mice were injected with either CO/TAM and electrophysiological recording of long-term potentiation was conducted in hippocampal slices of TAM-treated and CO-treated mice. Serum C3 levels were consistently reduced 85–97% in C3iKO+TAM mice compared to controls. C3iKO+TAM mice performed significantly better than C3iKO+CO-treated mice in all behavioral tasks, indicating that C3 lowering after brain development protected mice from age-related cognitive decline. In the second study, C3 lowering in adult mice protected hippocampal synapses from Aβ S26-dimer mediated LTP impairment. Our novel C3iKO mouse model allows for global C3 lowering at any age and will be crossed with AD-like models to evaluate C3 lowering in early-stage AD pathogenesis.

64. Long COVID-19 Comparisons with Persistent Concussion and Implications for Participation in Activities of Daily Living, Including Driving.

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This project explores apparent similarities in profiles of neurocognitive and neuropsychological symptoms between two groups - long COVID-19 and persistent concussion - compared with a control group. It also examines the impact of persistent symptoms of long COVID-19 and concussion on participation in life activities,
especially driving. Three studies will be undertaken: Study 1 and Study 2 are online surveys that will be disseminated to Anglosphere countries (Australia, New Zealand, America, Canada, United Kingdom, Republic of Ireland). Study 3 is an observational clinical study. Study 1 will compare the presence and severity of neurocognitive and neuropsychological symptoms between the three groups with the 22-item Post-Concussion Symptom Scale (PCSS). The Study 2 survey will examine the impact of persistent symptoms on self-reported participation in activities of daily living, including mobility and driving. It will consist of carefully structured questions and standardised activity of daily living self-report assessments from the disability and brain injury sectors. In Study 3, a small local cohort of participants recruited from the Study 1 and 2 participants (for all three groups) will engage in observational clinical testing focused on concussion-like effects and on driving ability. The results are expected to have implications for treatment and driver licensing practices.

65. Dynamics of cognition and fatigue in breast cancer survivors: An ecological momentary assessment study

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Breast cancer survivors often have cognitive complaints and increased fatigue post-treatment (Bray et al., 2018; Ruiz-Casado et al., 2020). Despite survivors describing daily fluctuations in cognition and fatigue (Small et al., 2019), the current literature largely uses one-time lab assessments which have low ecological validity and only capture a snapshot of symptom experience. Ecological momentary assessments (EMA) are short, daily assessments completed in a participant’s own environment which allow for the investigation of daily symptom variability. In the current study participants will be 30 breast cancer survivors (6-36 months post-chemotherapy) and 30 healthy controls. Daily fatigue and cognition (processing speed, working memory and attention) will be assessed for 30 days (1 session/day, 8min/session) using an in-house developed smartphone app. Multilevel random effects models will be used to examine within-person variability of fatigue and cognition. Initial results in healthy (N=14) and breast cancer (N=3) participants show good completion rates of 76% and 86% respectively. Further, results demonstrated greater variability in processing speed of two breast cancer survivors as compared to the control group. Using EMA may improve our capacity to unveil the daily dynamics of fatigue and cognitive function in breast cancer survivors.

66. Common suppressive effects of prediction across the brain: Links between corticospinal and sensory attenuation

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When sensations are predicted by one’s own actions or external cues, neural activity is downweighted compared to sensory inputs that are unpredictable. A similar suppressive effect is also observed when stimulating the motor system with transcranial magnetic stimulation (TMS). Akin to sensory attenuation, predictable TMS excites the motor system less effectively than unpredicted TMS. Using combined TMS and EEG, we measured corticospinal attenuation to motor cortex stimulation using motor-evoked potentials (MEPs) and simultaneously measured sensory attenuation to the “click” sound of the TMS coil, focusing on the N1 component of the event-related potential. We found evidence of both MEP attenuation and N1 suppression when the TMS pulse was predicted, relative to unpredictable TMS. Critically, the magnitude of ERP suppression predicted the magnitude of MEP suppression. We also verified that the MEP attenuation effect is specifically caused by predicting motor system stimulation rather than predicting the sensory byproducts of TMS. Our results reveal a close correspondence between attenuation of the sensory and motor systems despite their different origins. The findings reveal commonalities between predictive downweighting mechanisms across distinct neural systems, suggesting that domain-general mechanisms may be responsible for the predictive coding of neural representations throughout the brain.
67. Investigating the predictive neural encoding of smoothly moving objects
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There is mounting evidence that the brain employs predictive mechanisms to encode the position of moving objects. Much of this evidence, however, comes from paradigms employing ‘apparent motion’ stimuli, where rapid sequences of spatially and temporally separated flashes generate the perception of coherent motion. As a result, it is relatively unclear how the human brain encodes the location of smoothly moving objects, which evoke continuous patterns of neural activation rather than distributed bursts. In this study, we investigated this by asking participants to view a stimulus moving smoothly along a circular path, while EEG was recorded. Using multi-class LDA classification, we constructed maps of the stimulus location over time from participants’ EEG recordings. Analysis of preliminary data (N=6, data collection ongoing) found clear evidence of ‘representational overshoot’ following the unexpected disappearance or reversal of the stimulus, indicative of predictive position encoding. Strikingly, by varying classifier training time, we found that temporally distinct stimulus representations were extrapolated by different amounts, with early representations showing greater extrapolation and more precise spatiotemporal localization. These preliminary findings shed light on the neural encoding of smoothly moving objects, suggesting that the degree to which representations are extrapolated may vary along the processing stream.

68. The temporal visual oddball effect cannot be explained by repetition suppression or a generalised temporal anticipation effect
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The temporal oddball paradigm involves presenting a train of identical repeated events (‘repeats’), which can be interrupted by a different ‘oddball’. Oddball tests seem to last longer than repeat tests. This effect has been attributed to an exaggerated perceived duration for oddball tests. Other explanations are possible. One possibility is a repetition suppression effect, with perceived duration declining with repetition number. Another is a generalised temporal anticipation effect, with attention increasingly allocated to inputs as test presentations become more likely - regardless of their content. To tease these explanations apart, we conducted an experiment where the number of repeats preceding tests was fixed within a block - so participants could always anticipate the test presentation (regardless of whether it was a further repeat or an oddball). This eliminated the effect of repetition but preserved the temporal oddball effect - even though repeat tests could be anticipated. Our data suggest that a break from content repetition is a key driver of the temporal oddball effect. The effect cannot be adequately explained by repetition suppression, or as a generalised temporal anticipation effect.

69. Position representations of moving objects align with real-time position in the early visual response
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Tessel Blom, University of Melbourne
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Due to neural transmission and processing delays, sensory information in the brain is slightly outdated. When localising a moving object, these fundamental delays may be overcome through predictively encoding object position using information from its past trajectory. We evaluated this proposition using multivariate analysis of high temporal resolution electroencephalographic data. We tracked neural position representations of moving objects at different stages of visual processing, relative to the real-time position of the object in the world. We presented a stimulus that was either briefly flashed in one position, or moving smoothly along a straight trajectory that passed through the flash positions. Classifiers were
trained to identify neural representations of the position of flashed stimuli. We then established the latencies at which these position representations occurred for moving stimuli. We found that, during early stimulus-related activity (100-160ms), position representations of predictably moving objects were shifted substantially earlier than for unpredictable flashes, but subsequently followed the same processing timecourse. This shift was sufficient to bring early representations of the position of a moving object into alignment with its real-time position. This indicates that the predictability of straight trajectories enables full compensation for the neural delays accumulated early in stimulus processing.

70. Spike-timing dependent plasticity compensates for neural delays in a multi-layered network of motion-sensitive neurons

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The processes underlying visual representation of the external world take time to unfold. Because temporal delays accumulate as visual information propagates through the visual system, representations at higher cortical levels are progressively outdated. This is especially relevant to localisation of a moving object - because the location changes across time, neural representations potentially lag the true location. It has been proposed that the visual system compensates for neural delays by extrapolating the position of moving objects. Burkitt and Hogendoorn (2021, https://doi.org/10.1523/JNEUROSCI.2017-20.2021) showed that spike-timing dependent plasticity (STDP) can achieve motion extrapolation in a two-layer network of feedforward, velocity-tuned neurons. They demonstrated that allowing the network to adjust its weights via STDP caused the receptive-fields of second-layer neurons to shift in the opposite direction to a moving stimulus. This study extends this work by bringing the network more in line with biology. We expanded the network to multiple higher layers, reflecting the depth of the visual hierarchy. Additionally, we implemented more realistic synaptic time-courses. We examine the degree to which STDP can compensate for neural delays across six layers, showing that the multi-layer network achieves cumulative compensation of comparable magnitude to the delays incurred in visual processing.

71. Less accurate, but more precise, representations following adaptation to orientation revealed by forward encoding of brain activity in human observers

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Adaptation shapes perception by making neurons sensitive to the temporal context in which stimuli are embedded. This phenomenon has been reliably measured across the brain using a variety of techniques sensitive to a broad range of spatiotemporal scales of neural activity. While our understanding of adaptation has largely been informed by single-cell recordings in non-human animal models, there have also been demonstrations of the phenomenon in humans using non-invasive techniques that measure neural population activity, such as fMRI and EEG. However, these studies typically measure univariate changes in neural activity (e.g., repetition suppression), which may overlook more nuanced effects of adaptation. Here we used forward encoding of EEG signals from human subjects to understand how prolonged visual exposure to a single orientation alters the neural representation of subsequently viewed orientations. We found that adaptation reduced the accuracy, while increasing the precision, with which adapted stimuli were encoded. Further, we found that two discrete adaptive neural mechanisms operate at different points in the sensory processing cascade to produce qualitatively different outcomes: early increased precision and late reduced (biased) accuracy. Our findings reconcile neural sharpening and fatigue accounts of adaptation, while demonstrating how adaptation supports brain function by increasing saliency to change.
Changes in amygdalar integrity in frontotemporal dementia subtypes
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Marshall A. Dalton, The University of Sydney (Dr)
Olivier Piguet, The University of Sydney (Professor)

Although amygdalar atrophy has been previously reported in frontotemporal dementia (FTD), the trajectories of progression are not well characterised. The aim of this study was to determine the structural changes of the amygdala in FTD subtypes as disease progresses. Patients clinically diagnosed with behavioural variant FTD (bvFTD) (n=20), semantic dementia (SD) (n=20), primary nonfluent aphasia (PNFA) (n=20), Alzheimer’s disease (AD) (n=20), and 20 matched healthy controls (HC) completed whole brain structural MRI annually across multiple time points. Linear mixed effects models were applied to identify changes in amygdala volume over time. At baseline, bvFTD, SD and AD patients displayed significant amygdalar atrophy compared with HC. Atrophy was most severe and asymmetrical (Left > Right) in SD. Longitudinally, all patient groups showed a more pronounced amygdalar atrophy rate compared with HC. Further, rates of change differed among patient groups, with the highest rate of decline observed in SD. This is the first study to identify differential rates of amygdalar atrophy across FTD subtypes. Our findings provide important insights into the longitudinal brain atrophy profiles in FTD. The rate of amygdalar atrophy may represent potential imaging biomarkers of disease progression for clinical trials in these disorders.

Does APOE ε4 status change how 24-hour time-use composition is associated with cognitive function? An exploratory analysis among middle-to-older adults.
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Background: To explore if there is an interaction between 24-hour time-use composition and genetic dementia risk in relation to cognitive function, and to simulate how time-reallocations are associated with cognitive function across different levels of genetic dementia risk.
Methods: Cross-sectional global cognition, executive function, genetic dementia risk (at least one apolipoprotein (APOE) ε4 allele vs none) and 7 days of 24-hour accelerometry (average daily time-use composition of moderate-to-vigorous physical activity (MVPA), light physical activity, sedentary time, sleep) were collected from 82 adults (65.6±7.5 yrs, 49 females). Linear regression was used to explore the relationship between time-use composition and cognitive measures, testing for interaction between APOE ε4 status and time-use composition. The models simulated time reallocations in both APOE ε4 status groups.
Results: The 24-h time-use composition was associated with global cognition (F=2.4, p=0.02) and executive function (F=2.6, p=0.01). For both measures, the association differed according to genetic risk (interactions p<0.001). Reallocation time to MVPA was beneficially associated with measures of cognitive function, but associations were larger among those with at least one APOE ε4 allele. Discussion: Genetic dementia risk may impact the effectiveness of activity interventions. Increasing MVPA may provide greater benefits among those with higher genetic dementia risk.
74. Effortful and spontaneous cognitive processes underlying the experience of meaning in life across the lifespan

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The psychological experience of meaning in life reflects the interplay between a sense of purpose, coherence, and significance. It arises from the integration of past memories, present experiences, and future aspirations into a meaningful life story. While complex cognitive skills such as effortful reflection and abstract reasoning are proposed to support this process, empirical work exploring the cognitive underpinnings of meaning in life is lacking. This is particularly the case in healthy and pathological ageing. We conducted a three-wave longitudinal study on meaning and cognitive functioning in older adults with Alzheimer’s disease in Belgium (T1 n=140). Only working memory was associated with meaning in life, but there was no evidence for associations with other cognitive processes (e.g., episodic memory, executive functioning, abstract reasoning). Next, a pilot study in a healthy adult sample (18-74 years, n=186) explored the relationship between meaning and spontaneous cognition. Overall tendency for spontaneous cognition was negatively related to meaning, but future-oriented spontaneous cognition was positively related to meaning. Our findings suggest that distinct facets of self-referential thought as captured by indices of spontaneous cognition may be crucial to the experience of meaning and could be key in understanding how meaning is constructed across the lifespan.

75. Shorter contextual time-scale rather than memory deficit in ageing.

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Many aspects of cognitive ability and brain function that change as we age look like deficits on account of measurable differences in comparison to younger adult groups. One such difference occurs in auditory sensory responses that index perceptual learning. Meta-analytic findings show reliable age-related differences in auditory responses to repetitive patterns of sound and to rare violations of those patterns, variously attributed to deficits in auditory sensory memory and inhibition. Auditory event-related potentials were recorded from older (n=29, mean 67 years) and younger (n=17, mean 22 years) adults while hearing sequences of sound in which two pure tones alternated as rare and common events over time. The results indicate less reduction in response to repetitive sound streams in the older group but not a reduced sensitivity to pattern violations (i.e., inconsistent with a sensory memory deficit). Furthermore, an analysis over time indicated that the ageing brain may index shorter timescales of contextual reference in perceptual inference. In conclusion, age-related differences observed previously for perceptual inference appear highly context-specific necessitating reconsideration of whether and to what function the notion of deficit should be attributed, and even whether the notion of deficit is appropriate at all.

76. Profiles of grey matter atrophy across the long axis of the hippocampus in dementia

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The hippocampus is critical for memory network. While hippocampal atrophy is common in dementia, few studies
have explored hippocampal changes at subregional level. We conducted a retrospective neuroimaging study in semantic dementia (SD; n=29), Alzheimer’s disease (AD; n=79), and compared with 49 healthy older controls. Participants underwent whole-brain 3T structural MRI. Each hippocampi was segmented into anterior, intermediate rostral, intermediate caudal, and posterior subregions. Relative to controls, significant volumetric reductions were evident across all subregions bilaterally in AD, and all left hippocampal subregions in SD. No volumetric difference was found between SDs and controls in right intermediate caudal and posterior hippocampus. Furthermore, ADs showed a flat atrophy profile while SDs showed graded anterior-to-posterior atrophy.

This study is novel to chart distinct hippocampal atrophy profiles in AD and SD and suggests how hippocampus is distinctly targeted in these syndromes.

77. Frontostriatal dysfunction drives discrete profiles of motivational impairment in dementia

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Much of human behaviour is motivated by the desire to experience pleasure. This capacity to anticipate and seek out rewarding experiences via goal-directed behaviour relies on frontostriatal circuits in the brain. While mounting evidence reveals motivational disturbances in dementia, few studies have explored the neural correlates of these impairments or their potential overlap with related symptoms including apathy and depression. We assessed the neural correlates of anhedonia (loss of pleasure), apathy (loss of motivation), and depression in a large sample of dementia patients (n=121) and explored associations between motivational impairments and grey matter brain atrophy using a transdiagnostic approach. Relative to Controls, patients with frontotemporal dementia displayed significant levels of anhedonia (SHAPS; p<.001) and apathy (CBI-R; p<.001), while Alzheimer’s disease patients showed apathy (p<.001) in the absence of anhedonia (SHAPS; p=.99). Voxel-based morphometry analyses indicated that anhedonia was associated with bilateral atrophy in medial and orbitofrontal cortices, insular cortex, and putamen. This was largely distinct from the neural correlates of apathy with only a small region of overlap in the right OFC. While apathy and anhedonia are commonly thought to share similar mechanisms, our study provides new evidence dissociating these constructs at the neural level.

78. Attention to Affective features Across Distance

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Some evidence suggests that threatening facial expressions like anger can result in slowed responses to targets (Eastwood, Smilek, & Merikle, 2003). However, the way that attention is allocated across space is not uniform and space closer to the body is treated differently than space further away (e.g. Evans & Wener, 2007, Maravita & Iriki, 2004). Previous exploration of how space close to the body (i.e. Peripersonal space) is represented depending on emotion has relied on self-report measures (Ruggiero et al., 2016). The current research examines how people spontaneously modulate their own distance from emotional expressions. Additionally, it considers how attention is altered based on distance from an emotional face both when given agency over one’s own position or when positioned near or far from the face. Results suggest that when given agency, being exposed to an angry face confers an advantage at close distances but not far, however such was not true when participants were not given control over their own positioning.

79. Impact of Augmented Reality visual cues on attention and search performance

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Augmented Reality (AR) technology is increasingly deployed into applied scenarios with multiple tasks competing for limited cognitive resources. Visual cues are a common AR application, and prior research has demonstrated improved detection performance for cued targets but reduced performance for uncued targets. This project adapted classic sustained inattentional blindness paradigms into a video game depicting a military overwatch scenario. Covert attention was measured using Steady-state Visually Evoked Potentials (SSVEP) while eye tracking was used to measure overt attention. All participants performed an attention-demanding primary task but some were assisted with augmented reality cueing. People were given either valid, uninformative or no cueing. Their performance detecting a rare but salient threat was measured. Inattentional blindness was observed in all groups, but was significantly larger in the groups provided with cueing. Cortical responsiveness to onscreen cues predicted delayed detection of a rare, salient target. Overall, cueing helped detection of validly cued targets, but the presence of onscreen cues impaired detection of high importance, unexpected events. This suggests that effective AR design requires careful consideration of both costs and benefits of cueing.

80. The role of selective attention and repeated temporal structure during integrative perceptual decision making

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Previous work on ensemble coding and spatial contextual cueing demonstrates the visual system can encode summary statistical information from a group of objects. While such coding has been shown for both individual features and wider spatial configurations, it is unknown whether similar coding may exist for distinct stimuli separated in time. We recorded EEG while participants viewed a sequence of four coherent motion events embedded in a random-dot kinematogram and reported the average direction. Crucially, motion events could either repeat a previously seen temporal order and timing, or otherwise be randomly shuffled in time. To quantify the potential effects of selective attention, another set of motion events was presented in a spatially overlapping task-irrelevant kinematogram. Using mixture modelling, we found that participants' judgements were more precise under repeated versus random conditions. Interestingly, regression analyses revealed that decisions were also more strongly influenced by task-irrelevant motion signals in the presence of repeated temporal structure. We analysed a decision-related EEG component, the centroparietal positivity, and found less ongoing activity during the repeat condition. Our findings suggest that incidental learning of temporal structure improves the processing that underlies integrative decisions, while incurring a minor cost to selective processing.

81. Motion perception and attentional selection: self-prioritization effects underlying decisional and perceptual mechanisms

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The Self-prioritization effect (SPE) is a decision benefit afforded to self-relevant information, attributed to an attentional enhancement for self-relevant stimuli. To address this, we speculate if self-information is boosted, it will act as a highly salient distractor when selective attention is directed to other-information, but when attention is directed to self-information, other-information will show minimal interference. Across two experiments with random dot Kinematograms we investigated drift rate in responses as a measure of selective attention efficiency to self-information in the presence of other-information, and vice versa. In Experiment One (baseline), participants associated a direction of motion (left, right)
with themselves, and a stranger (Sam) respectively and then identified whether the coherent movement direction matched or mismatched the presented label (YOU, SAM). In Experiment Two, participants associated a colour (pink, blue) with themselves and a stranger (Sam), then viewed a label and two different coloured superimposed Kinematograms (blue, pink). Participants identified, via key press, the coherent movement direction of the coloured Kinematogram associated with the presented label. Faster responses and a larger drift-rate occurred for self-relevant, than other-relevant target trials. This suggests people can selectively attend to self-relevant stimuli when other-relevant distractors are present and enhanced visual processing underpins the SPE.

82. Can we predict when attention has lapsed? Modelling hidden attentional states in a dynamically updating vigilance task

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The ability to sustain attention to a monotonous task is crucial in many workplaces, from customs control to proof-reading reports. In these tasks, the frequency of “target” events often waxes and wanes over time. We investigated whether participants were able to leverage predictions about these hidden states to mitigate the effects of attentional lapses. We developed a dynamic vigilance task in which participants (N=32) continuously monitored displays of drifting symbols for the appearance of a set of characters in a target colour. The frequency of target events was determined according to “hidden” task states (lull vs. surge), updated using a Markov model. The display was frequency-tagged to elicit steady-state visual evoked potentials (SSVEPs), and both eye-tracking and electroencephalography data were recorded. A Hidden Markov Model was fit to participants’ responses to estimate their state predictions. Behavioural performance, pupillary responses, SSVEP measures of attention, and participants’ ability to predict hidden task states all decreased over the course of each 20-minute block, revealing attentional lapses. Critically, attentional lapses were more prevalent during lulls; thus participants were able to dynamically align their attentional resources with task demands. These findings open new avenues for interventions such as neurofeedback training aimed at enhancing sustained attention.

83. The timecourse of dividing attention: The influence of culture and bilingualism.

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Jiyun Mun, Griffith University, Honours Student

Although attention can be divided in about 80ms (Jefferies & Witt, 2019), little is known about whether individual differences may modulate the timecourse of dividing attention. Bilingual individuals disengage attention more rapidly than monolinguals; in Experiment 1, we tested whether bilinguals would also divide attention more rapidly. To assess this, we employed an Attentional Blink paradigm with simultaneous RSVP streams on both sides of fixation. One component of the AB, Lag-1 sparing, occurs only if the second of two targets appears in an attended region. Whether attention is unitary or divided can therefore be determined by presenting the second target between the streams and assessing whether Lag-1 sparing occurs. The results confirmed that bilinguals divide attention more rapidly than monolinguals. In Experiment 2, we compared the rate of dividing attention in individuals raised in East Asian and Western cultures. Cultural background typically biases whether individuals focus on the global or local details of a scene and was thus expected to modulate the rate of dividing attention. The results showed that individuals raised in East Asia divide attention more rapidly than individuals raised in Australia. The present study thus identified two key factors that reliably modulate the timecourse of dividing attention.
There is evidence emerging of the psychological impact of the built environment, but not the accompanying brain-based evidence. As built environment exposure may have implications for our cognitive, attentional, perceptual, and emotional functioning, it is critical we understand and measure this impact. To understand if the design elements of scale and colour of interior built environments modulate functional brain connectivity, healthy adult participants (scale n=66, colour n=18) were exposed to context-neutral room scenes presented for two minutes each. We used a rigorous inter-disciplinary approach combining electroencephalography, a cave automatic virtual environment, and indoor environmental quality monitoring. Our results show that both enlarging and reducing scale enhanced theta connectivity across the left temporoparietal region and right frontal region. We also found that when reducing the built environment scale, there was a network exhibiting greater high-gamma connectivity across the right frontoparietal region. For colour, the condition (blue) contrasted to our achromatic control (white) increased theta connectivity in the bilateral frontal regions. This study confirmed that functional brain connectivity is impacted by both scale and colour, suggesting the built environment could affect our cognitive processes and mental health. This helps us understand whether we can mediate performance and health outcomes through building design.
86. Identifying a distinct suppression signature in the default mode network during high cognitive demand
Christine Leonards*, University of Melbourne, PhD student

Suppression of the default mode network (DMN) during externally-directed cognitive tasks has been consistently observed in neuroimaging studies. Emerging insights suggest the DMN is a heterogenous system, especially during higher-order cognitive processes. However, few studies have investigated task-related modulation of DMN suppression across multiple demanding tasks within the same sample. In this study, 85 healthy 15- to 25-year-olds completed three high-demand functional magnetic resonance imaging (fMRI) tasks that were designed to map activity suppression from a resting baseline. We found a distinct suppression subnetwork apparent across the three tasks that partially encompassed DMN regions but also extended beyond the network. Common suppression was observed in the medial prefrontal cortex, dorsal-to-mid cingulate cortex extending to the precuneus, and posterior insular and surrounding cortex. Further, the magnitude of suppression of these regions was correlated within individuals across tasks. Our findings indicate that task-induced suppression during high cognitive demand reflects a distinct suppression signature that is not limited to the DMN but also extends to regions involved in broader aspects of self-awareness and cognitive control. Consistent intra-individual suppression suggests this may be a stable feature of brain function. These findings have important implications for understanding the neural mechanisms underlying efficient cognitive function.

87. Cortical geometry explains diverse patterns of brain activity
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Several neuroimaging studies have explored how brain function is constrained by its underlying structure and anatomy. Attempts to understand this structure-function coupling have mostly focused on finding associations between structural connectivity (i.e., from diffusion MRI) and functional connectivity (i.e., from functional MRI). However, such univariate analysis cannot fully explain the mechanisms of how the brain can flexibly produce diverse brain dynamics. Here, we ask whether human cortical geometry can explain the emergence of diverse patterns of cortical activity. To address this question, we derived the shape harmonics of the cortical surface, known as eigenmodes, that describe how the cortex varies in space at different spatial frequencies. We used the eigenmodes to analyze task-evoked activation maps and resting-state functional connectivity of 255 healthy individuals from the Human Connectome Project (HCP). We found that shape harmonics can reconstruct both types of data with high accuracy (data vs reconstruction correlations >0.9). Moreover, its performance is superior to other competing methodologies that require complex data (e.g., structural connectome) and/or algorithms (e.g., PCA). This shows that the geometry of the human cortex itself can successfully explain diverse aspects of brain function, providing parsimonious mechanistic evidence for the tight structure-function coupling in the brain.

88. Assessment of cortical inhibition depends on inter individual differences in the excitatory neural populations activated by transcranial magnetic stimulation
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Transcranial magnetic stimulation (TMS) is used to probe inhibitory intracortical neurotransmission and has been used to infer the neurobiological dysfunction that may underly several neurological disorders. One technique, short-interval intracortical inhibition (SICI), indexes gamma-aminobutyric acid (GABA) mediated inhibitory activity and is a promising biomarker. However emerging evidence suggests SICI does not exclusively represent GABAergic activity because it may be influenced by inter-individual differences in the specific excitatory neural populations activated by TMS. Here we used the latency of TMS motor evoked potentials (MEPs) to index these inter-individual differences, and found that one third of the observed variability in SICI magnitude was accounted for by MEP latency. We conclude that SICI is influenced by inter-individual differences in the excitatory neural populations activated by TMS, reducing the precision of this GABAergic probe. Interpreting SICI measures in the context of MEP latency may facilitate a more precise assessment of GABAergic intracortical inhibition. The reduced cortical inhibition observed in some neuropathologies could be influenced by reduced activity in specific excitatory neural populations. Including MEP latency assessment in research investigating SICI in clinical groups could assist in differentiating the cortical circuits impacted by neurological disorders.

89. Eigenmodes in the brain explain how local perturbations evolve into long-range effects
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Local perturbations of neural activity, for example via transcranial magnetic stimulation, can affect activity in distant regions of the brain. This propagation has been linked to neuroanatomy and functional organizational principles including the brain hierarchy of timescales. However, a general account of the mechanisms explaining how focal perturbations are integrated is missing. To address this knowledge gap, we combined multimodal neuroimaging and brain stimulation with advanced biophysical modelling. Specifically, we showed that neural perturbations in two specialized brain regions located at the extremes of the visual hierarchy (V1 and FEF) caused marked changes in eigenmodes, the global functional modes defined by neuroanatomy. Strikingly, the long-term and global effects of these local perturbations were largely captured by a limited number of eigenmodes. Using a biophysical interpretation of these global states, we explain how an acute and local neural perturbation evolves into a global effect that depends on brain anatomy and eigenmode energy. These results advance fundamental knowledge of large-scale brain communication and have implications for understanding and treating brain disorders.

90. Patterns of Perceptual Experience in Undiagnosed Visual Snow Syndrome are Similar to Those in the Absence of Visual Snow
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Introduction. Visual Snow Syndrome (VSS) comprises a range of perceptual phenomena, notably visual snow (VS; dynamic static throughout the visual field). Previous work has shown that 35% of people experience VS and 5% meet the VSS diagnostic criteria, a pattern consistent with VSS constituting an extreme form of normally varying perceptual experience. We investigated the patterns of perceptual phenomena associated with VSS in a large sample of naïve participants.

Methods. Participants completed a screening questionnaire assessing the frequency and severity of perceptual phenomena associated with VSS. Latent Class Analysis (LCA) was used to investigate whether presence of
Results. Of 1,846 participants included for analysis, 42.36% experienced VS and 4.49% had VSS without prior knowledge. Optimal four-class LCA solutions reflected differences in the frequency and total number of symptoms experienced, regardless of whether VS was included in the model.

Conclusions. Our results suggest that the perceptual phenomena associated with VSS are common in the general population, and that there is not a unitary pattern of perceptual experiences that indicates the presence of VS. Given diagnosed VSS requires the constant experience of VS, we plan to investigate whether there is a symptom profile which distinguishes diagnosed VSS.

91. Inattentional Blindness: Attentional Set for Efficient Task Success

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Inattentional blindness (IB) is the failure to notice an unexpected object in plain sight when attention is otherwise engaged. In seven experiments using a dynamic-counting IB paradigm, we investigated whether task instructions or visual distinctiveness of task-relevant objects determined the observers’ attentional set. Observers counted bounces of task-relevant objects that moved around randomly on the computer screen alongside task-irrelevant objects. Task-relevant and task-irrelevant objects were differentiated by features on two visual dimensions—shape and colour (e.g., green squares versus purple diamonds)—and observers were instructed either count-by-shape (squares, diamonds, crosses) or count-by-colour (purple, blue). We systematically manipulated the dimension on which task-relevant objects were more visually distinctive—that is, whether shape features or colour features better distinguished task-relevant from task-irrelevant objects. The findings indicated that observers established an attentional set for features on whichever dimension—shape or colour—better distinguished task-relevant from task-irrelevant objects. If features on the shape dimension better distinguished task-relevant from task-irrelevant objects then observers—even if instructed to count-by-colour—reported an unexpected object that matched the task-relevant objects in shape and failed to report an unexpected object that matched the task-relevant objects in colour. We conclude that observers set their attention to promote efficient task performance.

92. Characterising the EEG markers of surprise-induced deficits in vision and audition

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Unexpected stimuli can grab attention to the detriment of ongoing tasks. In the Surprise-induced Blindness (SiB; visual) and Surprise-induced Deafness (SiD; auditory) paradigms, relatively infrequent and unexpected stimuli impair the detection of a probe presented 300-400 ms thereafter. The detection deficits, however, quickly habituate across successive surprise trials. Here we sought to identify the EEG markers of SiB and SiD to better understand their causes and relationship. 30 participants completed the paradigms in counterbalanced order, with each containing 24 surprise trials amongst 160 total trials. Event-related potential analyses suggested two dissociable components time-locked to surprise stimulus presentations: an early one from 100-400 ms and a late one from 400-600 ms. The responses in the early window differed in scalp distribution and amplitude across modalities, and did not change significantly over successive trials. The responses in the late window were similar across modalities, with a parietal positivity that peaked at around 400 ms and decreased in amplitude over successive surprise trials. These qualities are indicative of a P300 late positive complex and consistent with the behavioural effects. We conclude that the SiB and SiD perceptual deficits are the
consequence of expectation violation and subsequent attentional reorientation, as indexed by the P300.

93. Motion silencing in dynamic orientation change detection and discrimination

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Detecting changes in our environment is critical for survival, but the motion silencing effect (MSE) may disrupt this ability when feature changes are coincident with motion. Experiment 1 asked 8 participants to make 2,160 binary decisions about the orientation changes of Gabor patches arranged in an annulus around fixation, displayed at various global rotational velocities (0 - 96 degrees per second). Participants indicated whether they could perceive local orientation changes. The data showed a clear decrease in local orientation change detection as global velocity increased. Experiment 2 used a Posner style cueing paradigm to investigate whether manipulating covert attention would decrease the MSE in orientation change discrimination. Using valid, invalid, and neutral line cueing conditions and the psi-marginal adaptive method to estimate threshold parameters, 36 participants discriminated the direction of local Gabor patch orientation change. Results showed a clear cueing effect, where participants were able to discriminate orientation change at higher global rotation velocities using a valid cue compared to a neutral or invalid cue. This suggests that spatial attention can moderate the MSE and encourages further investigations into the dynamic interplay between attentional and lower motion levels of processing. Funded by EPSRC Macquarie Cotutelle Award/Cotutelle iMQRES.

94. Cognitive drivers for the ‘default’ dynamic of human vision, and a hypothesis regarding neural correlates of the strength of imagined sensory experiences

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When people close their eyes, alpha-band (~8-12 Hz) oscillatory power increases. This encourages the idea that alpha-band oscillations are a default dynamic of the visual brain. We examined this by recording brain activity while people tried to meditate with eyes open or closed (Eyes Condition), when people attended to auditory or to visual changes through closed eyes (Attention Condition), and when people imagined having audio or visual experiences with closed eyes (Imagination Condition). We could decode the type of experimental epoch in the Attention and Imagination conditions from Eyes Condition spectra, because when people imagined or attended to audio or visual inputs, spectra were respectively more similar to Eyes closed and to Eyes open spectra. Our data are consistent with spectra changes when people close their eyes being partially driven by cognitive operations that trigger a targeted suppression of visual processing. We also find evidence that the strength of imagined sensory experiences might relate to an interplay between neural networks responsive to inputs from different sensory modalities. Mental imagery may involve a suppression of activity in non-imagined modalities that scales with the strength of imagined experiences.

95. Comparing mental imagery experiences across visual, auditory, and other sensory modalities

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Though mental imagery is often studied in the visual modality, it can also involve sensory experiences of sound, taste, smell, or even touch. Yet, it’s unclear whether mental images are constructed in a similar or distinct manner across sensory modalities. Consequently, here we obtained and compared reports on the properties of auditory and visual mental imagery experiences using an extensive questionnaire. For both modalities, we surveyed participants on the temporal properties of their imagined content (e.g., onset latency, duration), spatial properties (e.g., apparent location), effort (e.g., ease, spontaneity, control), and dependence on body movements (e.g., eye movements). We additionally probed for interactions between real and imagined content (e.g., inner speech during reading), and the perceived normality of imagery experiences. Participants also ranked their mental imagery experiences in the five traditional sensory modalities and reported on the involvement of each modality during their thoughts, imagination, and dreams. Overall, visual and auditory experiences tended to dominate mental events. Most people also reported that auditory mental imagery was superior to visual mental imagery on almost every metric tested except spatially. These findings suggest that mental images are restrained in a modality-specific manner similar to that during veridical perception and sensory-relevant self-generated movements.

96. Comparing metabolic and functional connectomes across ageing: a simultaneous MRI-PET study

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Functional magnetic resonance imaging (fMRI) has been the dominant tool to understand the neural changes of ageing. However, fMRI provides only one viewpoint of neural communication, and fMRI-measures are confounded by non-neuronal contributes, making it difficult to compare between groups, such as younger vs. older adults. Positron Emission Tomography (PET) using F18-fluorodeoxyglucose (FDG) characterises cerebral glucose uptake and is a quantifiable index of neural activity. With the advent of ‘functional’ FDG-PET, which provides a within-subject time-course of glucose uptake at a high temporal resolution (i.e., 16 seconds), researchers now can examine metabolic activity during cognitive tasks. Here we used simultaneous FDG-PET/fMRI to investigate how hemodynamic fMRI activity and metabolic fPET activity during an anti-saccade task differs between younger and older adults via independent component analysis. Results revealed that for both modalities the oculomotor network relates the strongest to task-related saccadic behaviour across age groups. However, the frontal eye field showed stronger metabolic fPET activity for older than for younger adults, whereas for hemodynamic fMRI activity this result was the opposite. These findings demonstrate the advantages of simultaneous FDG-PET/fMRI in providing a comprehensive understanding of the neural mechanisms that underpin ageing and highlights the importance of multimodality imaging in neuroscience research.

97. Exploring relationships between ageing, cognition, and the aperiodic component of resting-state electroencephalography (EEG) in healthy older adults

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Age-related changes in brain health are well established, with a clear association between ageing and decreased cognitive performance. While much research has explored age-related slowing of alpha-band activity, poorer cognitive performance has been linked with greater magnitude of the aperiodic component, or non-oscillatory brain activity, as measured with resting state (rs-) EEG. This study aimed to explore the relationship between cognitive performance and the aperiodic component obtained from
the rs-EEG of otherwise healthy older adults (n=76) aged 55-75 years with subjective memory concerns. Cognitive performance was measured via the Repeatable Battery for the Assessment of Neuropsychological Status (RBaNS), which assesses five cognitive domains (i.e., Immediate Memory, Visuospatial, Language, Attention and Delayed Memory). Results from a hierarchical regression analysis controlling for sex indicated age was a significant predictor of total RBaNS scores (beta = -0.409, p < .001), which aligns with existing literature associating older age with poorer cognitive performance. Ongoing analyses are planned to examine this relationship in conjunction with the aperiodic component of the EEG. It is expected that greater magnitude of the aperiodic component will be associated with lower total RBaNS scores, extending existing findings to an older population with subjective memory complaints.

98. Neuropsychological subtypes of incident mild cognitive impairment and mild neurocognitive disorder in a population-based cohort of older adults

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In recent years, studies of Mild Cognitive Impairment (MCI) have identified different subtypes characterised by distinct neuropsychological profiles, with four subtypes commonly identified. Using data from the Personality and Total Health Through Life (PATH) study, we investigated whether four distinct neuropsychological subtypes could be empirically derived in a sample of a) incident MCI and b) mild neurocognitive disorder (mNCD). 117 incident MCI and 161 mNCD participants aged 72-78 were included. For both incident MCI and mNCD, cluster analysis revealed a four-cluster solution which included amnestic and dysexecutive clusters. For Incident MCI, additional clusters were mixed dysexecutive/visuospatial and dysexecutive/visuospatial clusters, whereas mNCD additional clusters were a subtle cognitive impairment and a global impairment cluster. Discriminant function analysis revealed that 94% and 91% of MCI and mNCD participants respectively were correctly classified based on cognitive domain scores. Comparison of these clusters with single/multidomain MCI classifications showed that significantly more participants classified in the amnestic clusters were also classified as amnestic single-domain MCI. In conclusion, amnestic and dysexecutive subtypes were consistently identified across incident MCI and mNCD samples, whereas other subtypes are less consistently identified. Future research should investigate the neurobiological underpinnings of these subtypes, and their capacity to predict progression to dementia.

99. Distinct structural connectivity development in young people at high risk of bipolar disorder

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Bipolar Disorder (BD) has a strong familial component and close relatives of sufferers have been found to display similar structural network dysconnectivity patterns[1,2]. Structural connectomics and network-based statistics[3] describes the developmental trajectories of reorganization and miswiring in BD sufferers[4]. We study young adults with familial risk of BD and hypothesized: changes in (dys)connectivity distinguishes those at high-risk of BD from Controls, and these differences scale with the emergence of mood episodes before follow-up. Longitudinal data were acquired (baseline, 2-year follow-up) in age/IQ/sex-matched cohorts aged 12-30: High-Risk (HR) (n=97, 46 female) participants were unaffected individuals with a first-degree relative with BD; Control participants (n=86, 57 females) had no family history of mental illness. We used DTI MRI, with whole-brain probabilistic tractography to generate structural networks. Control/HR group differences at follow-up were benchmarked against a cohort with BD. Both groups shared widespread longitudinal network changes, with increases and decreases in connectivity. HR show differences in structural connectivity dynamics in a multi-system subnetwork, relating to facial affect processing, emotion, and cognitive control. The
developmental trajectory of HR young adults shifts towards the dysconnectivity pattern observed in BD suffers, and qualitatively scales with emerging symptoms, and may represent a marker to predict conversion versus resilience, to BD in HR young adults.

100. Shared Visual Context and Redistribution of Tasking in a Simulated Submarine Control Room

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Advances in digital technology that allow shared visual context and redistribution of tasking may alleviate workload and communication bottlenecks in complex work systems. This study examined the benefits of distributing visual imagery and task analysis tools, typically available only to the periscope operator, to other team members in a simulated submarine control room. Teams of five individuals (Sonar operator, Periscope operator, two Track Motion Analysts, Track Manager) undertook tasks typical for a submarine on patrol. Eighteen teams were allocated to one of three conditions. In the Baseline condition, visual imagery was available only to the Periscope operator, to other team members in a simulated submarine control room. Teams built the most accurate tactical picture (contact localization) when provided imagery+tools, indicating benefits resulted from task redistribution rather than information sharing. This came at a cost to workload, with both the imagery-only and imagery+tools conditions reporting higher workload. However, the reverse effect was shown in operator physiology, with heart rate variability and electrodermal activity indicating the two sharing systems were associated with lower physiological stress. There was no impact on situation awareness or on the completion of the broader team missions.

101. Disentangling the Prioritisation of Ownership and Reward in Memory

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Motivation fundamentally shapes our memory formation. When stimuli are paired with anticipatory monetary rewards (or other motivational properties), memory for that stimulus is enhanced. Similarly, ownership or object endowment can enhance memory for self-referenced stimuli. For example, individuals categorise their belongings as being of higher value and on recognition tasks recall self-related information with greater accuracy than other-related information.

It is currently unclear, however, if financial reward can be disambiguated from mere ownership in the formation of self-related memories. It is also unclear if there are developmental differences in the prioritisation of ownership and reward. Using a well-established ownership paradigm, we tested incidental memory for older (N = 72) and younger adults (N = 67) on stimuli that symbolised differences in ownership as well as differences in monetary reward. Memory for items across both age groups was comparable, such that memory was enhanced by ownership, but only when paired with a monetary reward. Decision-making strategies employing the use of drift diffusion modelling (LBA) show key differences in drift rate and threshold, such that faster drift rates for stimulus high in reward was apparent for young adults, but not older adults.

102. Children’s Emotional Experiences and the Controllability of Counterfactuals

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Counterfactual thinking involves imagining alternative outcomes for actual past events. When we consider counterfactual alternatives to actions that were within our own control, which can help us learn to choose better actions in the future. This study investigated children’s emotional experiences when considering controllable and uncontrollable counterfactuals. Four- to 9-year-old children (N = 192) were presented with two pairs of boxes, with each pair concealing one white ball and one black ball. Children selected a box from one pair (controllable) and the experimenter spun a wheel to select a box from the other pair (uncontrollable). The contents of the boxes were then revealed, with the child winning stickers if the selected boxes concealed matching balls but losing stickers if not. Children reported which selected box they felt better about (when they won) or worse about (when they lost). When they won, children across ages felt better about the box that was within their control. When they lost, however, older children were more likely than younger children to feel worse about the box that was within their control. These older children likely experienced regret when considering the counterfactual action of selecting the other box within the pair.

103. 3D Diamonds are LOC’s best friend - exploring the role of LOC in 3D vs 2D perceptual rivalry
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Perceptual rivalry stimuli has often been used to probe various aspects of the visual system, with perceptual rivalry stimulus known as ‘the diamond illusion’, repeatedly showing distinct fluctuating fMRI activations within the visual stream (V1, LOC), depending on whether the global or local form of the stimulus is being perceived (Fang et al., 2008). Additionally, there are mixed findings suggesting that LOC may have a role in processing 3D object stimuli, with stronger responses occurring with 3D images of objects compared to 2D images of objects (Grill-Spector et al., 2001). The current study used 3D and 2D forms of ‘the diamond illusion’ to investigate whether LOC processing can influence perceptual switching and duration rates. For the 3D condition, we hypothesised longer durations of stable perception, with less perceptual switching when perceiving the global form of the diamond. As expected, preliminary data has shown longer durations of the global form percept, when viewing the 3D diamond stimuli, compared to the 2D diamond. This suggests areas of LOC may play a role in 3D depth perception or object processing, compared to 2D images. This opens new avenues for exploring visual processing differences in populations with high autistic and schizotypal traits.

104. ERP correction for the study of non-phase-locked neural oscillations - an evaluation of methods
Anthony Harris, Queensland Brain Institute, The University of Queensland

Rhythmic properties of brain activity - neural oscillations - have been associated with a wide range of cognitive and perceptual phenomena, developmental changes, neuropsychological disorders, and neuro-computational processes. Understanding of the computational mechanisms subserved by neural oscillations has been hindered by the difficulty of differentiating legitimate oscillatory brain activity from the additive contribution of event-related potentials (ERPs). The ERP typically fluctuates at theta (4-7 Hz) or alpha (8-12 Hz) frequencies, but the extent to which it reflects a true endogenous oscillation is debated. Hence, in analysis of neural oscillations, the ERP is typically removed from the signal prior to analysis to remove its potentially confounding influence. I will show here that simple ERP subtraction does not adequately address the problem of the ERP, as deviations of single trial brain activity from the average ERP produce responses in similar oscillatory frequency bands to that seen in the averaged signal. In this work I examine the adequacy of ERP subtraction and several other single-trial ERP estimation techniques for removing the evoked response in both simulated and real EEG data. I test these methods separately for amplitude- and phase-based analyses and make recommendations for appropriate ERP controls in each type of analysis.
105. Resting state functional connectivity of the dorsal attention network in cannabis use disorder: a fMRI study
Lisa-Marie Greenwood, Australian National University

The dorsal attention network (DAN) focuses the brain’s attention towards task-related visual stimuli and has been linked to impaired cognitive performance and psychotic-like symptoms. Disruptions in the DAN may underlie altered visual salience processing, increased psychosis vulnerability and altered attention processing in cannabis use disorder (CUD), but this has not been investigated. In this cross-sectional study, we compared resting state functional connectivity regular cannabis users who meet DSM-5 criteria for severe (n=29) versus mild (n=21) CUD, and non-using controls (n=26). Averaged network strength in the DAN was defined as the z-transformed Pearson’s correlation coefficient between the mean time-series of all network nodes using the Gordon Atlas. Linear mixed-models examined group differences and interactions with psychotic-like symptoms. Severely dependent cannabis users had greater average network strength in the DAN compared to mildly dependent users (p=.04) and non-users (p=.02). Greater network strength in the severely dependent group was associated with more disorganised psychosis-like symptoms (p=.04), while the opposite direction was observed in mildly dependent users (p<.01). Hyper-connectivity of DAN strength was found in severely dependent cannabis users. Differential associations between disorganised symptoms and network strength as a function of CUD severity may indicate an increased vulnerability of psychotic-like symptoms in severe CUD.

106. Evidence for dissociable and shared mechanisms underlying motion-induced position shift illusions
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Motion-induced position shifts (MIPS) are a group of visual illusions, in which motion signals bias an object’s position, causing the object’s position to be misperceived. Previous research has typically studied MIPS individually, proposing various mechanisms (e.g., postdiction and extrapolation) to explain each illusion. Consequently, the extent to which shared or dissociable mechanisms underlie these phenomenologically similar illusions remains unknown. This study sought to address this gap, by examining individual differences in illusory magnitude. During two sessions participants (N = 40, data collection ongoing) viewed eight MIPS. Participants viewed: the flash-jump effect, Fröhlich effect, flash-drag effect, flash-grab effect, motion and luminance flash-lag effect, twinkle-goes illusion, and stationary objects containing internal motion (SOIM). For each participant, an average illusory effect was calculated for each illusion, by averaging across both sessions, then correlations between all possible pairs of illusions were explored. Preliminary results found 4 significant positive correlations, 3 of these were between the flash-grab effect, twinkle-goes effect and SOIM, which were all correlated with one another. These positive correlations suggest shared mechanisms may underly some MIPS. The uncorrelated illusions observed indicate that dissociable mechanisms may underly some MIPS. Overall, the preliminary results suggest both dissociable and shared mechanisms could underly MIPS.

107. The folly of pretending it’s not real: A failure of cognitive reappraisal to modulate perception and memory for aversive images
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People spontaneously prioritise emotional information. This bias can emerge during perception and memory encoding, which are dissociable such that factors may modulate one without the other. We investigated whether a form of emotion regulation called cognitive reappraisal reduced prioritisation of negative emotional distractors.
Participants performed an emotion-induced blindness (EIB) task, where emotional distractors impair target perception, which reflects their perceptual prioritisation. They did this either while or while not engaging in reappraisal, that is, imagining distractors to be fake. Afterwards, participants completed a surprise recognition test for the distractors, followed by measures of state and trait anxiety, and callous-unemotional traits. Results indicated that the reappraisal instructions did not decrease perceptual or memorial prioritisation of distractors; a manipulation check suggested that this may have stemmed from their ineffectiveness at reducing participants’ subjective emotional responses. However, exploratory analyses found that state anxiety predicted greater perceptual prioritisation (more EIB) and greater incidental memory for distractors, whereas callous-unemotional traits predicted less incidental memory for distractors.

**108. Controlling image valence removes ‘nature effect’ for cognition but not subjective restoration.**

Michelle Roberts*, PhD Student

Experiencing nature is associated with robust psychophysiological and affective benefits, however these restorative outcomes are less evident when viewing nature passively. As nature scenes are overwhelmingly visually preferred, it is also unclear whether restorative benefits are due to viewing nature itself, or merely highly-preferred stimuli.

We employed a 2 (Scene: Natural, Urban) x 3 (Valence: High, Intermediate, Low) between-subjects design (each group n ≥ 60; total N=389) to measure cognitive performance (Attention Network Test, Backwards Digit Span) and subjective restoration (self-reported fatigue). Stimulus valence was controlled via ‘calming’ ratings provided by an independent sample (N=990). 30 images were randomly selected for each scene/valence group based on the highest, middle and lowest-rated thirds. Participants completed a cognitive battery then viewed and rated images in a 10-minute restoration window before a second cognitive battery. Subjective fatigue was measured at baseline, post-cognitive batteries and post-restoration.

High and intermediatively-valent images were rated as more preferred and calming than low images. Irrespective of scene category, participants viewing high valence images reported greater reductions in subjective fatigue following the restoration window. These benefits did not correlate with increased cognitive performance. Our findings indicate that subjective restoration may be modulated by image valency more so than image naturalness.

**109. Different representational mechanisms account for mental imagery and perception in the visual cortex: modulation vs excitation.**

Thomas Pace*, University of New South Wales (PhD student)

Roger Koenig-Robert, University of New South Wales
Professor Joel Pearson, University of New South Wales

Current imagery research has frequently concluded visual imagery is functionally equivalent to a weak form of visual perception. We report novel evidence that perception and imagery are represented in the brain in fundamentally different ways. Where perceptual representations are generally defined by increased excitatory activity, imagery is largely represented via down-regulating or modulating activity. We first developed binocular rivalry methodology that put the visual system into a state of adaptation, then probed the additivity of perception and imagery. If imagery drives similar excitatory activity to perception, pairing imagery with perceptual adapters should increase adaptation. While pairing weak perception with adapters increased measures of adaptation (additive), pairing imagery had the opposite effect (subtractive), reversing their effects. Further discrimination experiments, along with physiological data from steady state visually evoked potentials, showed that this reversal was caused by imagery suppressing brain signals representing non-imagined content. This is the first evidence for the role of inhibitory feedback in modulating the visual cortex to produce mental images. These data provide novel behavioural and neural evidence that the brain represents imagery and perception in categorically different ways (modulation vs driving), providing a mechanism for their different qualia, and provokes a fundamental reanalysis of current imagery models.
110. Effective connectivity of imagery under psilocybin
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Visual alterations under classic psychedelics can include rich phenomenological accounts of eyes-closed imagery. Feedforward connectivity of the visual pathway is suggested to underpin sensory perception, and feedback connectivity is suggested to be enhanced during intentional imagery. We investigated directed connectivity change to visual, associative pathways using eyes closed resting-state functional MRI scans of 20 healthy adults under 0.2mg/kg psilocybin (magic mushrooms) or placebo. The regions investigated were the early visual region, fusiform gyrus, intraparietal sulcus, and inferior frontal gyrus. We observed a pattern of reduced inhibition from anterior visual-associative regions to posterior regions and increased self-connectivity of both early visual and higher visual-associative regions under psilocybin. Moreover, the self-connectivity of visual regions and connectivity from the fusiform gyrus to the early visual region was associated with behavioural measures of complex and elementary imagery taken immediately after the scans under psilocybin. Our analysis suggests that directed mechanisms of psilocybin-induced visual hallucinations involve decoupled excitation of visual and visual-associative regions and reduced inhibition of feedback connectivity. The results inform our understanding of clinical hallucinations and perception and how psilocybin induces visual imagery.

111. Investigating the experience of visual illusions in individuals who lack visual imagery (aphantasia)
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Why do we see things when our retinae are not physically stimulated and why are some of us more prone to seeing these things than others? Here we assess the role individual differences in voluntary visual imagery plays in the experience of other non-veridical visual experiences. We did this by investigating the experience of visual illusions in a special population who have no visual imagery (aphantasia). In our first study we had aphantasic individuals view a number of classic visual illusions and compared their subjective reports to individuals with imagery. The only illusion which showed a consistent significant reduction for aphantasic individuals was the neon colour spreading illusion. In a second large online study we used the method of adjustment to obtain a measure of the strength of the neon colour illusion. Using this measure we found that the aphantasic individual’s experience of the neon colour illusion was weaker than controls. Importantly there was no difference between the two groups when viewing catch (mock) neon colour ‘illusions’. Taken together these data provide evidence that individuals with aphantasia experience less vivid neon colour illusions, highlighting a potential link between two forms of non-veridical perception (neon colour illusion and voluntary visual imagery).

112. More and different mind wandering with mental imagery
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Mind wandering forms a major part of human experience, spontaneously commandeering our attention towards contents outside of the here and now. It reflects both
a limitation in our ability to control our own cognition and a unique ability to motivate ourselves by generating alternatives to the present moment. Given the prevalence, benefits, and costs of this psychological phenomenon, our understanding of it is severely lacking. Mind wandering may involve any of the sensory modalities. We were interested in the role of visual mental imagery in mind wandering. To investigate how mind wandering differs without mental imagery, we used a special population with a condition known as aphantasia, who are unable to voluntarily generate mental images. We compared mind wandering during a sustained attention to response task (SART) between self-reported and questionnaire defined aphantasics and controls with imagery. Individuals with aphantasia reported mind wandering less frequently during the task than controls with imagery. Also, aphantasia mind wandering was more present-focused and involved less images, with more abstract thoughts. These findings suggest that the format of thoughts does influence the process of mind wandering. It appears more abstract and present-focused, and less frequent without visual imagery, suggesting implications for those without imagery.

113. Body Image and Body Imagination: Aftereffects of seeing, remembering and imagining extreme body shapes on perceived body size

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Evidence suggests that mental imagery shares many properties with perception generated by retinal stimulation, including their associated neural activation patterns. For example, like perception, prolonged periods of visual imagery can produce perceptual aftereffects. That aftereffects tend to be smaller for prolonged visual imagery than for prolonged visual stimulation is one line of evidence suggesting that imagery functions as a weak version of perception. However, as neural activation patterns overlap more substantially for high-level perception, we sought evidence of high-level aftereffects - in particular the body size aftereffect. We assessed body size perception after an extended period of viewing, remembering, or imagining a set of low- or high-BMI bodies. As in previous studies, body size aftereffects were evident after visual exposure to bodies either with low or high BMIs. Remembering and viewing low-BMI bodies caused aftereffects of similar magnitude. However, imagining low-BMI bodies caused significantly larger body size aftereffects. These results appear inconsistent with the idea that imagery of low-BMI bodies is equivalent to weak perception of the same bodies. The results are discussed with reference to the particular emotional salience of body imagery, and the potential for top-down influences on body size estimation in general.

114. Cortical changes in survivors of childhood medulloblastoma

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Paediatric medulloblastoma patients are at significant risk for language deficits following surgery, chemotherapy and radiotherapy. Changes in cortical grey matter may be potentially sensitive biomarkers for such deficits. This study first examined reading outcomes in patients 1-year post treatment and then compared their cortical volume and morphology to healthy controls using voxel-based and surface-based morphometry. 26 patients (mean age 11 years 2 months) were recruited and matched for age and sex with healthy control subjects. Reading measures from the Woodcock Johnson Test of Achievement III were acquired. Structural 3D T1-weighted magnetic resonance imaging scans were obtained to measure cortical thickness, gyrification, surface complexity and
sulcal depth using the Computational Anatomy Toolbox (CAT12). Significant reading deficits were present in the medulloblastoma cohort. Whole-brain voxel-based morphometry revealed significant reductions across all measures in bilateral perisylvian frontal, temporal and occipital regions in medulloblastoma patients compared to controls. Patients also showed significant increases in gyrification compared to controls in frontal and temporal regions. This study provides preliminary evidence that differences in reading abilities in children following medulloblastoma treatment may be related to changes in cortical grey matter, highlighting the need for improved understanding of specific biomarkers for language outcomes.

115. Developmental trajectories of inhibition and fronto-basal-ganglia white matter in childhood ADHD: A possible mechanism for inhibitory deficits?

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Legacy deficits are often considered to be one of the key behavioral phenotypes in Attention-deficit/hyperactivity disorder (ADHD). However, there is a paucity of work examining developmental changes in inhibitory control and the underlying associated development of white matter in ADHD. Stop-signal task data were obtained from a cohort of children aged 9-14 (ADHD=135; Controls=138) across three time-points. Using Bayesian modelling, go and stop-trial responses were decomposed into separate parameters reflecting the mean, variability and skew. Failures to respond or inhibit were likewise modeled to account for attentional constraints. A subset of the total cohort had acquired diffusion MRI data (ADHD=74; Controls=73). Fixel-based analysis, a novel fibre-specific framework, was used to estimate white matter properties of the fronto-basal-ganglia circuit, a central network for inhibition. As predicted, longitudinal analysis revealed consistent deficits in inhibitory performance in the ADHD group compared to controls. ADHD children also displayed more task failures, suggesting that poor performance may be related to attentional lapses. In contrast, despite there being significant age-related increases in fronto-basal-ganglia macro-structure, no group differences were observed. Further analyses will explore the degree to which altered tract profiles of the fronto-basal-ganglia circuit subserve poor inhibitory control in ADHD.


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Research suggests variations in atypical white matter development could contribute to the underlying neuropathology of attention-deficit/hyperactivity Disorder (ADHD). However, it is not clear how much of
this contribution relates to axonal myelination. The T1w/T2w-ratio is a novel neuroimaging technique used to estimate neural myelination. We aim to analyse T1w/T2w-ratio neuroimaging data to estimate white matter myelin developmental trajectories of children with and without ADHD. 190 scans of children aged 9-15 years (nADHD = 99, nControl = 91) underwent MRI scanning at up to three waves. T1w and T2w neuroimaging scans were combined and calibrated, producing individual T1w/T2w-ratio maps. White matter tracts were delineated using TractSeg with average tract values extracted using MRtrix3Tissue. Data were analysed with linear mixed-effects models in R. Preliminary results indicate a consistent positive linear effect for age across most white matter tracts, with white matter myelination increasing over the three waves. No main effect for ADHD diagnostic status, nor an interaction between age and diagnostic status was found. This may suggest that while white matter myelination increases across childhood, this developmental trajectory does not differ for children with ADHD.

117. Longitudinal structure-function coupling in children with ADHD and typically developing children
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Attention deficit hyperactivity disorder (ADHD) is a prevalent childhood neurodevelopmental disorder characterized by aberrant structural and functional brain networks. No studies to date have investigated how the maturation of white matter networks supports functional communication during brain development in ADHD children. Here, we characterize the development of structure-function coupling of 175 individuals (aged 9-14y; controls=84; ADHD=91) in a longitudinal neuroimaging study with up to three waves (total number of observations = 278 [139 control/139 ADHD]). Structure-function coupling was calculated using spearman’s-

rank correlation between the structural and functional connectivity of each region (to the average of all other regions). We found strong structure-function coupling across this period in frontoparietal, limbic and paralimbic regions. ADHD children showed higher structure-function coupling in inferior premotor cortex, and lower coupling in dorsolateral prefrontal cortex and anterior cingulate, relative to controls. Further, there was a significant interaction between age and group; ADHD children showed lower structure function coupling from 9 to 11 years and an increase in structure-function coupling from 11 to 14 years in different regions of frontal and parietal cortices. These findings suggest that children with ADHD exhibit differential patterns of brain development, illustrating atypical patterns of coordinated white matter and functional connectivity development.

118. Multimodal assessment of a self-guided training approach to treating anxiety in autism
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Deanna Varley, University of Queensland
Kelsey Perrykkad, Monash University
Claudia Kinnane, Minds & Hearts
Wesley Turner, Minds & Hearts
David Zimmerman, Minds & Hearts
James Kirby, University of Queensland

Autistic adults frequently struggle with anxiety at rates higher than the equivalent neurotypical population. Associations between autistic traits and anxiety have been shown to be mediated by self-criticism - the target of compassion focused therapies. Compassionate Mind Training (CMT) programs build skills to reduce self-criticism through the promotion of self-compassion: the ability to recognise suffering of the self and committing to alleviate said suffering. While CMT has led to improvements in self-compassion across multiple cohorts, very little research has examined the feasibility, fidelity, and efficacy of CMT with autistic clients. We conducted a pilot investigation (N=23) into the efficacy of a key component of CMT, cultivating the compassionate self, delivered through an online self-guided daily meditation with autistic adults. Participants were asked to complete a daily ten-minute meditation over one week while wearing ambulatory heart rate monitors and completing seven daily experience
sampling surveys. Pre- and post- intervention surveys and parasympathetic reactivity to a self-criticism task were compared to test the effects of light-touch CMT, along with qualitative surveys on participant experience to assess the fidelity and accessibility of this approach. Our findings indicate compassion focused approaches are a feasible and self-focused means of reducing everyday anxieties in autistic adults.

119. A meta-analysis on the processing effects of mood: Positive mood increases reliance on heuristic knowledge compared to negative mood

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Cognitive processing that relies on learned knowledge structures, like schemas and stereotypes, can lead to inaccurate memories, judgments, and decisions. This multi-level meta-analysis examined whether positive mood increases such heuristic processing compared to negative mood. We included 65 eligible studies with 115 effect sizes (N = 10,216) and evaluated multiple outcome domains including social judgment (28 studies, 48 effect sizes), decision-making (8 studies, 13 effect sizes), persuasion (13 studies, 27 effect sizes), and schema-based false memory (18 studies, 27 effect sizes). Results of the pre-registered meta-analysis showed participants in a positive mood were more likely to use stereotypes and heuristics and exhibit schema-based false memory than those in a negative mood (Cohen’s d = 0.17). This effect was contingent upon experimental conditions that did not actively prime more detailed processing or draw attention to the source of a mood. These findings support the idea that mood regulates processing style selection. However, findings from a quality assessment of included studies suggest several weaknesses in the literature, including lack of reported experimenter blinding or failure to use a suspicion probe. Consequently, demand characteristics may be a contributor to the published findings.

120. Affective reactivity to reward as a marker of the severity of emotional disorder symptoms in the general population

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Mood and anxiety disorders are associated with diverse alterations in the intensity and stability of emotions. These affective symptoms are major contributors to reductions in quality of life across psychiatric disorders; however, the underlying cognitive and affective processes that give rise to pathological emotional states remain poorly understood. In this project, we investigated affective reactivity to reward, a novel affective/cognitive phenotype that represents the degree to which subjective emotional states fluctuate in response to minor everyday pleasant and unpleasant events. An online general-population sample (N = 329) completed a custom risky decision-making task with embedded high-resolution sampling of subjective emotional states, as well as measures of anxiety, depression, and hypomania. Formal comparison of hierarchical Bayesian computational models revealed that participants’ self-reported emotional states within the task were best explained by a model comprising a set of three cognitive appraisals: outcome amount, reward prediction error, and counterfactual reward difference. Within these appraisals, individual differences in a model parameter quantifying affective reactivity to outcome amount were positively correlated with the severity of self-reported symptoms of depression, hypomania, and anxiety. These results suggest stronger affective reactivity to reward as a candidate marker of the severity of emotional disorder symptoms across discrete diagnostic categories.

121. Working memory load reduces spontaneous memory encoding, but not perceptual prioritisation, of emotional stimuli

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Emotional stimuli appear to be prioritised in the course of perception, in that they (a) gain access to awareness during manipulations that otherwise suppress perceptual awareness and (b) disrupt perception of competing non-emotional stimuli (e.g., “emotion-induced blindness”). Emotional stimuli also appear more memorable than non-emotional stimuli and can form the basis of unwanted lingering, intrusive memories. To what degree can spontaneous perceptual prioritisation of emotional stimuli be disentangled from spontaneous encoding of them into memory? In an experiment testing this question, we examined whether they could be dissociated through a working memory load manipulation. Participants engaged in an emotion-induced blindness task (searching for a single target within an RSVP stream, which could be preceded by a task-irrelevant emotional image on some trials) either while under concurrent working memory load (holding six digits in mind) or while under no load. Working memory load had no impact on the degree to which emotional distractors impaired target perception, but it did reduce participants’ memory for distractors that appeared during the high-load condition. These results demonstrate both that emotional prioritisation in perception and memory can be dissociated and that spontaneous encoding of emotional distractors may be more malleable than prioritised perceptual processing of them.

122. Compassionate meditation effects on parasympathetic reactions to self-critical threat
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Indices of cardiac vagal tone including heart rate variability (HRV) are important biomarkers of parasympathetic responses to threat (Di Bello et al., 2020). Compassionate mind training (CMT; Gilbert, 2009) focuses on improving self-compassion and mitigating threat responses associated with self-criticism (Steffen et al., 2020). However, its benefits may be hindered by fears of compassion - fearful or avoidant responses to experiences of compassion/positive affiliative emotions. We investigated whether one week of CMT improves HRV reactivity to self-critical threat, and whether changes in HRV reactivity are moderated by fears of compassion. We randomly assigned 102 participants to complete daily CMT meditations over one week or a no-meditation control. We measured HRV responses during a self-critical threat task to compare to resting HRV as a measure of HRV reactivity in two sessions (before and after intervention). Responses on the fears of compassion scales (Gilbert et al., 2011) were used to test whether fears are reduced with CMT, and whether fears can explain differences in HRV reactivity pre- and post-intervention. This research may have important implications for clinical practice, as the presentation of aversive responses to therapeutic techniques has prognostic consequences for effectiveness of and client engagement in therapy (Gilbert, 2010).

123. Poser vs. Perceiver: Cultural variability in the expressivity and recognizability of emotions
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Whether emotions are universally recognizable or vary across cultures has been a longstanding debate within the field of emotion recognition. The current study aimed to expand the evidence for Dialect Theory, which predicts that experience with individuals of a particular cultural results in increasing recognition of that culture's emotional dialect. We predicted that individuals with greater cultural exposure would better recognize spontaneous emotional expressions from a range of different cultures. Expressions were taken from footage of athletes from around the world, immediately after a win or loss during the Weightlifting World Championships. Participants (N=96) rated whether athletes had won or lost, how energetic, and how positive or negative athletes were feeling. In contrast to predictions from Dialect Theory, we did not find evidence that greater cultural exposure influenced emotion recognition. Instead, differences in the expressivity of cultures emerged, with athletes from western cultures producing more broadly recognized expressions. In addition, recognition of expressions from athletes from different regions was not influenced by participants’ own cultural exposure. These findings highlight the importance of examining real-world emotional expressions and suggest that it is the poser, rather than the perceiver, who plays the most integral role in emotion recognition.
124. Chronic Cannabis Use and Error Awareness: The Effect on Learning from Errors
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Cannabis is the most commonly used illicit drug worldwide, with studies suggesting a deleterious effect on some aspects of performance monitoring. It is unknown, however, whether diminished error awareness influences adaptive behaviour in chronic cannabis users. Therefore, this study examined the effect of error awareness on learning from errors in cannabis users. Thirty-six chronic cannabis users (Mage = 23.81 years) and 34 controls (Mage = 21.53 years) completed a Go/No-Go task that allowed participants to learn from errors and adapt their behaviour. While multilevel models showed no difference in error awareness and correction rates between the groups, there was a significant effect of age of use onset on error correction in cannabis users. Further, the effect of error awareness was dependent on age of onset and cannabis use-related frequency and harm. That is, cannabis users reporting an earlier age of first use or scoring higher on the cannabis use index were less likely to perform correctly following an aware error. Taken together, it appears overall cannabis use might not be tightly coupled to behavioural indices of performance monitoring. There is evidence, however, that aspects of cannabis use predict impairments in learning from errors that may be associated with treatment outcomes.

125. Examining resting-state functional connectivity differences between people with moderate-to-severe Cannabis Use Disorder and non-users: An fMRI study
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fMRI studies have shown that cannabis-users display altered properties of neural integrity, including resting state functional connectivity (rsFC). Recent SLR has identified altered rsFC within regions implicated in disinhibition and reward processing (frontal/striatum). We aim to examine rsFC differences between individuals with a DSM5 diagnosis of Cannabis Use Disorder and non-users. We hypothesised rsFC alterations between frontal-frontal regions, and frontal-striatal regions. We measured rsFC using fMRI in 48 cannabis-users and 29 non-users. CONN-toolbox was used for pre-processing and for parcellating the brain. Two-group t-tests were used to identify significant differences in rsFC between region-pairs. Cannabis-users had significantly increased rsFC between two seeds and other region pairings; one seed placed at the occipital pole, paired to supplementary motor area, paracingulate gyrus, inferior frontal gyrus, and anterior cingulate gyrus. The other seed placed in the striatum linking to prefrontal areas. Non-users had significantly increased rsFC globally among insular, frontal, temporal, occipital and parietal lobe pairings. Altered rsFC pairings in this study were consistent with past literature and theories of addiction. People with CUD displayed alterations in regions ascribed to a preoccupation/anticipation (cravings) stage of addiction (prefrontal) and implicated in binge/intoxication (reward) phase (striatal). CUD may be associated with abnormal synchronization between key addiction related brain networks.

126. White matter alterations in cannabis users using Diffusion MRI: a Fixel-Based Analysis study
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Cannabis use disorders (CUD) affect >60 million people globally and have significant adverse psychosocial outcomes (inability to quit, cravings, operating machinery/driving while intoxicated). Such outcomes have been attributed to altered brain integrity but this notion is yet to be tested in people with a DSM-5 diagnosis of CUD and using advanced measures of white-matter microstructure. We used diffusion-weighted imaging to cross-sectionally compare white-matter microstructure (fibre density (FD), fibre cross-section (FC), fibre density and cross-section (FDC)) in 70 people with a CUD stratified by severity (mild=2-3 symptoms, moderate=4-5 symptoms, severe=6+ symptoms), and 28 controls. We explored if group differences are associated with CUD severity and cannabis exposure. CUD and control groups were not significantly different. Both mild and moderate CUD groups vs controls had lower FD in the superior longitudinal fasciculus connecting parietal and striatal-cingulate tracts implicated in addictive behavior (eg disinhibition), and this was correlated with the age of cannabis use onset. Mild CUD compared to controls had lower FC in a fornix region connecting the hippocampus to the subcortex. Different white matter integrity in mild and moderate CUD might reflect transient neuroplastic changes at the initial stages of addiction, which may normalize with the transition to severe CUD.

127. Effects of MDMA and THC on human socioemotional processing
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Both MDMA (3,4-methylenedioxyxymethamphetamine) and THC (delta-9 tetrahydrocannabinol) are being investigated as candidate treatments for a variety of mental illnesses. Alterations to socioemotional processing are thought to contribute to putative therapeutic effects of both substances, yet these effects are not fully understood. In a randomised, double-blind, and double-dummy procedure, healthy adults (n=17; 3 females) underwent three 7-hour experimental drugs sessions (105mg/70kg MDMA, 10mg/70kg THC, placebo). They completed a comprehensive battery of standardized assessments covering a range of clearly delineated socioemotional domains and an fMRI scan. Both substances produced expected generic drug effects, increasing ratings of ‘any effect’, ‘high’, ‘like’ and ‘want more’ (MDMA only), compared to placebo. MDMA also increased positive social feelings of ‘loving’, ‘sociability’, and ‘talkative’ compared to placebo, with no effect on negative social feelings. THC produced no change in positive social feelings and increased ratings of ‘worried about impression on others’ compared to placebo. No drug effects were observed on behavioural measures of social reward and threat processing, cognitive empathy, or social motivation. fMRI data analysis is ongoing. Initial analyses support the prosocial subjective effects of MDMA but provide little evidence of relevant behavioural effects of either THC or MDMA in healthy humans.

128. World first evidence of altered brain reward function in young people with a dsm-5 diagnosis of Cannabis Use Disorder: a fMRI study
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Australia has one of the highest rates of cannabis use globally, with 36% of Australians aged >14 having consumed cannabis in their lifetime. About 200,000 Australians endorse Cannabis Use Disorders (CUD), which are associated with mental health problems, and the third cause of concern of all national drug treatment episodes. CUD-related problems have been ascribed to altered reward brain pathways by prominent neuroscientific theories of addiction. No study has assessed reward brain function in people with a DSM-5 diagnosis of CUD, therefore the neurobiology of CUD is nuclear. We used fMRI to cross-sectionally map brain function during a reward processing task (MIDT), in 70 people with CUDs and 28 controls (pre-registration DOI:10.17605/OSF.IO/29EB4). CUD vs controls had greater brain activity while anticipating rewarding vs neutral outcomes, in medial prefrontal/parietal regions (p<.05, k=10, cluster-wise corrected); which was predicted by greater cannabis dosage and reaction times. CUD vs controls had greater brain activity when receiving rewards vs neutral outcomes, in orbitofrontal and deep brain regions (p<.01, k=10). Dysfunctional brain reward pathways implicated in disinhibition and motivation in CUD are consistent with neuroscientific theories of addiction and may be a target for treatment.

129. Atypical Resting Aperiodic and Periodic Neural Activity in Parkinson’s Disease

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Parkinson’s Disease (PD) has been associated with greater total power in canonical frequency bands of the resting electroencephalogram (EEG), but also reductions in the proportion of total power across all frequency bands. This discrepancy may be caused by aperiodic activity (1/f-like) present across all frequency bands. Aperiodic slope has been linked to the ratio of inhibitory to excitatory neural activity, and the aperiodic offset has been linked to the rate of neuronal spiking, both of which are relevant to PD. We examined differences in the EEG of PD participants (n = 26) and controls (CTL; n = 26). We extracted power from canonical frequency bands using traditional methods, and separate parameters for periodic and aperiodic activity. Cluster-based tests indicated that total alpha and beta power were greater in PD (vs. CTL) participants. The slope and the offset of aperiodic activity were greater for PD (vs. CTL) participants. After removing the aperiodic signal, greater alpha power in PD (vs. CTL) was only present in eyes-open recordings and no reliable differences in beta power were observed. Differences between PD and CTLs in resting EEG are likely driven by aperiodic activity, suggestive of greater relative inhibitory neural activity and greater neuronal spiking.

130. Periodic and aperiodic neural activity displays age-dependent changes across early-to-middle childhood

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The neurodevelopmental period spanning early-to-middle childhood represents a time of significant growth and reorganisation throughout the cortex. Here, we utilised a spectral parameterisation approach to explore age-related changes in both periodic and aperiodic (i.e., 1/f-like) components of the resting-state EEG signal. Eyes-open and eyes-closed recordings were analysed from 139 children ranging from 4-to-12 years of age (average age=9.41 years, SD=1.95). Linear regression models were then used to evaluate if age could predict aperiodic slope and offset, as well as peak frequency and power within the alpha and beta bands, after adjusting for aperiodic activity. Age significantly predicted both aperiodic slope and offset, with the spectral slope flattening, and offset decreasing, with increasing age. The aperiodic-adjusted alpha peak frequency also increased with age; however, there was no association between age and peak frequency for the beta band, or between age and aperiodic-adjusted spectral power within either the
alpha or beta bands, despite power in both frequencies being correlated with the aperiodic signal. These findings highlight the capacity for both periodic and aperiodic activity to elucidate age-related functional changes within the developing brain and emphasise the aperiodic slope and offset as novel non-invasive physiological markers of neurodevelopment.

131. White matter microstructure in cannabis users versus controls: A systematic review of diffusion MRI.
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Chronic cannabis use is associated with altered brain integrity in pathways high in cannabinoid receptors, to which THC, the primary psychoactive compound with neurotoxic properties, binds. If neurobiological alterations extend to white matter is unclear as recently published evidence from state-of-the-art diffusion-weighted MRI tools is yet to be integrated. A PROSPERO pre-registered systematic search of 5 databases led to the identification of 25 diffusion MRI studies of 2262 people aged from 16 to 40 years of age: 1155 cannabis users that started consuming cannabis at approximately 15 years of age, or 9 years, on average; and 1107 controls. All studies but 4, reported group differences in white matter integrity, most consistently: lower fractional anisotropy of the arcuate/superior longitudinal fasciculus and higher mean diffusivity/trace and differences in fractional anisotropy within the corpus callosum. Earlier age of cannabis use onset was associated with FA in the corpus callosum. White matter integrity differences may be due to several mechanisms, including alterations from the effects of THC on brain receptors innervated white matter fibre tracts, or may predate cannabis use onset. Longitudinal studies using advanced diffusion metrics are required to comprehensively define the neurobiology of cannabis use.

132. Network localization of tics: evidence from coordinate-based network mapping and lesion network mapping
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Tourette Syndrome (TS) is a relatively common tic disorder, affecting approximately 1% of children globally and is associated with psychological distress and impaired functioning. Neuroimaging studies implicate widespread cortical and subcortical abnormalities in TS, however, due to the neuroanatomical heterogeneity of these findings, it remains unclear which brain regions are key to TS symptomatology. The aim of this study was to localize a network of brain regions associated with tics, utilising published coordinates of neuroimaging abnormalities in patients with TS and cases of tics caused by focal brain lesions. We used two network localization techniques termed ‘coordinate-based network mapping’ and ‘lesion network mapping’, which leverage a large dataset of normative resting-state scans (n=1000), to assess whether
structural abnormalities in idiopathic TS and tic-inducing lesions, respectively, map to a shared network. This allowed us to identify a neural network associated with idiopathic and secondary tic symptoms, as well as commonalities between these networks. Preliminary analyses demonstrate that both TS and lesion-induced tics map to a common network, including the thalamus, caudate, putamen, globus pallidus (external segment) and occipital lobe. We propose that the brain regions consistent across these networks may mediate tics as shared symptoms between idiopathic TS and acquired tics.
133. Re-evaluating the Late Positive Event-Related Potential Component in Recognition Memory Tasks

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The capacity to distinguish between previously encountered and novel events is known as recognition memory. Two Event-related potential (ERP) components, the late positive component (LPC) and frontal N400 (FN400), have been proposed as neural correlates of recollection and familiarity processes in dual process models of recognition memory. Researchers have assumed these ERP components to be closely time-locked to the onset of the stimulus to be recognised, reflecting memory retrieval processes that occur over fixed time windows. We tested this assumption by analysing an EEG dataset (n=132) recorded during a word recognition memory task. Participants were presented with lists of words to be remembered. In a separate block of trials, participants judged whether words presented onscreen were in the studied lists. We used a Residual Iterative Decomposition algorithm to deconvolve stimulus- and response-locked ERP waveforms. We did not observe typical LPC effects (larger amplitudes for correctly remembered compared to novel stimuli) in the deconvolved stimulus-locked waveforms, but clear effects were found in the response-locked ERPs. Our findings indicate that classic LPC effects reflect activity that is time-locked to the response rather than the stimulus, and likely reflects processes more closely related to decision-making rather than memory retrieval.

134. The other-race effect in face recognition: when will people give a criterion shift?

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People are better at recognising faces when the face belongs to their own race rather than another race. This effect is typically manifested in the sensitivity measure (i.e., better discrimination) but also in a more liberal response bias for other-race faces (Meissner & Brigham, 2001). Here, in an old/new recognition paradigm, we applied a manipulation in the test phase where faces are surrounded by a coloured border indicating that the face is either more likely or less likely to be old. This manipulation has been shown to shift participants’ response criterion accordingly (Layher, Dixit, & Miller, 2020). Across two experiments, participants viewed own-race and other-race faces surrounded by coloured borders that they were told indicated a 25 percent or 75 percent likelihood of being old. Border cues were either valid (Experiment 1) or invalid (actual probability was 50%; Experiment 2). Across both experiments, participants responded more liberally to other-race faces than to own-race faces and shifted their response criterion in line with the border cues. However, criterion shifting occurred equally for own- and other-race faces, suggesting that the other-race effect occurs early, during encoding and cannot be moderated by manipulations targeting later, decision-making processes operating during retrieval.

135. Talking about faces: Identifying faces from verbal descriptions

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Numerous real-world tasks depend on the ability to accurately describe faces (e.g., police identifications based on descriptions). However, research has primarily focused on understanding perceptual expertise for faces while verbal expertise is rarely studied. Consequently, we know little about how people describe faces for identification and how accurately face information can be verbally communicated. Study 1 examined how well individuals could communicate about faces in real-time by modifying an existing face identification measure, the Glasgow Face Matching Task (GFMT). Participants completed face identification tests independently, and a novel face communication task in pairs (‘the Verbal GFMT’). Study 2 examined the face description ability of super-recognisers (individuals with superior face identification abilities).
compared to controls (individuals with normative face identification abilities). Study 1 found that individuals can communicate about faces ($M=72.45\%$, $SD=10.92$), however this is poorer than their perceptual matching ability for those same faces ($M=81.32\%$, $SD=9.78$). Study 2 found that super-recognisers are better at describing faces for identification purposes than controls; this was most evident for concise descriptions (7% accuracy advantage).

Together, these findings suggest face communication is an independent domain of expertise within face identification and raise questions about why certain individuals can describe faces effectively.

136. Super-recognisers can match faces in the blink of an eye
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“Super-recognisers” are people who are naturally gifted at identifying faces, often achieving the very highest levels of accuracy on face recognition tests. An important insight into the source of their superiority is the finding that super-recognisers achieve maximal accuracy when given only 2 seconds to view pairs of faces and decide if they show the same person or different people. In contrast, controls and forensic specialists require up to 30 seconds. This raises the question of how early in face processing super-recognisers’ superiority emerges. I will present the findings from a study that compared 51 super-recognisers’ and 60 control participants’ unfamiliar face matching accuracy after very brief stimulus presentations of 75ms, 200ms, 500ms, and 1500ms. We found that both participant groups performed at chance at 75ms, but super-recognisers outperformed controls from the 200ms exposure onwards. These findings identify super-recognisers’ superior performance as emerging at a similar time course to early face identity signals in the brain. This suggests that individual differences in unfamiliar face identity processing are founded on automatic, feedforward perceptual processing, carrying important implications for our conceptual understanding of expertise in face recognition.

137. Face detection from shading cues is more robust than recognition to variations in lighting direction
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One challenge for face detection and recognition is the drastic image changes that can be produced by variations in lighting direction. Here, we examine whether human observers can use the unique pattern of shading and shadows across a face to detect and recognise faces across variations in lighting direction. We presented participants with two-tone images of faces (‘Mooney’ faces) which isolated the pattern of contrast present in the shading and shadows on a face. These images were generated from 3D models of human heads rendered under different lighting conditions. We found that participants can discriminate faces from non-faces based on these contrast patterns and this was mostly unaffected by changes in the horizontal lighting direction. Participants were also able to discriminate between matching and non-matching face identities, though increasing the difference in horizontal lighting direction between faces in an image pair reduced discrimination sensitivity. Our results suggest that the visual system can utilise the distinctive pattern of shading across a face to perform detection and recognition, with detection (but less so, recognition) being robust to variations in horizontal lighting direction.

138. Localised Changes in Dentate Nucleus Shape and Iron Concentration in Friedreich Ataxia Assessed Using Quantitative Susceptibility Mapping
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The dentate nuclei (DN) are the output hubs of the cerebellum and key sites of pathology in people with Friedreich ataxia (pwFRDA). Previous studies have reported reduced DN volume and increased mean iron concentration in pwFRDA using quantitative susceptibility mapping (QSM). This study aimed to determine whether these DN changes are spatial nonuniform. QSM data was acquired from 49 people with FRDA and 46 controls. The DN were manually traced. Regional changes were assessed using 3D shape modelling and dentate-optimised voxel-based analyses. Relative to controls, pwFRDA showed bilateral surface contraction most strongly in rostral and caudal areas of the DN. Conversely, increased susceptibility was maximal in dorso-medial areas. The magnitude of these changes all correlated with disease duration and ataxia severity. The spatial profiles of DN atrophy and iron changes in pwFRDA are unique and nonuniform. Evidence for atrophy is strongest in areas with high grey matter density, while iron increases appear to predominate in the medial white matter. Regional changes may therefore provide more specific biomarkers for FRDA than whole-nucleus measures. To our knowledge, this is the first shape analysis, and the first voxel-level QSM analysis, of the DN in health or disease.

139. Month-to-month intra-individual variability in motor-cognitive performance in spinocerebellar ataxia
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Spinocerebellar ataxias (SCAs) are characterised by progressive movement incoordination. We investigated month-to-month variability in motor-cognitive tasks in SCAs compared to controls to determine whether there are short-term fluctuations in performance, over and above overall motor deficits. 14 individuals with SCA and 13 controls completed monthly online tasks over 7 months: speeded finger tapping (FT); paced FT; simple visual reaction time (RT); choice RT; and cognitive interference RT. Intra-individual variability across time (standard deviation [SD]) was compared between the SCA and Control groups, and correlated against ataxia severity. Individuals with SCAs had greater SD compared to controls on paced FT (d=1.0, p<0.001), simple RT (d =0.8, p=0.02), and interference RT (d =0.99, p=0.03). More advanced disease correlated with greater SD on simple RT (r=0.57, p=0.03). These novel findings indicate that there is considerable short-term variability in psychomotor function in SCAs, unrelated to long-term progressive neurodegeneration. This variability has important implications for the reliability of even simple psychomotor tasks as treatment outcome markers, but also may reflect an important clinical marker. Further work is necessary to investigate modifiable correlates of this variability (e.g., fatigue; depression).

140. Cerebro-cerebellar functional connectivity alterations in Friedreich ataxia: a resting state fMRI study
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Friedreich ataxia (FRDA) is a rare, inherited neurodegenerative disease characterised by progressive and debilitating motor dysfunction. Degeneration of cerebellar white matter pathways have been previously reported, but functional connectivity changes within cerebro-cerebellar circuits remain unclear. To address this gap, 35 adults with FRDA and 45 age/sex-matched controls underwent an 8 minute resting fMRI scan. Using T1w MRI, three cerebellar cortical seeds were individually defined using a cerebellum parcellation algorithm (anterior, lobules I-V; superior posterior, lobules VI-VIIB; inferior posterior, lobules VIIIA-IX). Voxel-wise seed-based functional connectivity was performed using the CONN toolbox and non-parametric cluster permutation was applied to test between-group differences and clinical correlations. Compared to controls, people with FRDA showed significantly reduced connectivity between a) anterior cerebellum and precentral/postcentral gyri (pFWEleft=0.002, pFWEright =0.023) and b) superior posterior cerebellum and left dorsolateral PFC (pFWE=0.017). Greater disease severity correlated with lower connectivity in these regions (r=-0.38, p=0.029; r=-0.041, p=0.017). There were no significant between-group differences in inferior posterior cerebellar connectivity. This study provides novel evidence of alterations in cerebro-cerebellar connectivity in motor and non-motor circuits that correlate with disease status in people with FRDA.

141. Brain-body connections revealed by joint non-linear analysis of EEG and postural sway
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To maintain upright posture, cortico-motor networks operate as a complex and bidirectional feedback loop. To date, no studies have attempted to quantify this feedback loop in postural control. To address this, we used the non-linear dynamical technique, Joint Recurrence Quantification Analysis (JRQA) to examine the patterns within combined EEG and postural sway signals after cortico-motor feedback loop disruption. For 46 participants without balance impairments, EEG and postural sway were recorded simultaneously with a portable EEG headset and force plate respectively. Baseline recordings were taken during quiet standing. To disrupt the feedback loop, participants completed a cognitive backward-counting task of increasing difficulty (counterbalanced for order). Analyses showed that the combined EEG and sway signal differed significantly to scrambled signals, reflecting organised system behaviour. The addition of a concurrent cognitive task increased the JRQA measures of determinism and recurrence rate, which suggests increased cortico-motor system rigidity. Entropy decreased with the cognitive task, suggesting decreased synchrony between systems. Level of task difficulty had small to no effects. The results are a promising step towards finding objective biomarkers of postural dysfunction, which could help in identification and treatment of motor pathologies.

142. Unpacking the Relationship between Initial Judgements of Solvability and Problem-Solving Success: Interleaving Impacts Metacognition
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Deciding whether a problem is solvable is a key metacognitive step in the problem-solving process. Initial Judgements of Solvability (JOSs) have recently been shown to discriminate solvable from unsolvable problems and to predict effort regulation and problem-solving success. Building on this research, our study examined the influence of study design on JOS discrimination and predictiveness. Participants judged whether each of 40 briefly presented anagrams was solvable or unsolvable (or reported having already solved it). Solving attempts either followed each JOS (interleaved design) or occurred after all 40 JOSs had been made (blocked design). JOSs were more accurate and predictive of successful problem-solving when interleaved with solving attempts than when blocked. A second manipulation, whether anagrams were presented for 2 s or 4 s during the JOS task, influenced the likelihood of solving the anagram during the JOS process,
but did not moderate the influence of design on either JOS accuracy or predictiveness. Thus, our findings indicate that interleaving JOSs and solving attempts can bootstrap metacognitive accuracy, effort regulation, and problem-solving success.

143. Global self-performance estimation in computationally-complex decision-making

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Life often requires us to solve computationally intractable problems. We examined how human participants internally evaluate their own performance in complex decision-making over multiple trials, in comparison to that in perceptual decision-making. Participants performed a complex decision task (knapsack task) and a perceptual decision task, and evaluated their task performance at the end of each block (i.e., global self-performance evaluation). Blocks differed in the hardness of trials as well as the presence or absence of trial-by-trial feedback. In both tasks, participants performed better and had higher evaluations of their performance in easy compared to hard trials. Despite similar levels of task performance across blocks with and without feedback, participants had lower self-performance evaluations in the absence of feedback. Moreover, the interaction effect between difficulty and feedback indicated lower self-performance evaluations in blocks without feedback but only in easy trials in the complex decision-making task. Our findings demonstrate that people systematically underestimate their task performance in the absence of feedback in perceptual decision-making, but this is true only for easy problems in complex decision-making. We also show that Signal Detection Theory can account for these patterns in global self-performance estimations not only in perceptual, but also complex decisions.

144. Why we lack confidence in signal-detection-based analyses of confidence

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Signal-detection theory (SDT) is one of the most popular frameworks for analyzing data from human behavioral experiments - including investigations of confidence. Applications often involve a key assumption - that repeated exposures to an input will evoke a normally-shaped distribution of different experiences. This assumption is questionable. In visual perception many dimensions are subject to non-uniform mappings between inputs and perception. Even if a repeated input were normally mapped into perception, mappings can be changed by adaptation. We have found that visual adaptation can impact on measures of motion perception, perceptual sensitivity and confidence. All these changes could be accounted for by a biologically inspired model, describing how adaptation changes mappings between inputs and perception. In an adapted state, this model can encode abnormally shaped, skewed distributions of values for a repeated input. We find these are sufficient to undermine SDT-based analyses of confidence. Moreover, the subtly skewed model distributions could not be detected using standard procedures for testing if data has probably been informed by a normally shaped distribution of experiences. Our data serves as an existence proof, that if SDT-based analyses of confidence are inadvertently applied to abnormally-shaped distributions of experiences, conceptually flawed conclusions can be encouraged.

145. Stopping interference effects in healthy younger and older adults

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Inhibiting pre-planned or ongoing actions in response to environmental demands is a critical component of human motor control. In experimental settings, the stop signal task (SST) represents the gold standard of indexing inhibition. However, a growing body of literature finds that the traditional SST conflates two dissociable sources of inhibition: an involuntarily pause associated with attentional orienting, and the subsequent voluntary cancelation of an action. Seeking to tease these processes apart, we recruited younger (20-35 years) and older (60-85 years) adults to complete a series of modified SSTs which involved not only stop cues, but also cues which had to be ignored and cues which required the participant to enact an additional movement. Electromyographic (EMG) recordings allowed detailed examination of muscle activation patterns during responding and cancellation. The examination of covert responses (movements which were suppressed before they resulted in an overt button press) revealed that, within a stopping context, a non-selective inhibitory response occurs similarly for both stop cues and other infrequent behavioural cues that are not associated with an imperative to stop (i.e., ignore cues). We also observed behavioural delays to additional cues outside of stop signal contexts, raising key questions regarding the nature of reactive inhibition.

146. Individual differences in procedural learning are associated with fibre specific white matter microstructure of superior cerebellar peduncles in healthy adults

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Functional neuroimaging implicates fronto-basal ganglia-cerebellar circuitry in procedural learning (the capacity to implicitly learn sequential information). However, limited work has considered the role of white matter fibre pathways in procedural learning. Our study aimed to address this by probing the relationship between procedural learning and white matter organisation in the superior cerebellar peduncles (SCP) and striatal premotor tracts (STPMT). High angular diffusion weighted imaging was acquired from 20 healthy adults aged 18-45 years. Fixel-based analysis was performed to extract measures of white matter microstructure (fibre density; FD) and macrostructure (fibre cross-section; FC) from the SCP and STPMT. On the serial reaction time task (SRTT), procedural learning was indexed by the difference in reaction time between the final block of sequence trials and the randomised block (namely, the rebound effect). Connectivity fixel enhancement was conducted to investigate the relationship between fixel metrics within the SCP and STPMT and the rebound effect on the SRTT. Analyses revealed a significant positive relationship between FD and the rebound effect in segments of the left and right SCP (pFWE < .05). This study supports the likely role of white matter organisation in the basal ganglia-cerebellar circuit in explaining individual differences in procedural learning.

147. How our gut may bug our brain: Assessing gut bacteria’s role in cognition across healthy ageing

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Dementia is Australia’s second leading cause of death, with individuals suffering from mild cognitive impairment often progressing to dementia. Through understanding the mechanisms of declining cognition, therapeutics may be developed that can prevent or slow cognitive decline. While the gut microbiome is an emerging therapeutic route, existing research has not thoroughly assessed gut bacteria and cognition across healthy ageing in humans. Presently, whole genome shotgun sequencing of gut bacteria, several measures of cognition (trail making test A/B, Cogstate Brief Battery) and brain haemodynamics measured via functional near-infrared spectroscopy and N-back tasks, was undertaken in healthy younger and older adult groups. No associations between gut bacteria and cognition were shared between the two groups, showing for the first time that there are age-dependent associations of gut bacteria and cognition. Specifically, a functional pathway of butyrate production was negatively associated to 1-back accuracy in the older but not the younger group. Butyrate is an anti-inflammatory molecule capable of modulating brain derived neurotropic factor production. The association between reduced butyrate producing capacity and impaired 1-back performance may indicate that butyrate production is leading to impaired cognitive performance in the older group, highlighting butyrate production as a potential therapeutic target for future intervention studies.

148. Does cerebrovascular status mediate the relationship between dietary pattern and cognition?

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Diets including the Mediterranean diet (MedDiet) may improve cognitive and vascular outcomes, while pro-inflammatory Western-Style Diets (WSD) often have an opposing effect, linked to accelerated brain ageing. As vascular risk factors exacerbate cognitive impairment, the vasculature may be an intermediary between diet and cognition. However, there is insufficient research assessing diet and the cerebrovasculature. Therefore, the current experiment aims to (i) assess the effect of dietary pattern on cerebrovascular health; and (ii) investigate whether the cerebrovasculature acts as an intermediary between dietary pattern and cognition. To do this, the current study will assess the cross-sectional relationship between dietary pattern, cerebrovascular status and cognitive control; a sensitive marker of age-related cognitive impairment. The study included a preclinical sample of 160 healthy, healthy Australian adults (aged 60-70). The Australian Eating Survey was adapted to create a MedDiet and WSD score. Cerebrovascular measures were focused on the frontal lobes, as these areas are particularly vulnerable to age and play a critical role in cognitive control processes. Cognitive control was evaluated using behavioural data from a task-switching paradigm (i.e., switch and mixing costs). We hypothesised that MedDiet predicted cerebrovascular status. Moreover, we expect that cerebrovascular health partially mediates the effect of diet on cognition.

149. Can mental workload predict driving performance?

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Most traffic incidents are attributed at least partly to human error. Mental workload has been proposed as one
factor that is theoretically linked to human performance. Resource theories posit that as mental workload fluctuates, the resources available to complete a primary task (e.g., driving) will vary, and that high workload should lead to poor performance and errors. Recent research from our team showed empirically, for the first time, that fluctuations in mental workload predicted performance on a simple laboratory task. The present study aimed to determine whether performance on a complex real-world task like driving could also be predicted by changes in mental workload. Using the Detection Response Task (DRT) as a quantitative measure of mental workload, we collected data from 59 undergraduate students who completed two 18-minute driving scenarios concurrently with the DRT. Mixed-effects linear regressions as well as cross-correlation functions indicated that workload increases predicted poorer speed control by about 15 seconds in advance, and poorer lane control by up to 45 seconds in advance. These results, while preliminary, have implications for future driver-safety technologies and provide broader empirical support for the link between workload and performance.

150. Prediction of upcoming words is influenced by prior predictability: A reanalysis of a multi-laboratory study
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Accounts of perception suggest that meaning is extracted from sensory information via the application of predictions, to facilitate efficient environmental processing. However, direct neural evidence for prediction is lacking, with most research focusing on prediction-error signals. The present study sought to examine the extent to which pre-stimulus brain activity gauges prediction through a reanalysis of Nieuwland and colleagues’ (2018) study. Participants (N = 356) were presented with article/noun sentence continuations that varied according to word predictability. Alpha power and frontal event-related potentials (ERPs) preceding the critical words were measured, as were inter-individual differences in intrinsic neural activity, such as individual alpha frequency (IAF) and 1/f-like aperiodic activity. Preliminary analyses revealed that pre-stimulus alpha power and pre-stimulus ERP amplitudes were not only influenced by the predictability of the critical words but were also affected by the prior-word predictability. Further, low prior-word predictability was associated with smaller post-stimulus N400 amplitudes, suggesting that early exposure to surprising information may prompt the brain to expect the unexpected. As such, the present findings have implications for existing neurocognitive models of language, by suggesting that prediction should not be studied in isolation. Rather, the accumulation of predictability over time should be accounted for.

151. Movement velocity underpins foresighted decision-making under risk: Insights from rodent version of Iowa gambling task
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Foresighted vs. impulsive decisions require a ‘cost-benefit’ analysis of choices favoring delayed vs. immediate rewards, a capacity that varies under uncertainty (probabilities of outcomes are unknown) vs. risk (probabilities of outcomes are known). We hypothesized that motor impulsivity drives cognitive impulsivity under risk where energy-demands are high. Movement vigor/velocity is the energy expended in reward pursuit and might be crucial for decisions under risk. Using a rodent decision-making task, i.e., rodent-Iowa Gambling Task (r-IGT), we examined the link between velocity (reward motivation) and long-term choices under uncertainty and risk condition. Mildly food-deprived Wistar rats performed r-IGT, wherein the animal chose between four outcomes of rewards and punishments (sugar & quinine pellets) that were varied in safe (low immediate rewards - high delayed rewards) or impulsive choices (high immediate rewards - high delayed punishments) in uncertainty (initial trials) and risk (last trials). The results suggest that high movement velocity in habituation correlated with high consumption of rewards (p=0.04). Reward consumption and safe choices were uncorrelated in the uncertainty trials (p=0.76) but positively correlated in the risk trials (p=0.04). Movement velocity & reward-
motivation might be necessary for foresighted decisions under risk; age-induced motor decline might impact decision-making under risk.

152. Action-effect prediction in sensory attenuation and error monitoring: Distinguishing stimulus-driven and volitional movement

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Ideomotor theory proposes that action is initiated based on its anticipated effects. However, while volitional movement is believed to be guided by action-effect predictions, these are considered less influential with regard to stimulus-driven activity. We compared the effects of predictability on auditory evoked responses to tones that were produced according to participants’ (n = 61) own timing (i.e., volitionally) and in response to simple visual cues (i.e., stimulus-driven). N2b component amplitudes reflected error monitoring for sound resulting from volitional action, which was absent with respect to stimulus-driven movement. We also explored the sensory attenuation phenomenon, comparing evoked responses to stimuli produced by each form of action with those of externally-generated tones. When controlling for temporal predictability, N1 amplitudes elicited by externally-generated stimuli did not differ from those elicited by volitional or stimulus-driven movement. Reduced P2 amplitudes were observed in response to both volitional and stimulus-driven motor activity. In contrast with internal forward models of sensory attenuation, which suggest that stimulus predictability provides the basis for suppression of self-generated sensations, we propose that these findings contribute to growing evidence in support of an attribution to attentional factors instead.

153. Moment-by-moment prediction of physiological responses to emotional stimuli

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Activity of the Autonomic Nervous System (ANS) measured with galvanic skin response (GSR) or heart rate (HR) can be interpreted in the context of processing emotional content. These effects of emotion processing on ANS activity have also been linked to central nervous system activity, with aggregating processes like event-related potentials on the electroencephalogram (EEG) side, or ANS activity averaged for full trials. Thus, the interaction of central and peripheral nervous system reactivity to emotional content is less clear in a continuously changing context. We used the EMAP dataset (https://www.wgtn.ac.nz/emap-open-database) of moment-by-moment reactions to emotional video clips (including EEG and peripheral physiological measures) to model moment-by-moment GSR and HR. The machine learning technique Long Short-Term Memory achieved a lower prediction error than Decision Tree and Linear Regression, pointing to the need to address temporal dependencies. In addition, there was little evidence for a moderation of the prediction error by individual differences. Mapping the predictive electrodes and frequencies showed that the neurophysiological patterns and the peripheral measures that play a role in predicting HR and GSR are largely distinct, suggesting HR and GSR specific neural correlates also in the context of moment-by-moment reactivity.

154. Motion Extrapolation in the Twinkle Goes Illusion: Effects of Duration, Speed, and Contrast

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Neural processing delays are inherent in the transmission of visual information from the retina to the brain. However, we typically experience minimal perceptual lag when interacting with moving objects. The visual system may achieve this through motion extrapolation; predicting a moving object’s current position by projecting its past trajectory forwards by the intervening delay time. A
recently discovered motion-position illusion, “twinkle goes”, provides a new opportunity to investigate the perceptual consequences of motion extrapolation. In this illusion, when the disappearance of a moving object is masked by dynamic noise, the perceived disappearance location is extrapolated forwards along the object’s trajectory, relative to its true disappearance location. We explored the magnitude of this illusion across manipulations of the moving object’s presentation duration, speed, and contrast. We anticipated greater extrapolation with decreasing duration, decreasing contrast, and increasing speed. As expected, we found extrapolation decreased at longer durations. Surprisingly however this relationship was non-monotonic. Likewise, higher speeds were associated with greater extrapolation, but this relationship was also non-monotonic. Extrapolation was independent of contrast. These results are partially consistent with the existence of visual motion extrapolation mechanisms. However, non-monotonic relationships and lack of contrast dependence warrant the development of more detailed model-based accounts.

155. Effects of an acute exercise bout on visual cortex long-term potentiation and 1/f aperiodic signal

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Jennifer Steiniger, Turner Institute for Brain and Mental Health, Monash University
Dr Patrick Cooper, Turner Institute for Brain and Mental Health, Monash University
Dr Shou-Han Zhou, Turner Institute for Brain and Mental Health, Monash University
Dr Joshua Hendrikse, Turner Institute for Brain and Mental Health, Monash University
Dr Rachael Sumner, The University of Auckland

Prof. Ian Kirk, The University of Auckland
Dr James Coxon, Turner Institute for Brain and Mental Health, Monash University

Long-term potentiation (LTP) is a form of neuroplasticity commonly implicated in mechanistic models of learning and memory. Acute exercise can boost LTP in the motor cortex, and is associated with a shift in excitation/inhibition (E:I) balance, but whether this extends to other regions such as the visual cortex is unknown. We investigated the effect of a preceding bout of exercise on LTP induction in visual cortex using electroencephalography (EEG). Young adults (N=20, mean age=24.20) engaged in 20 minutes of either high-intensity exercise or rest in two counterbalanced sessions. LTP was induced using a high frequency “visual tetanus”. Established EEG markers of visual LTP, the N1b and P2, were taken before and after the visual tetanus. As expected, there was increased negativity for the N1b following the visual tetanus, with specificity to the tetanised stimulus orientation, and a non-specific increase in the P2. These effects were not sensitive to a preceding bout of exercise. However, the EEG-derived 1/f slope indexing E:I balance did show an enhanced modulation in the exercise condition. Overall, these results suggest some effects of exercise on mechanisms that underlie plasticity in the visual cortex.

156. Investigating the effects of regular exercise on neuroplasticity and cognition in young to middle-aged adults

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Regular exercise has been shown to influence neuroplasticity and cognition. However, while many studies have established a role for exercise in improving brain health in older individuals, the influence of exercise on younger populations remains comparatively unclear. In this presentation, I will provide an overview of recent work investigating the effects of exercise on hippocampal structure and function in young to middle-aged adults. I will present data from 40 healthy adults (M\text{age} = 25.48 \pm 9.35), self-reporting either high (n = 20) or low (n = 20) levels of exercise, according to World Health Organisation guidelines. I will present evidence of elevated hippocampal integrity (i.e., increased N-acetylaspartate, volume) and hippocampal-dependent memory in those engaging in high levels of regular exercise. Lastly, I will present our recent work examining how exercise can prime neuroplasticity to augment outcomes of complementary interventions (i.e., repetitive transcranial magnetic stimulation; rTMS). To this end, I will present our recent findings suggesting that regular exercise interacts with the effects of multi-dose rTMS to improve cognitive outcomes. Overall, this presentation will highlight the effects of exercise on brain structure and function, which may lead to novel approaches for mitigating the cognitive decline associated with psychiatric disorders and ageing.

157. Network localisation of multiple system atrophy

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Multiple system atrophy (MSA) is a progressive neurodegenerative disorder characterised by parkinsonism, cerebellar ataxia and autonomic dysfunction. Prominent symptoms define two subtypes, MSA-P (parkinsonism) and MSA-C (cerebellar-ataxia). Whilst brainstem and cerebellar atrophy are well characterised, studies have reported abnormalities in multiple other regions. Here, we apply Coordinate-based Network Mapping (CNM) to localise heterogeneous neuroimaging findings in MSA into a functionally connected brain network with focal hubs most central to symptom generation. Systematic searches identified whole-brain neuroimaging studies reporting coordinates of significant brain abnormalities in MSA patients compared to healthy controls. CNM was conducted across included studies, and separately for MSA-C and MSA-P. Nineteen studies including 471 patients, 465 controls and 351 peak coordinates were included. Peak coordinates were distributed throughout the brain. However, results of CNM revealed >15/19 studies were commonly functionally connected to the basal ganglia, midbrain and cerebellum. In MSA-C and MSA-P, results identified sets of regions functionally connected to all included studies (b/b, 8/8), with hubs within the cerebellum and putamen, respectively. We demonstrate that previously heterogeneous neuroimaging findings in MSA localise to a network of specific brain regions. Subtype networks align with diagnostic markers and neuropathological examination.

158. Network mapping of essential tremor localises to the cerebellum

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Elizabeth G. Ellis, Cognitive Neuroscience Unit, School of Psychology, Deakin University, Geelong, Australia
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Neuroimaging studies of essential tremor (ET) have found abnormalities widely distributed across the brain. A new technique called coordinate-based network mapping (CBNM) has the potential to utilise these heterogeneous findings to localise the network underlying ET. We identified 14 studies reporting coordinates of structural brain abnormalities in ET, then used a normative human connectome (n=1000) to map functional connectivity from these coordinates to localise region/s that are connected to all studies’ findings. CBNM findings were then validated.
using an independent resting-state fMRI dataset of ET patients (n=50) and healthy controls (n=49). Our CBNM analysis showed that the heterogeneous locations reported by all individual studies were functionally connected to the cerebellum, specifically converging upon lobules VI and VIIb/Villa. Importantly, the validation analysis further revealed that this cerebellar hub had reduced functional connectivity to the bilateral sensorimotor cortices in ET patients, as compared to healthy controls. These results indicate that the dispersed brain abnormalities in ET are all part of the same functional network, which is defined by connectivity to the cerebellum, and further suggests that ET may arise from dysfunctional connectivity between the cerebellum and sensorimotor cortices.

159. Neuroimaging signatures of hallucinations in Parkinson’s disease

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Visual hallucinations are a common nonmotor symptom in Parkinson’s disease and are associated with dysregulated brain activity. As these alterations in brain activity are complex and difficult to interpret, dimensionality reduction techniques are often used to isolate key features, providing new insights of altered brain function in neuropsychiatric symptoms. We tested the hypothesis that Parkinson’s patients with hallucinations display an altered hierarchical structure in their brain activity, where unimodal (sensory) regions are more highly connected to heteromodal (associative) regions on dimensionally-reduced projections of resting state fMRI data. The study involved 96 individuals including healthy and patients (hallucinating and non-hallucinating) based on their clinical presentation. These individuals undertook neuropsychological tests and underwent resting-state functional magnetic resonance imaging. We applied non-linear dimensionality reduction techniques to the resting state data to explore how brain connectivity patterns differed between healthy vs hallucinating vs. non-hallucinating patients. Overall, the configuration of brain networks in patients with hallucinations were more compressed compared to non-hallucinators and healthy individuals. Furthermore, it was apparent that associative networks serving executive functions of the brain were distorted in patients with hallucinations. These results provide further support that adaptive visual perception relies on a balance between “bottom-up” sensory processes and “top-down” endogenous processes.

160. Using machine learning to develop objective measures of disease progression in Parkinson’s disease

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Hanna Suominen, Australian National University

Wenbo Ge - PhD student, Australian National University

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In Parkinson’s disease, there is a lack of reliable, objective measures for monitoring disease progression, other than clinical scales of neurological and psychiatric disability, which are not well-correlated with actual neurodegeneration. There is a need for additional markers of PD severity which can translate to clinical practice. In our work, we are using machine learning (ML) and signal processing to develop biomarkers based on non-invasive behavioural and imaging measures (e.g., postural sway, EEG, finger tapping) which have previously been shown to be affected in Parkinson’s patients. In tandem with this
approach, we are using shared and publicly-available datasets to develop effective ML algorithms. Our work on feature engineering and ML using the vowel phonation and accelerometer subsets of the large smartphone-based mPower dataset shows the potential to detect symptoms imperceptible to a neurologist. We also show that ML on ERP and sway data can distinguish patients from controls. From the signal processing work, results from clinical measures in the lab show postural sway correlates highly with cognitive and symptom severity measures. Our current work aims to track these measures across time in our mobile lab in a regional NSW population.

161. A cognitive process model account of declining efficiency with increasing task difficulty in automation-aided signal detection

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Jackson Duncan-Reid, Oregon State University
Jason McCarley, Oregon State University

Automated decision aids can assist the human operator to perform high-stakes signal detection tasks, such as identifying an enemy on the battlefield, a tumour in an x-ray, or a weapon in passenger baggage. Operators often use decision aids poorly, though, with performance falling below best-achievable levels. Previous research has suggested that operators interact with binary signal detection aids using a sluggish contingent criterion (CC) strategy, shifting their response criterion in the direction stipulated by the aid’s diagnosis each trial but making adjustments that are smaller than optimal. The current study tested this model by examining the efficiency of automation-aided signal detection under different levels of task difficulty. Sixty participants recruited from Prolific were asked to perform a numeric signal detection task, in which they made binary classification judgments with or without the assistance from a 93%-reliable aid. The difficulty of the task varied between groups of participants, producing two levels of task difficulty. Results confirmed that automation-aided efficiency decreased with task difficulty, consistent with the sluggish CC model, suggesting that automation use is less efficient in a difficult signal detection task than in an easier one.

162. Intuitive logic is an illusion: Whether we like an argument has nothing to do its validity

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Constantin Meyer-Grant, University of Freiburg
Nicole Cruz, University of Innsbruck
Henrik Singmann, University College, London
Spriha Goswami, University of New South Wales
Christoph Klauer, University of Freiburg

Judging whether an argument is logically valid (whether conclusions necessarily follow from premises), has generally been assumed to take time and mental effort. This assumption has been challenged by recent findings that appear to demonstrate “intuitive” sensitivity to logical structure - such as where people show more positive affective reactions to logically valid arguments than to invalid arguments (the “logic-liking” effect). In five experiments we show that the logic-liking effect does not involve an assessment of logical validity. When stimuli are used which de-confound the effects of argument validity, conclusion possibility and linguistic surface features, affective “liking” judgments were found to be driven by surface features (e.g., whether the argument premises and conclusion both contain a negation). The effect of these surface features on affective judgments was reduced when task goals were clarified. Explicit judgments of deductive validity were also influenced by surface features, although a specific effect of argument validity was identified for these judgments. We conclude that there is no evidence for the existence of “intuitive logic”, and hence that this phenomenon has little role in theory-building in the field of human reasoning.

163. Messy homes and remote witnesses: how messy cues can impact witness credibility.

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Eryn J. Newman, Australian National University
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Courts increasingly rely on remote hearings where witnesses join from various locations to give their testimony.
In these online contexts, jurors are exposed to contextual cues otherwise not present in the physical courtroom, such as a speaker’s room. When jurors assess a witness, they are expected to rely on relevant content. However, psychological research shows people often draw on extra-legal cues in forming decisions. We examine one such cue, the messiness of the speaker’s room that is visible in the background. Participants considered statements from remote witnesses who had either messy or clean backgrounds, and rated how accurate, reliable, and trustworthy the person’s account was. We found that witnesses who had a messy background were rated as less accurate, reliable, and trustworthy, even when participants were aware that the witness spoke from work and had no control over the mess. Throughout, the exact same testimony was deemed less credible when presented by a witness with a messy background. These results show that cues to physical messiness/cleanliness can systematically shape the perception of witnesses and testimony, consistent with emerging research in person perception. The findings highlight the need for procedural development in virtual courts and guidelines for presentation consistency.

164. What I can do won’t help: Beliefs about action efficacy constrain compassionate action
Kelsey Perrykkad, ECR - Postdoc, Monash University
Chase Sherwell, The University of Queensland
James Kirby, The University of Queensland
Jakob Hohwy, Monash University

In contrast to empathy and sympathy, compassion compels action to relieve suffering. Perhaps, then, one barrier to compassionate behaviour is a general lack of belief in the efficacy of one’s actions. Further, beliefs of inefficacy may relate to how coherently and stably one represents themselves, and action beliefs may mediate the recently identified correlation between self-concept clarity and helping behaviours. Using a pre-registered design in two online samples totaling 484 participants, we investigated associations between self-reported self-concept clarity, action beliefs, and compassionate action (for self and others). As an objective measure of compassionate behaviour, participants were given an opportunity to donate to charity. Our data provides decisive evidence for moderate to large correlations between self-concept clarity, general sense of agency, self-efficacy and self-reported compassionate action. In both samples, as we hypothesised, the action belief variables mediate the effect of self-concept clarity on self-reported compassion. Surprisingly, none of the measures were predictive of charitable donation in either sample. In sum, while beliefs about action effectiveness have a large impact on compassionate action as subjectively assessed, and mediate the impact that self-concept clarity has on helping behaviours, these findings do not appear to generalize to all helping behaviours.

165. When a lightbulb moment does not enlighten: Experimentally induced false insights
Hilary Grimmer*, PhD Student

The insight experience (or ‘Aha moment’) generally evokes strong feelings of certainty and confidence. An ‘Aha’ experience for a false idea could underlie many false beliefs and delusions. However, for as long as insight experiences have been studied, false insights have remained difficult to elicit experimentally. That difficulty, in turn, highlights the fact that we know little about what causes people to experience a false insight. We developed and tested a new paradigm to elicit false insights using a combination of semantic priming and visual similarity to elicit feelings of insight for incorrect solutions to anagrams. In another study, we found that false insights produced in this way are relatively resistant to corrective warnings and instructions to avoid errors. These studies highlight the importance of misleading semantic processing and the feasibility of the solution in the generation of false insights, and suggest that the effects of misleading information can be difficult to mitigate.

166. Goal-directed decision-making among teams in dynamic and uncertain environments
Timothy Ballard, The University of Queensland

Although there is a growing body of research examining how people make decisions that require the prioritisation
of competing goals, this research tends to focus on situations in which decision-makers operate on their own and in static environments. We, therefore, know relatively little about how multiple decision-makers work together to make goal-directed decisions in more dynamic and uncertain environments. In this research, we develop and test a model of team goal-directed decision-making that can be applied to such environments. We report empirical results from a paradigm in which two team members make decisions that allow them to progress toward competing goals, while also managing the resources that enable such progress. We use computational modeling to understand the underlying mechanisms necessary to account for the observed decisions. We believe this research provides a useful foundation for exploring more complex decision processes that more closely resemble those encountered in practical settings.

167. The neural substrate and underlying mechanisms of executive control fluctuations in primates.

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Trial-by-trial alterations in response time have been linked to fluctuations of executive control and transient lapses of attention. Here, we report remarkable homologies in performance-dependent fluctuations of response time in two primate species. We examined the effects of selective bilateral malfunction in four frontal regions on control fluctuations in the context of a rule-shifting task. Lesions in orbitofrontal cortex (OFC), but not within superior-lateral prefrontal cortex, significantly exaggerated the performance-dependent fluctuations of control and prevented its restoration following feedback. Lesions within dorsolateral prefrontal cortex (DLPFC) or within anterior-cingulate cortex (ACC) led to instability of control and disruption of its link with upcoming decisions. Examining the activity of DLPFC and OFC cells shed more lights on the underlying neuronal mechanisms by showing that before the start of each trial, OFC cell activity conveyed detailed information regarding the current state of executive control and the likelihood of success or failure in the future decisions. These findings bring insights to the neural architecture of executive control and suggest that DLPFC and ACC support sustained executive control, but OFC is more involved in the trial-by-trial allocation (setting) of control to the ongoing task and restoring the control.

168. Mode-based morphometry a new approach to mapping human neuroanatomy

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James Pang, Monash University

Kevin Aquino, The University of Sydney

Yu-Chi Chen, Monash University

Alex Fornito, Monash University

Cortical thickness (CT) has been studied extensively to investigate neuroanatomical variations between groups. These analyses are typically performed at the level of individual surface vertices or a priori-defined regions-of-interest, thus defining a specific spatial resolution scale at which anatomical differences are examined. Here, we develop a new approach for mapping CT differences between groups that relies on eigendecomposition of the Laplace-Beltrami Operator of the cortical surface. The resulting eigenmodes represent an orthogonal basis set of spatial patterns, ordered by spatial wavelength, that can be used to obtain a multi-scale characterization of diverse brain maps. We leverage this property to model CT differences between two groups as linear combinations of eigenmodes, which allows us to identify characteristic spatial scales of neuroanatomical variation through the resulting beta (coefficient) spectrum. To validate the approach, we develop a model with a known ground truth. We simulate two experimental groups and study the resulting CT maps using a classical t-statistic vertex-based analysis and our mode-based-morphometry (MBM) approach. We also compare the two approaches using empirical data. Our results show that MBM is a more robust and accurate approach to mapping neuroanatomical variability than classical approaches, and can identify the characteristic spatial scales of such variations.
169. Anatomical connectivity between the hippocampus and cortical mantle in the human brain: new insights using quantitative fibre-tracking

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The hippocampus supports multiple cognitive functions including episodic memory. Recent work has highlighted functional differences along the anterior-posterior axis of the human hippocampus but the neuroanatomical underpinnings of these differences remain unclear. We leveraged track-density imaging to systematically examine anatomical connectivity between the cortical mantle and the anterior-posterior axis of the in-vivo human hippocampus. We combined high-quality Diffusion-Weighted Imaging data from the Human Connectome Project with a tractography pipeline specifically tailored to measure the location and density of streamline endpoints within the hippocampus. We first identified the most highly connected cortical areas and detailed the degree to which they preferentially connect along the anterior-posterior axis of the hippocampus. We then created ‘endpoint density maps’ to characterise, in detail, where different cortical areas preferentially connect within the hippocampus. Our results revealed striking differences in how specific cortical areas preferentially connect along the anterior-posterior and medial-lateral axes of the hippocampus and provide detailed maps of human hippocampal-cortical networks. Our novel method represents a major advance in our ability to map the anatomical connectivity of the human hippocampus in-vivo. Our results inform our understanding of the neural architecture of hippocampal dependent memory systems in the human brain with implications for basic and clinical neuroscience.

170. A Histology Grade Atlas of the Human Brain from in vivo MRI.

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Introducing “Caress the Detail” an initiative aiming to provide a new generation of high-resolution, open-access brain atlases combining histology-derived annotation detail of human brain anatomy with cutting edge in vivo MRI imaging. We present the first step of this initiative: a comprehensive dataset of two healthy volunteers (males) reconstructed to a 0.25 mm isotropic spatial resolution for T1w, T2w and DWI contrasts. Multiple acquisitions were collected for each contrast for each participant (20 T1w, 12 T2w, 10 DWI), and were averaged using symmetric group-wise normalisation (Advanced Normalisation Tools). T1w and T2w data were acquired using a 7T human research scanner (Siemens MAGNETOM) at the Centre for Advanced Imaging, University of Queensland. T1w scans were recorded using a MP2RAGE sequence (WIP944) at 0.4 mm isotropic resolution using: TR=4300ms, TE=1.8ms, TI1=830ms, TI2=380ms, GRAPPA=2. T2w scans were recorded using TSE sequence (WIP692) at 0.4 mm isotropic resolution with the parameters: TR=1330ms, TE=118ms, GRAPPA 3. DWI scans were recorded with a human 3T MRI (Philips Achieva CX) (NeuRA Imaging Centre) using an inverse blip corrected SPIR sequence at 1.25 mm isotropic resolution, with 32 directions, 5 b-factor averages, B-val=1000, TE=60ms, TR=26.5s, SENSE=3. All images were meticulously aligned and are hand delineated.

171. A mathematical perspective on edge-centric brain functional connectivity

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Edge time series are increasingly used in brain imaging to study the node functional connectivity (nFC) dynamics at the finest temporal resolution while avoiding sliding windows. Here, we lay the mathematical foundations for the edge-centric analysis of neuroimaging time series, explaining why a few high-amplitude cofluctuations drive the nFC across datasets. Our exposition also constitutes a critique of the existing edge-centric studies, showing that their main findings can be derived from the nFC under a static null hypothesis that disregards temporal correlations. Testing the analytic predictions on functional MRI data from the Human Connectome Project confirms that the nFC can explain most variation in the edge FC matrix, the edge communities, the large cofluctuations, and the corresponding spatial patterns. We encourage the use of dynamic measures in future research, which exploit the temporal structure of the edge time series and cannot be replicated by static null models. Link to paper: https://www.nature.com/articles/s41467-022-29775-7

172. An explainability framework for cortical surface-based deep learning
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Fernanda L. Ribeiro, The University of Queensland
Steffen Bollmann, The University of Queensland
Ross Cunnington, The University of Queensland

There is no question regarding the utility of deep learning; yet, deep learning systems consist of complex models with millions of parameters, making it virtually impossible to directly understand the mechanisms underlying their predictions. The emergence of explainability methods has, however, enabled a better comprehension of models through concepts that are easily understood by the end user. Here, we propose an explainability framework for cortical surface-based deep learning. We show how it can be used to probe the relationship between the functional organization of human visual cortex and its structure using our previously validated neural network (capable of predicting retinotopic maps from anatomical features). Our explainability approach modifies surface features and monitors the difference in predictions (intact vs. modified input). Specifically, we iteratively select a vertex in visual cortex, determine its neighborhood, replace the anatomical features (myelin and curvature) there with constants, and generate new retinotopic maps. We show that our approach can not only detect the location of important vertices but also the relevance of particular anatomical features in predicting retinotopic maps. Although we exemplify the use of our approach to elucidate a model of retinotopic mapping, it can serve as a general framework for surface-based deep learning.

173. Mistaken identity: Do examples of face pareidolia bias rapid face detection?
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Blake Saurels, University of Queensland
Amanda Robinson, University of Queensland
Jessica Taubert, University of Queensland

The mechanisms underlying face detection are so sensitive that sometimes we see illusory faces in inanimate objects, a phenomenon called face pareidolia. Real faces and illusory faces are structurally alike, sharing holistic properties such as configuration and orientation of face features (e.g., eyes, mouth). Unlike real faces, however, illusory faces do not contain the low-level visual properties (e.g., skin colour) of real faces. Understanding illusory face detection can give insight into the mechanisms underlying face detection. For example, if the holistic properties of a face are driving detection, then illusory faces and real faces should be detected similarly. Here, we used rapid serial visual presentation (RSVP) to limit visual processing, and had participants detect the presence of real or illusory faces in sequences of distractor objects at 6Hz or 30Hz. We expected that illusory faces and real faces could be detected at both speeds, but that real faces would have a significant advantage over illusory faces in the 30Hz condition. The results reveal the speed at which we can detect faces in naturalistic images and help inform how face detection mechanisms are fooled by faces that are not really present.

174. Investigating a novel motion-induced “splitting” illusion
Joseph Melling*, The University of Melbourne, Honours Student
Presenting a simple stimulus inside of a moving frame has been shown to produce the misperception of that stimulus’s position. In the present study, we examined whether the transparent motion of two frames moving simultaneously in opposing directions can produce two simultaneous misperceptions of a single stimuli. Participants (n=6, data collection ongoing) peripherally viewed two overlaid transparent texture-filled frames oscillating with opposing phase. A single red dot was presented when the bars reversed direction, and participants were asked to report how many dots they saw. In one condition, the speed of the moving frames varied; in the second, the opacity of the flashed dot varied. The proportion of responses where participants reported perceiving two stimulus dots was compared to a control condition where two dots were actually presented. Analysis of preliminary data shows frequent reports of two dots in the experimental condition. By establishing the existence of this “splitting” illusory effect, we show that it’s possible to be aware of two simultaneous opposing perceptual predictions about a single object. This study lays the groundwork for future investigation as to the mechanism of this effect.

175. A comparison of psychophysical versus EEG classification images

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Laura Wang*, Queensland Brain Institute, The University of Queensland; School of Psychology, The University of Queensland (Honours student)
William Harrison, Queensland Brain Institute, The University of Queensland; School of Psychology, The University of Queensland
Reuben Rideaux, Queensland Brain Institute, The University of Queensland

Interrogating the features to which our sensory systems are tuned informs our understanding of perception. Classification images, a technique that maps behavioural decisions to their perceptual determinants, is an effective psychophysical technique for probing feature selectivity. However, the number of trials required to yield an interpretable classification image increases with the complexity of features of interest, which can be arduous and potentially prohibitive. Using the visual system as a model, here we sought to test whether it is possible to reduce the time required to form an informative classification image, by decoding decisions directly from observers’ EEG signals while they passively view rapidly presented noise images. We ran two reverse correlation experiments, both with ~10,000 trials, one with the standard behavioural paradigm (~3 h) and one where we decoded decisions from neural activity (~1 h). Using the standard approach, we found clear classification images for four out of five participants. By contrast, we were unable to decode neural activity in a manner that produced interpretable classification images. These results suggest that the signal-to-noise ratio and/or spatial resolution of EEG are insufficient to replace biological decoding systems under these conditions.

176. Examination of single subject auditory semantic N400 data: Exploring reliability and effects of task, system and analysis.

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This study investigated a known neural marker of lexical semantic processing using an auditory sentence based N400 paradigm. The aim was to find factors that could increase the sensitivity of this neural marker at the single-subject level (often reported at change level) for future use with non-verbal autism. Using typical adults (n=20), we conducted a within subjects multi session study where the effect of task (Count, Probe), statistical analysis (Univariate, Multivariate) and trial number (single session, two combined sessions) was investigated in terms of single subject detection rate. Furthermore, concurrent EEG
system recordings were conducted aimed at validating the portable EPOC+ system with the ActiCAP research grade system. Results showed that the combined session data recorded from ActiCAP was the most sensitive at detecting single subject lexical semantic processing at 75%, reported in both analyses. Group level univariate analysis showed that Task had no impact on N400 effect size \( f(1,19)=0.188, p=0.670 \) and EPOC+ was comparable to ActiCAP \( f(1,19)=1.347, p=0.260 \). However, unlike the ActiCAP system, MVPA found decoding was not significantly above chance level for EPOC+. Participant’s results session to session replicated only 50% of the time which goes towards explaining the difficulties obtaining 100% single subject detection.

177. Dopamine alters sensorimotor-to-associative gradient organisation in Parkinson’s disease

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Parkinson’s disease (PD) is primarily characterised by altered dopaminergic neuromodulation. Whilst structural and functional connectivity changes have been documented in PD, novel techniques can offer further insight into how changes in neuromodulation affect the hierarchical organisation of the brain. Recently, in the healthy brain a principal gradient has been identified to capture a hierarchical organisation that spans sensorimotor-to-associative regions. Here, we apply the framework of functional cortical gradients to investigate the influence of dopamine on brain organisation in PD. We collected resting state fMRI in 27 individuals with PD, both ON and OFF dopamine replacement therapy. We extracted cortical gradients using the BrainSpace toolbox. We found compression of the principal gradient in PD participants OFF dopamine compared to their ON state (\( p < 0.001 \)). This compression was consistent with reduced differentiation between sensorimotor and associative regions. Significant differences in gradient scores were found in the dorsal attention (\( p=0.001 \)), ventral attention (\( p=0.009 \)) and visual networks (\( p=0.001 \)). Our results demonstrate that the principal hierarchical organisation of sensorimotor-to-associative function is significantly compressed in the dopaminergic OFF state. These findings suggest a novel mechanism by which dopamine medication helps improve cognitive and motor function in PD: by promoting network differentiation and enhancing functional specialisation.

178. Effects of non-invasive brain stimulation in dystonia: a systematic review and meta-analysis

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Several studies have investigated non-invasive brain stimulation (NIBS) as a treatment for dystonia, however, results have been variable, leaving efficacy unclear. The aim of this study was to pool all previous NIBS studies in dystonia to evaluate its effect on clinical symptoms, and determine whether methodological characteristics are associated with variability in effect size. Embase and MEDLINE Complete databases were searched for articles using any type of NIBS as an intervention in dystonia patients. Meta-analysis of 27 studies demonstrated a small, significant effect for NIBS in reducing symptoms of dystonia (random-effects Hedges’ \( g = 0.21 \), \( p = .002 \)). Differences in the type of NIBS, type of dystonia, and brain region stimulated had a significant effect on dystonia symptoms. Meta-regression revealed utilising concurrent motor training programs resulted in significantly larger mean effect sizes. Furthermore, the mean effect size for studies that applied 10 sessions of active stimulation (\( g = \)
0.92) was significantly larger than studies which applied 1 (g = 0.2) or 5 (g = 0.04) sessions of stimulation. Findings suggest providing a greater quantity of sessions, and the application of NIBS alongside motor training, may help to improve dystonia outcomes in future studies.

179. 100 years of the Archibald Prize: How low-level image statistics correlate with judged categories of portrait art
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The Archibald Prize is a prestigious Australian portrait award for painting. There are different categories in which a portrait can be awarded, each with a different set of judges. What determines whether a portrait is a winner or not, and does this depend on the panel of judges? Evidence suggests that our aesthetic appreciation of art is heavily influenced by low-level image statistics. However, it is unknown the extent to which such factors influence the selection of Archibald Prizes. Here, we analysed the image statistics of portraits from 1921-2021 (1,600 portraits) across 4 categories: Archibald Prize (95), People’s Choice Award (30), Packing Room Prize (28), and No Award (1,447). We find significant differences between categories across a range of image statistics: contrast, mean luminance (brightness), 1/f slope (how similar two pixels are as a function of distance), and fractal dimension (complexity). These results suggest that low-level image statistics may be able to predict the aesthetic value of portraits. We also observe significant differences between each award category, suggesting that the way in which the portraits are viewed may change how low-level image statistics are preferred (e.g. viewing portraits up close in a packing room vs. far away in a gallery).

180. Brain temperature as a measure of neuroinflammation: assessment using whole-brain magnetic resonance spectroscopy
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Prior studies suggest a pathogenic role of neuroinflammation in psychiatric disorders; however, there are no accepted methods that can reliably measure these inflammatory processes in patients. Magnetic resonance spectroscopic imaging (MRSI) is a non-invasive technique that demonstrates sensitivity to neuroinflammation. Using MRSI in conjunction with echo-planar spectroscopic imaging (EPSI), we aimed to measure brain metabolites to derive estimations of whole-brain and regional brain temperature, which may increase during neuroinflammation. Typhoid vaccine, a safe experimental model of human neuroinflammation, was administered to twenty healthy volunteers in a double-blind, placebo-controlled crossover study including MRSI/EPSI scans before and after treatment administration. Mood, assessed using the Profile of Mood States, was measured hourly up to four hours post-treatment administration. A mixed model analysis of variance tested for treatment effects. A significant proportion of brain regions (44/47) increased in temperature post-vaccine compared to post-placebo (p<0.0001). For temperature change in the brain as a whole, no significant treatment effect was observed. Significant correlations were observed between mood scores and post-treatment whole brain and regional temperatures. Results indicate that regional, rather than whole, brain temperature may be a more sensitive measure of neuroinflammation. Future application of these neuroimaging techniques to patient populations would be of clinical interest.

181. Changes of mind in the face of perceptual and decisional uncertainty
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Changes of mind can improve performance by correcting initial errors, which is especially important for uncertain choices. Uncertainty can originate from perceptual processes, post-perceptual decision-making processes, or both. In this study, we aimed to characterise the role of perceptual and decisional uncertainty in changes of mind during a motion discrimination task by collecting behavioural and electroencephalographic data. Participants viewed a field of moving dots arranged
around a static, central grating and were asked to judge motion direction relative to the orientation of the grating. Perceptual uncertainty was manipulated by varying the strength of motion coherence, whereas decisional uncertainty was manipulated by varying the angular offset between the grating orientation and the motion direction. After each response, participants reported whether they wished to change their mind. High perceptual and decisional uncertainty reduced participants’ likelihood of both changing an incorrect response and staying with a correct response, implying that uncertainty decreases the ability to detect errors. We characterised brain activity associated with the motion events using neural population-tuning analyses and decision-making processes using decision-related event-related potentials (ERPs). ERP amplitude, but not tuning strength, predicted change-of-mind scores, suggesting that changes of mind primarily reflect decision-making dynamics.

182. Exploiting structural knowledge overcomes complexity constraints in human reasoning
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Andrew Zalesky, University of Melbourne
James Roberts, QIMR Berghofer Medical Research Institute
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Linking objects, ideas, or situations generate complex relational structures that support cognition. The human capacity to concurrently consider relations is very limited, yet we rarely experience this computational constraint in everyday life. Recent studies have shown that a hippocampal-entorhinal mechanism supports the generation of general (structural) knowledge and its actualisation of past events via a replay mechanism. We hypothesise that the knowledge structures generated by the hippocampus dynamically link with fronto-parietal brain systems involved in the trial-by-trial solution of reasoning problems. To test this hypothesis, we created an original relational reasoning task differentially activating the fronto-parietal systems via problems of various levels of complexity. Participants first learned trial-specific relational strategies to solve problems at different complexity levels. This assessed an individual’s ability to form relationships between objects to solve logical puzzles. The configuration of the task was then modified to allow the generation of trial-invariant structural knowledge on the relationships between items across different puzzles. Results confirm that the integration of this context-independent knowledge reduced trial-specific relational complexity and facilitated the solution of complex puzzles. These findings motivate future neuroimaging work assessing the neural processes supporting the dynamic integration of structural knowledge in problem-specific patterns of activity.

183. Bayesian accounts of perceptual decisions in the nonclinical continuum of psychosis: aberrant top-down or bottom-up processes?
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Neurocomputational accounts of psychosis investigate underlying differences in how information is evaluated and integrated into a predictive model of the world, in attempts to understand the occurrence of altered perceptual experiences. Conflicting Bayesian theories remain unresolved as to whether hallucinations and delusions arise due to an overreliance on prior information, described as an abnormality in top-down guided perception, or overreliance on current sensory information, explained as aberrant salience towards objectively uninformative stimuli. This study examines the relationship between perceptual decisions under uncertainty and psychosis proneness in a neurotypical population using a visual-spatial estimation task where both prior and sensory information were orthogonally manipulated. Bayesian modelling was used to compute individuals’ reliance on prior relative to sensory information, described as an abnormality in top-down guided perception, or overreliance on current sensory information, explained as aberrant salience towards objectively uninformative stimuli. Preliminary results of 357 participants suggested a weak, positive relationship between normative scores of psychotic-like experiences and a heightened reliance on sensory information (r = .11, p = .035), providing
support for aberrant salience theories of psychosis development. A robust replication of the methods and analysis pipeline are currently underway, with a validation dataset consisting of 782 participants. This will further elucidate subtle differences in information processing and predictive processes that extend into the non-clinical continuum of psychosis.

184. What are the odds? Examining preschoolers’ understanding of possibility and probability
Jessica Crimston*, PhD candidate at UQ

The ability to plan ahead is highly adaptive and has even been proposed as one of the key reasons for our success as a species. The utility of this ability often rests on the accuracy of our predictions; it can be important, for instance, to distinguish between mere possibilities and certainties. We sought to understand when young children begin to make such distinctions with the introduction of a simple, future-oriented, probability-based decision-making task. We found that although 2-year-olds struggled, 3- to 5-year-olds were generally able to differentiate between possible and necessary outcomes (e.g., 50% vs. 100% or 33% vs. 0%). All age groups, however, struggled to distinguish two possible outcomes with varying probabilities (e.g., 33% vs. 66% or 50% vs. 66%). Our results suggest that even by age 5, children may still lack a basic understanding of probability.

185. The effect of cardiorespiratory fitness and cerebral arterial health on cognitive control in healthy older adults
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Mahmoud Abdolhoseini, University of Newcastle
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Montana Hunter, University of Newcastle
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Cognitive control processes and prefrontal cortical (PFC) structures that support them are particularly vulnerable to ageing. Cardiovascular risk factors (CVRF) also increase in prevalence with age and systematically impact cerebrovascular health. Cerebral arterial stiffening is associated with measurable changes in the morphology of the arterial pulse wave that are, in turn, associated with neurophysiological changes which impact both brain structure and cognition. Understanding the link between cerebrovascular health, brain structure and cognitive control ability may help account for the large individual variability in cognitive ageing. Pulse Diffuse Optical Tomography (Pulse-DOT) measures derived from the arterial pulse wave component of the NIRS signal, can characterise variability in regional cerebral arterial elasticity. In this study of healthy older adults (n~150, 60-70 years), we investigate the relationship between performance on the cued-trials task-switching paradigm, a measure sensitive to subtle age-related declines in cognitive control, and regional arterial elasticity over the prefrontal cortex. We expect that reduced arterial elasticity over the dorsolateral and medial PFC will be associated with poorer task-switching and less interference control, respectively. These effects will be stronger in people with CVRF. These findings will tell us about mechanisms that underlie age-related cognitive decline and variability therein.

186. A test of time-resolved functional MRI with subsecond event durations
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Functional neuroimaging (fMRI) signals unfold over several seconds, but many neurocognitive processes occur on far shorter timescales. Relative differences in the timing and amplitude of fMRI signals (hemodynamic responses) can reflect changes in these neurocognitive processes, and previous studies have found robust and largely linear associations between evoking stimulus characteristics and observed hemodynamic responses. Evoking stimuli typically have long durations, however, so the extent to which such associations hold across sub-second events...
remains unknown. In this study, we attempted to recover and characterise the hemodynamic responses evoked by short (100-900 ms, and 1000ms-1800ms) visual and auditory stimuli of varying intensities. By iteratively fitting the observed fMRI signals to parameterised hemodynamic response functions, we found that changes in the peak amplitude and latency reflected changes in stimulus duration and intensity. Such effects were less clear with lower-intensity stimuli, thereby circumscribing the potential utility of the technique. Nevertheless, the size and direction of the changes were consistent with those observed through forward modelling, demonstrating the broad validity of existing hemodynamic response functions in such analyses. We conclude that hemodynamic chronometry represents a useful complementary approach for inferring brief mental events from fMRI data.

187. A cortical-depth-dependent analysis of surface-smoothed fingertip maps in human S1 acquired at ultra-high field (7T)

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Ultra-high field (7T) permits high-resolution fMRI, which is particularly useful for resolving fine details tangential to the surface as well as differences across cortical depth. Whereas most cortical-depth-dependent fMRI studies focus on measuring the degree of activation at different depths by averaging all the responses at each, there has been far less work assessing the consistency of the spatial distribution of responses across depth. Here we aimed to explore the integrity of a spatial response pattern across depth, particularly focusing on the role of depth-tangential surface-based smoothing. For this, we analysed sub-millimetre fingertip mapping data from human somatosensory cortex. Data were acquired using fMRI at 7T and was comprised of two sets of somatotopic maps (bottom-up or top-down driven). Both sets of raw somatotopic maps were found to vary across depth and were marked by a banded pattern at superficial layers; however, this pattern dissipated in deeper layers - being dominated by noise. Spatial smoothing of the fMRI signal lead to retained clarity of the banded pattern in even the deepest layers, by reducing variance in the maps. Interestingly, spatial smoothing proved to be a double edged-sword with examples of aggressive removal of fingertip representations. Task- and depth-related variography is discussed.

188. The Attention Atlas virtual reality platform maps three-dimensional (3D) attention in unilateral spatial neglect patients

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Deficits in visuospatial attention, known as unilateral spatial neglect, are common following brain injury, but are underdiagnosed and poorly treated, resulting in long-term cognitive disability. In clinical settings, neglect is often formally assessed using simple pen-and-paper tests. While convenient, pen-and-paper tests cannot characterise the full spectrum of neglect. We report a new research program that compares traditional assessments with a novel virtual reality attention assessment platform: The Attention Atlas (AA). The AA was codesigned by researchers and clinicians to meet the clinical need for improved neglect assessment. The AA maps the neglected space in three dimensions and seeks to identify the optimal parameters that best distinguish neglect from non-neglect, and the spectrum of neglect, by providing near-time feedback to clinicians on systems-level behavioural performance. A series of experiments will address procedural, scientific, patient, and clinical feasibility domains. We believe that the development and validation of The Attention Atlas is part of a new generation of translational neuroscience that exploits the latest advances in technology and brain science, including technology repurposed from the consumer gaming market.

189. Up close and emotional: electrophysiological dynamics of approaching angry faces
Zhou YU, The University of Queensland
Ada Kritikos, The University of Queensland
Alan Pegna, The University of Queensland

Recent evidence has suggested that in-motion emotional faces are processed rapidly in the neural system, and the looming motion further enhances the neural response to angry faces. However, it is unclear if this early response is specific to emotional expressions, or if it is present for faces in general. To address this question, the current study presented upright or inverted angry and neutral faces, which either expanded or contracted in size on a constant depth-cued background, such that they appeared to approach or recede from the viewer. EEG/ERP measures were used to identify the time course of brain activity for these stimuli. The results showed that in the upright-face conditions, both the P1 and N170 were enhanced for angry expressions, and the P1 was most enhanced by approaching angry faces. In addition, both the P1 and N170 amplitudes were enhanced for inverted faces. These findings show an early modulation of brain activity for upright looming angry faces. Moreover, they suggest that configural processing of faces is necessary for the early interaction between emotion and looming motion, also, exclude the influence of low-level visual features as a contributing factor.

190. Comparative assessment of venous artefact across magnetic field strengths and voxel resolutions
Wei Shi Koo*, University of Wollongong (PhD student)

MRI hardware and imaging resolution have been linked to reduction in contributions originating from draining veins on cortical surface. Here, we assessed venous artefact across imaging parameters by acquiring 1mm isotropic EPI images at 3T (N=5), 0.8mm isotropic EPI images at 7T (N=2) and using the 1.6mm 7T HCP images (N=12). Participants were presented retinotopic mapping stimuli (bowties, rings, bars, and full-field flash). Normalised mean EPI luminance maps and retinotopic maps were reconstructed on depth discrete surfaces across the grey matter. We further examined average luminance (inside and outside venous artefact) and BOLD response amplitude. We observed reduction in venous artefact from superficial to deep surfaces consistently across imaging parameters. Also, across imaging parameters, the decrease in averaged EPI luminance from deep to superficial surfaces was greater inside (26%) than outside (4%) venous artefact (p<.001, $\eta^2_p=.81$). A monotonic increase was found for BOLD amplitude (48% increase) from deep ($M_{amp}=1.09$) to superficial ($M_{amp}=1.57$) surfaces. Across imaging parameters, significant group differences in BOLD amplitude were observed (p<.001, $\eta^2_p=.72$). Our findings demonstrate the generalisability of venous artefact through visualisations but modulation of venous effects with imaging parameters. Future research will benefit from examining the source of these modulations (e.g., differences within venous artefact).
191. Crossmodal correspondence does not require superior colliculus involvement

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Crossmodal correspondence refers to the tendency to preferentially match a certain value of one sensory attribute, with a certain value of another from a different modality. In the elevation/pitch correspondence for example, visual stimuli presented above fixation are preferentially matched with auditory stimuli that are high in pitch. This preference manifests as faster reaction times, and higher accuracy in psychophysics tasks, as well as enhanced binding in multisensory integration paradigms. The neural underpinnings of this association are poorly understood however, and a myriad of brain regions have been implicated. This study explores the possibility of superior colliculus involvement in the phenomena. In a study conducted online with 262 participants, we attempted to vary visual input to the superior colliculus by presenting visual stimuli of different wavelengths, alongside a concurrent but irrelevant auditory stimulus. The superior colliculus does not receive input from short wavelength s-cones in the retina, and so short wavelength visual stimuli should not be reaching it. We observed that the behavioural effects of the elevation/pitch association persisted, regardless of the wavelength of light presented. This is not consistent with superior colliculus involvement in the crossmodal association and implicates cortical areas as more likely sites of origin.

192. Generic viewpoints between foregrounds and backgrounds are aesthetically preferred

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Ramachandran & Hirstein (1999; Journal of Consciousness Studies) proposed that generic viewpoints — where the spatial relationships between features are largely preserved despite small changes in the observer’s position — are aesthetically preferred. We investigated this in a forced choice aesthetic preference experiment on 17 participants, using a series of cartoon image pairs containing a more generic and a more specific viewpoint between foreground and background objects. We also investigated the pair of cartoon images initially published by Ramachandran & Hirstein that were supposed to demonstrate generic viewpoints are preferable. Generic viewpoints were significantly preferred amongst our set of cartoon images (log odds ratio of 1.56 (SE = 0.25; p < 0.001) fixed effect in a linear mixed effect model) although, curiously, not in the image pair initially published by Ramachandran & Hirstein. When differences aside from viewpoint were controlled for in the Ramachandran & Hirstein images, a preference for a generic viewpoint was restored. It may be that the lack of unusual spatial alignments in generic viewpoints helps our brains easily separate foreground from background objects, and that things that make processing the visual world easier are also things we find appealing.

193. Noradrenergic modulation of brain network topology and energy landscape dynamics mediates conscious resolution of perceptual ambiguity

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Ramachandran & Hirstein (1999; Journal of Consciousness Studies) proposed that generic viewpoints — where the spatial relationships between features are largely preserved despite small changes in the observer’s position — are aesthetically preferred. We investigated this in a forced choice aesthetic preference experiment on 17 participants, using a series of cartoon image pairs containing a more generic and a more specific viewpoint between foreground and background objects. We also investigated the pair of cartoon images initially published by Ramachandran & Hirstein that were supposed to demonstrate generic viewpoints are preferable. Generic viewpoints were significantly preferred amongst our set of cartoon images (log odds ratio of 1.56 (SE = 0.25; p < 0.001) fixed effect in a linear mixed effect model) although, curiously, not in the image pair initially published by Ramachandran & Hirstein. When differences aside from viewpoint were controlled for in the Ramachandran & Hirstein images, a preference for a generic viewpoint was restored. It may be that the lack of unusual spatial alignments in generic viewpoints helps our brains easily separate foreground from background objects, and that things that make processing the visual world easier are also things we find appealing.
Although many models of conscious perception implicate processing exclusively within the cerebral cortex and thalamus, there is emerging evidence that the Locus coeruleus noradrenergic system plays an important role in conscious visual perception. Specifically, noradrenaline modulates the signal-to-noise properties of incoming visual inputs, making it easier to resolve perceptual ambiguity. Despite these links, we lack direct evidence regarding the large-scale noradrenergic impact on visual perception under ambiguity. Previously, we have argued that noradrenaline shapes brain network topology and transitions in brain-state dynamics. To test whether these same effects were related to the resolution of perceptual ambiguity, we used a combination of functional MRI, pupillometry, attractor landscape framework, and computational modeling. We found that pupil diameter showed a substantial increase at the precise point in the task when subjects noticed a shift in the perceptual interpretation. These switches were also associated with an increase in BOLD within the LC. We next tracked the brain network dynamics during the perceptual switches and found an increase in the salience network functional connectivity to the rest of the system and a flattening of the attractor landscape. These results confirm the role of the noradrenergic system in large-scale reconfiguration during a perceptual change under ambiguity.

194. The perception of sound source duration across changes in reverberation, with and without a concurrent depiction of the listening environment
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The human perceptual system has the capacity to at least partially separate direct signals (sound sources) and indirect signals (environmental reverberation) when processing sounds at the ear. Here, we investigated whether this separation could permit the accurate measurement of a sound source’s duration and so provide “source duration constancy”. We also investigated the influence of visual exposure, as a visual understanding of a listening environment can potentially be informative of its reverberation. In an online format, participants were presented with sounds (noise burst sources convolved with reverberation from real-world environments), either with (n = 43) or without (n = 41) a simultaneous depiction of the environment, and judged which of two sounds had a longer source duration. We find that there was a high degree of source duration constancy without visual exposure, with the potential for a further (though uncertain) increase in constancy with visual exposure. This indicates that estimations of source duration can be relatively constant despite changes in the duration of the sound at the ear due to reverberation. Furthermore, the possibility of a visual exposure effect suggests the potential for environmental contributions to be informed by inferences across multiple modalities.

195. The ‘volume’ of a person’s inner speech modulates their auditory-evoked activity
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Speaking-induced suppression (SIS) refers to the phenomenon that sounds generated by one’s own speech elicit a smaller neurophysiological response than externally generated sounds that are physically identical. We have previously shown that inner speech, the silent production of words in one’s mind, can also result in SIS - ‘inner SIS’ - which is suggestive of a deep relationship between inner and overt speech. The present study investigated whether the magnitude of inner SIS was sensitive to the ‘volume’ of a person’s inner speech. Undergraduate students were instructed to produce an inner phoneme at a precisely designated time which co-occurred with a content-matched audible phoneme. Electroencephalography was recorded. Participants were instructed to produce, in their minds, an inner phoneme of either Loud, Medium, or Soft volume, or not produce an inner phoneme on Passive trials. Despite the fact that the audible phoneme was identical across all trials, there were significant differences in the level of SIS associated with Loud, Medium, and Soft inner speech. These results suggest that the ‘volume’ of a person’s inner speech influences the magnitude of the auditory-evoked response. This finding may have implications for phenomena such as auditory-verbal...
hallucinations, which are nominally associated with irregularities in inner speech.

196. The Interplay Between Spectral Scaling and Symmetry in Visual Preference
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A core goal of experimental aesthetics is to understand physical properties that determine visual preference but many image properties known to influence visual preference are studied in isolation from each other, with their interactions poorly understood. The present study focuses on the joint role of fractal scaling characteristics and types and number of symmetry axes (none, horizontal-, vertical- and four-fold symmetry) in determining visual preference. We used a two alternative paired comparison procedure to measure not only the preference but also the perceived complexity, regularity and visual interest of abstract synthetic noise images. This approach allows us to consider both the physical (fractal scaling and axes of symmetry) and perceived (complexity and/or regularity) determinants of visual preference. Furthermore, we test the generalisability of our manipulations and findings across the three visually distinct types of synthetic abstract images: Grayscale, Thresholded (two-tone black and white), and Edges-only images. Our findings reaffirm the inverted-U curved relationship between fractal scaling and preference across all levels of symmetry and in all three types of images. Furthermore, we demonstrate the utility of perceived “regularity” ratings to quantify changes in the perceived symmetry, with large differences between the horizontal and other types of symmetry.

197. Associations of physical activity and sedentary behaviours with cognitive function in bipolar disorder: Findings from the UK Biobank cohort.
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Background: Physical inactivity and sedentary behaviour are increased in bipolar disorder (BD) and are associated with cognitive deficits in psychiatrically-healthy populations. Whether these behaviours detrimentally impact cognition in BD remains unclear. We explored associations of physical activity/sedentary behaviour with cognition in BD; and examined age-related performance effects.

Methods: Relevant data were available for 1096 participants with BD and 60750 psychiatrically-healthy comparison (HC) participants. Physical activity, sedentary behaviour (TV or computer use), diagnostic group, age, and their interactions were regressed on a score of global cognition. Results: TV use was negatively associated with cognition, and computer use positively associated with cognition, with the latter association strengthened in BD. Cognitive performance was worse in those with high physical activity in comparison to moderate activity, which was strengthened in BD. Age interacted with computer use, such that cognitive performance in those with low computer use decreased more rapidly as a function of age. Discussion: Associations of sedentary behaviour with cognition appears to be moderated by the type of sedentary behaviour being performed. Additionally, high levels of physical activity may be detrimental to cognitive function. Several of these associations were strengthened in BD, highlighting the importance of these behaviours in this cohort.

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198. Basal ganglia connectivity and fatigue in adolescent myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS)

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Profound, unexplained fatigue is a hallmark symptom of adolescent myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS). Disturbances within basal ganglia (BG) networks are implicated in fatigue pathophysiology, yet the integrity of these networks in adolescents with ME/CFS has not been explored. Using a network-based approach, we aim to examine BG connectivity in adolescents with ME/CFS compared with healthy controls and how this relates to the primary symptoms of fatigue, cognition and pain. 48 adolescents aged 13-18 years (25 ME/CFS) were recruited and underwent diffusion and T1-weighted MRI scans, cognitive testing and self-report measures assessing fatigue severity and pain. Streamlines tractography was performed using QSIprep 0.15.3 with an MRtrix3 multishell ACT-HSVS pipeline combined with the Brainnetome246 parcellation scheme to create structural networks. At present, network measures of global efficiency, local efficiency, and centrality for BG regions and networks are being compared between cases and controls, and general linear models controlling for demographic variables will then be used to assess associations between network metrics and z-scores for fatigue and cognition. As there is no established aetiology or treatment for adolescent ME/CFS, this analysis will assist with the identification of neural substrates associated with the condition and support development of targeted treatment in this population.

199. How does thinking affect neurometabolic functioning in paediatric chronic fatigue syndrome?

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Post-viral fatigue syndromes like myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS) often show inflammatory-related neurometabolic alterations. This case-controlled study examined the effect of cognitive exertion on neurometabolic functioning in paediatric ME/CFS, and its relationship with fatigue and cognition. Thirty-six adolescents (16 ME/CFS, 20 controls, mean age=16±1.6) underwent assessment of fatigue, cognition, and a brain magnetic resonance spectroscopy scan, before and after a period of cognitive exertion. A left basal ganglia voxel was used with internal water as a reference. Random mixed-effects modelling adjusted for age, sex, and Cramér-Rao lower bounds was employed to evaluate group differences in peak concentrations of N-acetylaspartate (NAA), choline, creatine, and myo-inositol. While no significant interaction effects were identified, ME/CFS patients showed significantly higher pre-
exertion creatine, higher pre- and post-exertion NAA, and greater variability in these concentrations than controls. Myo-inositol and choline were negatively associated with fatigue in controls, while choline and cognitive ability were positively correlated in ME/CFS. Overall, cognitive exertion elicited a similar neurometabolic response in all adolescents. However, higher threshold and variability in NAA and creatine may suggest abnormal regulation of energy production and homeostasis in the basal ganglia in ME/CFS. Choline may also represent a useful biological marker of clinical outcomes in paediatric ME/CFS.

### 200. Individualised Profiling of White Matter Organisation in Moderate-to-Severe Traumatic Brain Injury Patients

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Approximately 65% of moderate-to-severe traumatic brain injury (m-sTBI) patients present with poor long-term behavioural outcomes, which can significantly impair activities of daily living. Numerous diffusion-weighted MRI studies have linked these poor outcomes to decreased white matter integrity of several tracts in the brain. However, most studies have focused on group-based analyses, which are unable to deal with the substantial between-patient heterogeneity in m-sTBI. As a result, there is increasing interest and need in conducting individualised neuroimaging analyses. We generated a detailed subject-specific characterisation of microstructural organisation of white matter tracts in 5 chronic patients with m-sTBI (29 - 49y, 2 females). We developed an imaging analysis framework using fixel-based analysis and TractLearn to determine whether the values of fibre density of white matter tracts at the individual patient level deviate from the healthy control group (n= 12, 8F, M_age=35.7y, 25 - 64y).

Our individualised analysis revealed unique white matter profiles, confirming the heterogeneous nature of m-sTBI and the need of individualised profiles to properly characterise the extent of injury. Individualised profiles may assist clinicians in tracking recovery and planning personalised training programs for chronic m-sTBI patients, which is necessary to achieve optimal behavioural outcomes and improved quality of life.

### 201. Interoception in health and disease: A meta-analytical review of the neurophysiological properties of the heartbeat evoked potential

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Lorimer Moseley, IIMPACT in Health, University of South Australia

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The heartbeat-evoked-potential (HEP) is a marker of interoception, the perception of internal bodily signals. Dysregulated interoception is evident in various conditions, though most prominently in mental health conditions. We aimed to determine if HEP differences exist between clinical and matched control groups. We investigated the HEP parameters used to differentiate HEP between
these groups. A systematic review and multi-level meta-analysis (osf.io/tmq3w/) was conducted. Group-specific characteristics, interoceptive task, electrophysiological methodology, and quantitative outcome data for the HEP response (SMD between groups) were extracted. A total of 24 clinical conditions (pooled as neuropsychiatric, neurological, or cardiovascular) were analysed. Lower HEP (poorer interoception) was demonstrated in the neurological sub-group (SMD= -1.02, SE=0.14, 95%CI= -1.46 to -0.9), while little evidence supported lower HEP in cardiovascular (SMD= -0.29, SE=0.17, 95%CI= -0.62 to 0.04) and neuropsychiatric sub-groups (SMD= -0.07, SE=0.08, 95% CI= -0.23 to 0.09). The confidence intervals indicate large variability in interoception within cardiovascular and neuropsychiatric conditions. This review highlights various statistical and methodological inconsistencies that may contribute to the variability of results, and by extension, limit the potential clinical inferences that can be drawn. None-the-less, these findings indicate behavioural interventions to improve interoception warrant further investigation especially in neurological conditions. A systematic approach for future HEP research is discussed.

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Christos Pantelis, The University of Melbourne
Antonia Merritt, The University of Melbourne
Bruce Tonge, Monash University
Warda Syeda, The University of Melbourne

Population-centric frameworks of biomarker identification for psychiatric disorders typically assume that diagnostic groups are mutually-exclusive, and homogeneous. There is a paucity of approaches capable of identifying individual-specific ‘fingerprints’ across multiple domains. To address this, we propose a novel framework, combining a range of biopsychosocial markers into higher-level ‘fingerprints’, capable of capturing intra-illness heterogeneity and inter-illness overlap. A multivariate framework was implemented to identify individualised patterns of brain structure, cognition and clinical markers based on affinity to other participants in the Australian Schizophrenia Research Bank (ASRB) database. First, individual-level affinity scores defined each participant’s “neighbourhood” across each measure. Next, diagnostic verification and classification algorithms were implemented using multivariate affinity scores. Affinity-based classification was compared to weighted K-nearest neighbours (KNN) classification. Individualised affinity scores provided a biopsychosocial ‘fingerprint’, which described the affinity of an individual to the representative groups in the dataset. Affinity score-based diagnostic classification achieved a high degree of accuracy in training, nested cross-validation and prediction steps, and outperformed KNN classification in the training and test datasets. Affinity scores facilitate early and accurate diagnosis of neuropsychiatric disorders, and can also be used to determine factors that contribute most strongly to an individual’s diagnosis and for planning intervention strategies.

203. Drawing on memory: A meta-analytic review
Georgina Maddox*, PhD Student, Flinders University
Glen Bodner, Flinders University
Paul Williamson, Flinders University
Matthew Christian, Flinders University

Drawing is commonly used as a tool to facilitate event recall in eyewitness and therapeutic settings, but its effects on memory accuracy and on memory inaccuracies has not been closely scrutinized. We report a meta-analysis of whether drawing is a more effective tool for enhancing memory recall than more traditional verbal methods of communication (e.g., “talk only” interviews). Database searches identified 36 randomised controlled trials of drawing-based interventions for memory event recall. The four memory outcome measures were the amount reported, the accuracy of reported information, errors, and confabulations. We also examined four potential moderators: age (e.g., children vs. adults), event type (e.g., autobiographical, video), control type (written vs. oral), and task timing (e.g., immediate vs. delayed). Random-effects analysis indicated drawing was favoured relative to verbal controls across outcomes. Drawing enhanced the amount and accuracy of information reported, but did not reduce errors or confabulations relative to control. The memory benefits of drawing were not moderated by age, event type, control type, or task timing. Our meta-analysis
suggests that drawing is a valuable facilitator of event recall and communication relative to traditional “talk only” interviews and/or written accounts.

204. Visually-related words in working memory
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Friedemann Pulvermüller, Brain Language Laboratory, Department of Philosophy and Humanities, Freie Universität Berlin, Germany

Findings from neuropsychology and neuroimaging studies suggest that sensory brain regions are relevant for semantic language processing. However, whether perceptual systems of the brain functionally contribute to the processing of words with visual meaning is still controversial. We aimed to determine whether perceiving visual stimuli has a differential effect on working memory for words referring to colours (e.g. green, mauve) and words referring to object form (e.g. square, oval). Twenty-three participants were presented with either 4 colour words or 4 form words and kept these words in memory for a 6 second period during which they were presented with either flashing colours or abstract shapes. Results revealed a differential impairment of working memory for colour and form words depending on word meaning, with flashing colours primarily interfering with working memory for colour words and abstract shapes specifically impairing working memory for words referring to object form. The resulting double dissociation indicates that processing resources in specific perceptual systems of the brain are shared between perceiving visual information and working memory for words with visual meaning. These findings strengthen the argument that perceptual systems are functionally relevant for semantic language processing.

205. A Computational Model of Context Effects on Prospective Memory
Shayne Loft, The University of Western Australia

Luke Strickland, Curtin University

Vanessa Bowden, The University of Western Australia

Prospective memory (PM) tasks require remembering to perform a deferred action and are often associated with predictable contexts. We overview a computational model of the cognitive processes by which context supports PM. Under control conditions, participants only completed a lexical decision task. Under PM conditions, participants had the additional PM task of responding to letter strings containing certain letters. Within blocks stimuli were presented in one of two colours, with colour potentially changing after each set of four trials. A pre-trial coloured fixation point was presented before each set. Under control and PM standard conditions fixation colour was meaningless. Under PM context conditions, fixation colour indicated whether a PM target could occur within the next set. We replicated benchmark effects of higher PM accuracy for context compared to standard conditions, and variation in PM costs (slowed lexical decisions relative to control conditions) as a function of context. PM theories assume that more cognitive resources are allocated to the PM task in relevant compared to irrelevant contexts. In contrast, Prospective Memory Decision Control, which formalises PM as a process of evidence accumulation among independent ongoing and PM task responses, accounted for context via proactive and reactive cognitive control mechanisms, without capacity-sharing.

206. Affective Working Memory in Depression
Annabel Songco, University of New South Wales (ECR <2 years post-PhD)

Shivam D. Patel, University of Cambridge
Katy Dawes, University of Cambridge
Evangeline Rodrigues, University of Cambridge
Cliodhna O’Leary, University of Cambridge
Caitlin Hitchcock, University of Cambridge & University of Melbourne
Tim Dalgleish, University of Cambridge
Susanne Schweizer, University of New South Wales & University of Cambridge

Depressed individuals show a wide range of difficulties in executive functioning (incl. working memory), which can be a significant burden on everyday mental processes. Theoretical models of depression have proposed these
difficulties to be especially pronounced in affective contexts. However, evidence investigating affective working memory (WM) capacity in depressed individuals has been mixed. The pre-registered study used a complex span task, which has been shown to be sensitive to difficulties with WM capacity in affective relative to neutral contexts in other clinical groups, to explore affective WM capacity in clinical depression. Affective WM capacity was compared between individuals with current depression (n = 24), individuals in remission from depression (n = 25), and healthy controls (n = 30). Results showed that overall, WM capacity was more impaired in the context of negative distractor images, relative to neutral images. Furthermore, those with a lifetime history of depression (individuals with current depression and individuals remitted from depression), performed worse on the task, compared to healthy controls. However, there was no support for the greater disruption of WM capacity in affective compared to neutral contexts in those with a lifetime history of depression. These findings’ implications for current models of depression are discussed.

207. Enhanced semantic memory in a case of highly superior autobiographical memory
Lucy Ford, Clinical Neuropsychology Registrar and Researcher (post-Master’s degree)

Highly superior autobiographical memory (HSAM) is characterised by the ability to recall personal events, dates, and news events from long-term memory with profound detail and accuracy. We created two novel experiments to objectively verify whether rich autobiographical information is retrieved sequentially (serial processing) or simultaneously (parallel processing) in a case of HSAM (R.S.), who has a self-reported superior memory for two sources of personally relevant information: (a) the ability to name days of the week for any given calendar date since the year 2000; and (b) the ability to remember practically the entire text of the seven Harry Potter books. RS and 10 age-matched controls were presented with pairs of calendar dates or sentences and asked which date/sentence came earlier in the week/book. Items within a pair varied in the proximity to one another in time. RS correctly identified earlier items with near perfect accuracy and her reaction time was not impacted by the temporal distance between items. Structural MRI comparing RS with a normative dataset found no significant differences in any memory-related brain regions. HSAM memory retrieval for stored semantic information appears to largely reflect parallel processing and is boosted by reportedly attaching autobiographical memories to these details.

208. Visual working memory is associated with white matter microstructures in healthy adult brain
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Jason B. Mattingley, Queensland Brain Institute, The University of Queensland; School of Psychology, The University of Queensland
Lena Oestreich, UQ Centre for Clinical Research, The University of Queensland
Michael J. O’Sullivan, UQ Centre for Clinical Research, The University of Queensland

Visual working memory (VWM) has been related to white matter properties in several long-range association tracts. It remains unclear, however, whether white matter microstructure supports the spatial and non-spatial VWM in different ways. To address this question, we collected behavioural and diffusion imaging data from 72 healthy adult humans aged 18-38 years. We developed a novel VWM task involving common encoding displays but in which the content to be remembered was either spatial or non-spatial. To estimate response precision originating from "true" memory processes independently of random guesses, response errors were analysed using mixture distribution modelling. Microstructural properties of ten tracts-of-interest were quantified using four diffusion metrics. The high-dimensional tractography data were then reduced by a two-step principal component analysis. The estimated response precision in both spatial and non-spatial tasks was negativity associated with generalized bulk diffusivity across all tracts. Both response precision and binding errors across VWM tasks were related to diffusion directionality in a cluster of frontal-occipital tracts only in individuals with less coherent tracts in the right hemisphere. Importantly, the estimated random guesses were not associated with any white matter factors, demonstrating functional specificity of the brain-behaviour associations to VWM processes, both spatial and non-spatial.
209. Virtual reality outlier analysis identifies atypical attentional patterns within a diverse sample of people with brain injuries

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In clinical settings, attentional challenges following brain injury, including unilateral spatial neglect, are often formally assessed using standard pen-and-paper techniques. The limitations of this standard are increasingly apparent. Consequently, computer-based methods, including virtual reality (VR), promise to provide new rehabilitation opportunities. A key challenge is to distinguish typical from atypical VR performance within clinical samples, which produce cognitive diversity across individuals. Here, we had patients with brain injury and clinician controls play a simple VR visual search game, requiring a target to be located among distractors. Stimulus parameters were varied across a series of distinct game levels. We recorded response accuracy and reaction time, alongside the player’s orientation in three-dimensional space, indexed by VR headset and hand controller coordinates. We used outlier analysis to define cut-offs indicating the boundaries of typical game performance for each analysis metric based on a combination of patient and control data. The results showed that outlying performance was more frequently observed in patients than controls, with some patients showing atypicality across multiple metrics. Additionally, distinct attentional patterns were observed across patients. The results suggest that outlier analysis provides a means to characterise individual performance patterns and create new standards for cognitive assessment in diverse populations.

210. Virtual reality and game-based cognitive interventions for children and adolescents with ADHD

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Erin McKay, Turner Institute for Brain and Mental Health, Monash University

Sally Richmond, Turner Institute for Brain and Mental Health, Monash University

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Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most prevalent neurodevelopmental disorders, affecting approximately 5% of children and adolescents worldwide. Children and adolescents with ADHD are vulnerable to behavioural challenges and executive dysfunction, which in turn can lead to poor academic and social outcomes. Emerging evidence suggests that digital interventions that target cognitive skills may offer benefits for those with ADHD. This presentation will discuss the findings of two pre-registered randomised controlled trials assessing the effects of (1) inhibitory control training delivered via virtual reality in 24 adolescents requiring a target to be located among distractors.
with ADHD (aged 13-17 years) and (2) attention training delivered via a digital app in 55 children with ADHD (aged 5-8 years). Assessments of executive functioning, inattention/hyperactivity and attention were conducted pre-intervention, immediately post-intervention and at 3-month follow-up. Participants were randomly assigned to either the intervention or a control condition. Intervention effects at each timepoint, and treatment moderators will be presented. These studies provide important evidence about the utility and efficacy of digital cognitive interventions in paediatric patients with ADHD.

211. Vergence Movements in Virtual Reality
Logan Bruce McIntosh*, PhD Student, University of Queensland School of Psychology
Guy Wallis, University of Queensland School of Human Movements and Nutrition
Philip Grove, University of Queensland School of Psychology

This study examined differences in the duration and range of vergence movements between two of our previous experiments. These experiments used similar methods but different displays (stereoscope vs. virtual reality head-mounted display) and the initial vergence location from which the movements were initiated also differed. The effect of initial vergence angle was explored by measuring vergence duration and range thresholds from several initial fixation distances. Interactions were observed between the disparity direction (crossed or uncrossed) and the initial vergence angle. Uncrossed movements were significantly faster to complete and had a significantly larger range as the vergence angle increased. In contrast, crossed movements tended to be slower, but not significantly, and had a significantly smaller range as the vergence angle increased. An initial offset of 2.38 degrees resulted in equivalent durations in both directions, while an initial offset of 3.18 degrees was required for equivalence of vergence range. Tonic vergence angles were also measured, which were found to correspond to approximately 0.79 metres on average, replicating previous findings. The implications of these findings for virtual reality environment design will also be discussed. This project was supported by Boeing Defence Australia.

212. Valid cueing enhances inattentional blindness in a virtual reality vigilance task.
Oren Griffiths, Flinders University
Sal Russo, Flinders University
David Nicoll, Flinders University
John Salamon, Flinders University
Tobias Loetscher, Uni SA
Mike Nicholls, Flinders University

Inattentional blindness is heightened when expected search targets are visually dissimilar to an unexpected, important rare target. Conformal cueing used in augmented reality systems seeks to render expected targets salient, thereby potentially increasing the risk of inattentional blindness. An experiment (n =39) was conducted in virtual reality, in which participants sought to identify threats in a dynamic, simulated battlefield scene. One group received valid cueing, one group received invalid cueing and a third received no cueing. Cues flickered at 15Hz to elicit steady state visual evoked potentials. Gaze was measured continuously. The validly cued group gazed at expected threat targets more frequently, and responded to them faster and more accurately, than the other groups. The validly cued group also showed more cortical activity consistent with cue usage. However, this performance benefit came at the cost of a marked reduction in the capacity to detect an unexpected, uncued threat (an unexpected gunman) that was otherwise plainly visible and remained onscreen for 18s. This observation highlights the need to more holistically consider the costs and benefits of augmented reality.

213. The impact of age and executive functioning on visual attention in dynamic scenes: a Virtual-Reality study of pedestrian safety.
Sebastien Miellet, University of Wollongong
Orhun Ozcelik, University of Wollongong
Victoria I. Nicholls, University of Cambridge

Road traffic accidents kill more than 270,000 pedestrians worldwide every year, and older adults are
disproportionally vulnerable. Yet, very limited research has focused on older pedestrians’ visual attention during road crossing. In a recent study using eye-tracking and crossing decisions on videos of road traffic, we showed that both environmental constraints and executive functioning abilities interact with aging to influence how the road crossing task is performed (Nicholls, Wiener, Meso & Miellet, 2022). Our findings also suggested compensatory strategies that seem efficient when the situation is simple (one traffic direction, limited field of view). In the current study, we conducted two experiments using eye-tracking in Virtual-Reality with wide field of view to investigate scenarios of varying complexity. The traffic density, number of lanes, number of traffic directions, which lanes and directions were used, vehicles speed, and task-irrelevant distractors were parametrically manipulated. We also considered the effects of participants’ age, walking speed, and executive functioning abilities on the dangerousness of crossing decisions in terms of time to impact. Our results provide a fine-grained description of how the situation complexity interacts with executive functioning and age to impact decision-making in daily, dynamic, and time-constrained situations such as road crossing.

214. Perceptual modulation over the gait-cycle: vision-in-action in virtual reality
Matt Davidson, Postdoc, University of Sydney
Robert Keys, University of Sydney
Frans Verstraten, University of Sydney
David Alais, University of Sydney

The majority of our knowledge about visual perception has been inherited from a tradition of seated laboratory experiments, which precludes an account of how vision may operate in more ecologically valid conditions. Here, we exploited advances in virtual-reality (VR) technology to present tightly-controlled stimuli during steady-state walking, and required participants to perform tasks that advanced at a constant walking speed into the foreground. In a first series of visual detection experiments, we observed sinusoidal oscillations in accuracy, reaction-time, and response likelihood, with best performance occurring during the swing-phase of the gait-cycle. In a second series of experiments, participants minimised the distance between their dominant hand and a floating target, and we capitalised on continuous psychophysics to record a frame-by-frame tracking-response at the presentation rate of the target stimulus. We observed a sinusoidal rhythm in tracking error, which also peaked at the swing-phase of the gait-cycle before rapidly returning to baseline. By generalising from a detection to a visuomotor task, these results demonstrate that walking, one of our most common and overlooked of everyday behaviours, may modulate perception over the gait-cycle.
215. Basic visual feature predictors of natural scene binding
Emily J. A-Izzeddin*, PhD student, Queensland Brain Institute, University of Queensland
Jason B. Mattingley, Academic, Queensland Brain Institute, University of Queensland
William J. Harrison, Academic, Queensland Brain Institute, University of Queensland

Humans have an exceptional capacity for quickly making sense of a completely new visual scene. This ability involves integrating spatially distributed visual information into a singular and coherent representation—a process known as “scene binding”. While the contribution of semantic content and object-level information to scene binding has been studied extensively, far less is known about how low-level features, such as orientation and luminance information, influence scene binding. We investigated scene binding by having observers make judgments about the relationships between small natural image regions taken from high quality digital photos. Observers viewed a standard image patch (diameter = 2°) and then reported which of two subsequent patches—the target and a foil—was from the same scene as the standard. Observers’ performance decreased linearly with the log of the relative distance between target and standard but remained well above chance even at the largest distances, at which there is little correlation between image regions. We also found that performance systematically depended on the target-standard azimuth, with high consistency across observers. These results and computational modelling suggest that orientation specific low-pass information greatly facilitates scene binding in the absence of unambiguous semantic and object-level information.

216. Contribution of higher-order structure to perception of mirror symmetry
Cayla Bellagarda, University of Western Australia
J Edwin Dickinson, University of Western Australia
Jason Bell, University of Western Australia

The global percept of visual mirror symmetry can come from precise local arrangements of otherwise meaningless elements such as dots or Gabors. Typically symmetry is defined by lower-order structure where paired elements fall along the same virtual line orthogonal to the symmetry axis. Here, we explore the role of higher-order structure in mirror symmetry, defined by implicit lines projecting between “pairs of pairs”, forming implicit four cornered shapes. To do so, we employ corner elements (two Gabors joined at an) in a temporal integration paradigm. Four experienced psychophysical observers completed a symmetry detection task involving 7 delay durations between symmetric partners for 5 symmetry conditions, varying in the type and presence of higher-order structure. We find a significant additional contribution of this higher-order structure in strengthening symmetry signal. We also show that while we are more sensitive to patterns with higher-order information, no differences in temporal processing were identified. These findings show the utility of corner elements in symmetry perception (and form perception more generally), and also have important implications for existing models of symmetry perception reliant on lower-order virtual lines alone and not accounting for higher-order structure.

217. Numerosity tuning in human association cortices and local image contrast representations in early visual cortex
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Martijn van Ackooij, Department of Experimental Psychology, Helmholtz Institute, Utrecht University, Netherlands
Ben M. Harvey, Department of Experimental Psychology, Helmholtz Institute, Utrecht University, Netherlands

Humans and many animals perceive visual numerosity (object number) and numerosity-tuned neural responses are found in several species. However, it remains unclear how numerosity is estimated from visual images while disregarding object size and spacing. Human early
visual cortex responses monotonically increase following numerosity, regardless of object size or spacing. This is surprising because numerosity is considered a high-level visual or cognitive feature while early visual responses are thought to follow image contrast in the spatial frequency domain. We therefore asked whether early visual responses could be explained by the spatial frequency content of numerosity displays. We found aggregate Fourier power (contrast at all orientations and spatial frequencies) followed numerosity closely but nonlinearly, with little effect of object size, spacing or shape. This allows straightforward numerosity estimation from spatial frequency domain image representations. Using 7 Tesla fMRI, we showed monotonic responses originate in primary visual cortex (V1) at the stimulus’s retinotopic location. Responses here and in neural network models followed aggregate Fourier power more closely than numerosity. Truly numerosity tuned responses emerged after lateral occipital cortex and were independent of retinotopic location. We propose numerosity’s straightforward perception may result from pervasive spatial frequency analyses in early visual processing across species.

218. Sensitivity to shape changes can be predicted by local context effects.

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J. Edwin Dickinson, School of Psychological Science, The University of Western Australia.
Ruby A. Martin, School of Psychological Science, The University of Western Australia.

Habak et al (2004) placed one shape inside another and showed this made a shape change harder to detect, an effect attributed to masking between representations of curvature. It isn’t always easy to distinguish effects arising from a higher, more global processing level from a local one. We apply our tilt-illusion (TI) field model to see whether the influence on shape could arise because of local interactions between lines with similar orientation (TI), with those consequences then flowing to later levels of visual processing. We attempt to predict the outcomes using local TIs. First, the TI was assessed for six observers to individualize predictions of expected shape interactions based on the TI. These match Habak et al (2004) data well. In Experiment two participants make line and global shape orientation judgements. The results were equivalent when expressed as an amount of local illusory tilt on the target, suggesting a TI account is plausible. This spatio-temporal field model applies to any image. Previous applications to face and shape adaptation are extended here to simultaneous shape interactions. We conclude it is critical to always understand the amount of variance that could be accounted for by local interactions before proposing global explanations.

219. The N400 as a marker of differential neural processing of language in persistent pain patients.

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Louise Kyriaki, Australian Bureau of Statistics
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Valeria Bellan, Cognitive Neuroscience Laboratory - University of South Australia.

Contemporary research describes pain as a biopsychosocial phenomenon, influenced by beliefs, cognitions and expectations. However, literature has seldom examined how these beliefs are embedded in the human language. To better understand the relationship between pain and language, we examined the N400 response, an event-related potential linked to unexpected stimuli. Participants (18 with low back PP, 21 pain-free) read statements framing pain as a protective mechanism or a dangerous phenomenon (e.g. “pain is an enemy/gift”), and control statements (e.g. “blood is red/green”) while their electroencephalogram was recorded. We hypothesised participants with PP would exhibit larger N400 amplitudes to statements framing pain as functional/helpful (incongruent with their beliefs and thus unexpected), when compared to pain-free participants. Mixed effect modelling revealed no differences in the N400 response between protective and danger statements in participants with PP, with large variance suggesting pain beliefs may be highly idiosyncratic. However, participants with PP elicited smaller N400 amplitudes across both pain-related and control stimuli, when compared to pain-free participants, highlighting potential neurophysiological confounds. These findings suggest it may be inappropriate to use the N400 to explore beliefs in non-neurotypical populations, and
further investigation will need to consider these differences when examining populations with PP in electrophysiological contexts.

220. Vulnerability of the Prosocial Rewards in Daily Life

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Prosocial behaviours are rewarding and play an essential role in a sustainable society. However, such rewards can easily be affected by various factors such as sleep duration. We investigated the neural basis of prosocial rewards that may be impacted by insufficient sleep using fMRI. Fifteen males (26.5±6.14 y.o) participated in a crossover, two-day in-lab study with two conditions; ‘3-hour Restricted-Sleep (RS)’ and ‘9-hour Sufficient-Sleep (SS)’. In the scanner, participants first viewed an anonymous person being ostracized (Ost) in a virtual ball toss. They then joined the game to see whether they would act prosocially by tossing more to Ost than to others (NonOst). We focused on the right orbitofrontal cortex [OFC; (x,y,z) = (6,46,-15)(mm)], a region engaged in subjective pleasantness in a previous study, which also overlapped with a significantly-activated area during task engagement [F= 3.48, p<.001]. We found greater OFC response during prosocial acts [F(1,14)=5.05, p=.04]. More specifically, the differential responses during prosocial acts differed between sleep conditions [Target (Ost/NonOst) x Sleep (RS/SS), F(1,14)=8.31, p=.012], such that the differential responses were significant for SS [t(14)=5.87, p=.001] but not in RS [t(14)=.4,p=.69]. The results suggest that sleep insufficiency may affect pleasantness when acting prosocially via diminished activation in the OFC.

221. Cortical and corticomotor markers of pain: A combined Transcranial-Magnetic Stimulation - Electroencephalography study

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Samantha Millard, Neuroscience Research Australia

Emily Si, Neuroscience Research Australia

Despite numerous neuroimaging studies into the aetiology of chronic pain, progress has fallen behind work on Transcranial Magnetic Stimulation (TMS) has been used to explore the role of inhibitory and facilitatory circuits during experimental pain and in chronic pain populations. Here, combined TMS-electroencephalography (EEG) was used to determine whether experimental pain could induce alterations in cortical inhibitory/facilitatory peaks observed in TMS-evoked potentials (TEPs), and alterations in motor-evoked potentials (MEPs) which index corticomotor excitability. In 23 healthy participants, multiple sustained thermal stimuli (40s duration each) were delivered over the forearm, with one block of stimuli delivered at a non-painful temperature, and another block delivered at 46 degrees (rated on average, as 4.8/10 in pain severity). During each thermal stimulus, MEPs were recorded from the forearm, and TEPs recorded from 64 scalp channels. Relative to baseline, painful stimuli led to an increased frontocentral negative peak ~50ms post-TMS (p=.007), with a larger increase associated with higher pain ratings (r=-.48). Painful stimuli did not alter MEP amplitude, though a stronger reduction in MEP amplitude during pain was associated with lower pain ratings (r=-.49). This is the first study to use TMS-EEG to examine alterations in cortical and corticomotor activity in response to pain. Our results suggest that both frontocentral cortical inhibitory activity and corticomotor excitability are correlates of pain sensitivity.

222. Pain in the brain & genes: Advancing neuroimaging genetics of chronic pain with CTG-VIEW

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Siobhan Schabrun, Neuroscience Research Australia
neurological & psychiatric disorders utilising large-scale genome-wide association study (GWAS) data. Here we demonstrate an open science & analytics platform — CTG-VIEW https://view.genoma.io — which integrates this ever-increasing tide of GWAS data to examine the genetic basis underlying grey matter (GM) morphology differences in chronic pain. Using GWAS summary statistics for chronic pain conditions (N=196,963 cases vs N=239,125 controls) and structural neuroimaging measures (N=19,629-34,000), bivariate linkage disequilibrium-score regression and latent causal variable analyses were employed to determine the genetic correlations (rG) and genetic causal proportion (GCP; FDR<5%) between these complex traits, respectively. The results show for the first time, a genetic basis to decreased GM in particular brain regions (e.g., pars triangularis, insula, posterior cingulate cortex) in chronic pain conditions — along with an unexpected causal relationship suggesting the genes underlying reduced insular cortical thickness may contribute to an increased risk of chronic abdominal pain (rG [S.E.] = -0.25 [0.08], p=1.06E-03; GCP [S.E.] = -0.69 [0.20], p=4.96E-04). This work also demonstrates the application of methodological strategies to address intractable mechanistic challenges and help advance the field towards identifying objective (causal) biomarkers for clinical translation.

223. The neural dynamics associated with computational complexity
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Peter Bossaerts, University of Melbourne
Carsten Murawski, University of Melbourne

(Background) Many everyday tasks require people to solve computationally hard problems. Yet, little is known about the neural dynamics that support solving these tasks, partly because there is no general framework to characterise complexity of tasks. Here, we present and test such a framework, grounded in computational complexity theory, to study the neural processes associated with problem-solving that overcomes previous limitations. (Methods) We performed an experiment in which twenty participants solved several instances of the 0-1 knapsack problem, a combinatorial optimisation problem, while undergoing ultra-high field (7T) fMRI. Instances varied in two task-independent measures of computational hardness: complexity and proof-hardness. (Results) Behaviourally, we replicate previous results showing that participants perform worse and spend more time on instances with higher complexity. Neurally, we characterise a network of regions whose activation was correlated with both measures but in distinct ways, including the anterior insula, dorsal ACC and the intra-parietal sulcus/angular gyrus. Activation and connectivity changed dynamically as a function of complexity and proof-hardness. As conjectured, we found neural markers of proof-hardness, despite it not affecting performance. (Discussion) These results suggest that computational complexity theory provides a suitable framework to study the effects of computational hardness on the neural processes associated with solving complex cognitive tasks.

224. Investigating the conflict in the Stroop task using the Bayesian hierarchical diffusion model
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The Stroop interference is one of the oldest and most robust effects in cognitive psychology and is widely used to study both the automaticity of reading and attentional control of conflict. Recently, we aimed to increase knowledge of these important cognitive processes by investigating the role of response modality (oral versus manual responding) in modulating the Stroop interference effect in a two-response color (red/green) variant of the Stroop task. Importantly, our study was among the first to investigate the Stroop interference effect in both oral and manual tasks at the level of the Bayesian hierarchical diffusion model. The results indicated that the Stroop interference effect modulated the drift rate, with a larger drift effect in the oral task than in the manual task. Further, we found evidence that response modality also modulated the drift rate in the neutral hashes condition, with a faster drift rate for oral responding relative to manual responding. These findings were interpreted in terms of the evidence accumulation process in the Stroop task being driven by the task goal, with phonological encoding, a speech production process, being a locus of Stroop effects in the oral, but not the manual task.
225. Effect of handedness and familial sinistralty on Stroop effect and visual choice reaction time
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The present study investigated the effect of handedness and familial sinistralty on Stroop effect and choice reaction time. Stroop test measures cognitive control of an individual and the ability to inhibit the cognitive interference when processing two different attributes of the stimulus. The sample consists of 35 left-handed and 49 right-handed subjects of the age range 18-25 years. The mean age was 20.5 years. The Stroop effect was studied in two different conditions: reading and naming the colour in the congruent and incongruent conditions. Visual choice reaction time for five different stimuli was measured using Schuhfried Vienna test system. Handedness and familial sinistralty were assessed using Handedness inventory developed by Chapman and Chapman. MANOVA was carried out. The main effect of familial sinistralty was significant on all variables studied. Individuals with familial sinistralty performed better than individuals without familial sinistralty. The main effect of handedness was significant only for choice reaction time and naming the colour in the congruent condition and not for other conditions. Left handers performed better than right handers. Findings are explained in terms of the theories of selective attention, parallel and distributed processing and hemispheric specialization.

226. Modelling the time course of semantic knowledge in the brain
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How does the brain transform incoming visual input into meaningful information about the things we see? Previous research has focussed on the time-course of object and category representations in the brain. However, it is still unclear when semantic knowledge emerges, and how the brain’s organisation of semantic knowledge connects to language. Here, we investigated when the representation of objects in the brain aligns to different models of language: hierarchical models (i.e., wordnet) and models based on word usage patterns in written language (i.e., word2vec). We used time-resolved decoding of electroencephalography (EEG) data to investigate the neural response to 200 different object concepts. To test the limits of these models, participants were shown unique stimuli selected to optimally differentiate between the predictions of different semantic models. Our results show that the visual models explained the most variance early in the time-course, whereas the semantic language models explained variance later in time. We also explored the contribution of individual semantic dimensions on emerging concept representations, with human- and animal-related factors explaining the most variance in the EEG data after 200 ms. Together, the results shed light on how semantic knowledge emerges, and how this representation relates to semantic similarity in language.

227. The interplay between the frontoparietal network and default mode network underlying balanced time perspective
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Balanced time perspective is the ability to flexibly switch between different time perspectives depending on the current context. Despite being associated with a range of positive outcomes in everyday life, little is known about the underlying neural mechanisms supporting balanced time perspective. The present study examined the interplay between the Default Mode Network (DMN) and the frontoparietal control network (FPN) in maintaining balanced time perspective. Ninety-one healthy participants completed the Chinese brief version of the Zimbardo Time Perspective Inventory and underwent resting-state functional imaging. Voxel-wise functional connectivity analyses revealed that connectivity between anterior medial prefrontal cortex (amPFC) and posterior cingulate cortex (PCC) with regions including anterior cingulate cortex (ACC), precuneus, and cerebellum was associated with balanced time perspective. Our findings suggest that maintaining a balanced time perspective requires coordination between the DMN and FPN and may have implications for understanding alterations in time perspective in clinical disorders.

228. Music therapy targets cognitive compensatory neural networks measured with magnetoencephalography

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The ageing population is predicted to increase, leading to increased incidence of dementia and the resultant burden on health care. Pharmaceutical interventions for dementia only manage symptoms and do not target underlying causes to delay or prevent disease onset, while carrying negative side effects. Therefore, non-pharmaceutical interventions for dementia such as music therapy should be explored as a standalone or co-therapy. Music therapy is a cost-effective, easily implemented intervention that improves behavioural and cognitive symptoms of the dementia, however, the neural mechanisms underpinning these benefits is not fully understood. Six participants with dementia completed an 8-week music therapy program involving working memory and executive functioning tasks. Dementia participants did not improve on depression, anxiety, and the Standard Mini Mental State Examination measures, but improved on an n-back task. Connectivity analysis of Magnetoencephalography data revealed increased activation in neural networks and areas associated with neural compensation. The connectivity results show preliminary evidence between known cognitive benefits of music therapy for people with dementia and functional networks associated with those cognitive processes. Music therapy is a viable short-term intervention which can target compensatory neural networks and could be a long-term intervention that incorporates modifiable lifestyle factors to protect the brain from dementia.

229. Multimodal Measurement Approach for Effects of Urban Environments on Psychological Wellbeing

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The built environment fundamentally affects human wellbeing. Most existing research on the psychological effects of urban environments is based on self-report measures. While those reports provide insights into
subjective experiences, they are also affected by conscious and subconscious bias. In the current study, we evaluate a multimodal approach to capturing wellbeing employing objective mobile physiological (heart rate) and neurophysiological (EEG) measurement technologies alongside self-reports to capture the impact of two different urban environments. Moreover, we endeavoured to measure and, when possible, control the physical aspects of the environment. The study specifically aimed to discover any significant differences between adults’ psychological wellbeing indicators across low and moderate urban density environments. Data collection took place in two urban outdoor locations on the Gold Coast in Australia. Non-parametric statistical tests showed that moderate urban density reduces people’s psychological wellbeing compared to low urban density. In the lower-density environment, individuals’ theta activity increased while beta and heart rate measures decreased. Moreover, self-report indicated that the lower-density environment enhanced individuals’ feelings of comfort and safety and decreased their negative mood. The research showcases the benefits of employing ecologically-valid multimodal psychological-environmental measurement approaches to evaluate the perceived impacts of built environments effectively.

230. The effect of cue validity and cognitive load on the detection of frequent and infrequent targets
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Forty nine participants completed a virtual reality experiment to investigate the impact of working memory load on cueing-induced inattentional blindness. Participants had to click on moving targets amongst distractors. Half of the participants received valid cueing (i.e., rectangular overlays that highlighted targets) and half received invalid cueing (i.e., overlays that were not useful for target detection). Participants also engaged in an auditory N-Back task with two levels of difficulty. On one critical trial a rare un-cued target was also presented. Participants gaze and brain activity was continuously monitored via eye tracking and EEG. Contrary to earlier findings from our lab, we found no evidence that valid cueing reduces the likelihood of noticing the rare target. Eye tracking and EEG (steady state visual evoked potential; SSVEP) data revealed that participants paid more attention to valid cues compared to invalid cues. Behavioural performance (reaction time and accuracy) was improved with valid cueing. However, under high cognitive load all participants were slower to click on the frequent targets and missed more of them. Although cognitive load did not impact SSVEP responses, it did affect participants gaze. Participants presented with valid cues spent more time looking at those cues when under high cognitive load.

231. Attention, n1 event related potentials and perception in the prepulse inhibition paradigm
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Dr Camilla Luck, Curtin University
Professor Ottmar Lipp, Queensland University of Technology
Dr Welber Marinovic, Curtin University

When a weak stimulus is presented immediately before a stronger one, the neural response to and perceived intensity of the stronger stimulus are reduced in comparison to presenting the strong stimulus alone. This phenomenon is known as prepulse inhibition (PPI), a measure of sensory gating. Here, we investigated 1) if there is a relationship between neural and perceptual PPI, and 2) the effect of attentional load on neural and perceptual PPI. Participants were tasked with comparing an electric pulse presented alone with one preceded by a weaker electric prepulse (Experiment 1) or an acoustic pulse presented alone with one preceded by a weaker acoustic prepulse (Experiment 2). In Experiment 3, we added a counting task (easy vs hard) to examine the effect of attentional load. In both modalities, the prepulse reduced N1 event related potential amplitude to the pulse and the perceived intensity of the pulse. N1 amplitude predicted participants’ perceived intensity choice in both modalities. In Experiment 3, attentional load did not influence N1 amplitude, but reduced the observation of perceptual PPI. Our study
provides evidence for a relationship between neural and perceptual PPI and suggests that attentional processes are critical for the observation of perceptual PPI.


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Philip Grove, School of Psychology, University of Queensland

We investigated the extent to which stereoscopic depth constancy occurs for 3D laparoscopic surgical displays, as well as the technical limitations of those displays. We compared perceived slant for red-blue anaglyph random-dot stereograms and for physical slanted surfaces captured and displayed through a 3D laparoscope across a range of viewing distances from 50 cm to 250 cm. The second study tested the accuracy of perceived depth and magnitude of perceived visual ghosting for physical depth intervals that were captured and displayed through a 3D laparoscope across a range of viewing elevations and viewing distances typical for a laparoscopic surgical team. Preliminary results show that perceived slant increases as a product of viewing distance, and perceived depth decreases as a product of viewing angle and viewing elevation. Furthermore, perceived visual ghosting increases as a product of viewing angle and viewing elevation. Thus, the findings of these studies offer insight into the extent to which stereoscopic depth constancy takes place under typical viewing conditions, and the technical limitations of 3D laparoscopic displays under those conditions.

233. Human contrast detection thresholds are independent of locomotion

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Although vision is used to guide and inform movement and locomotion, most experiments have been conducted in a darkened environment while seated. Recent work in mice has shown a change in some low-level visual processing due to locomotion (e.g., Busse et al., 2017 for a review). There is also evidence that the sensitivity of visual processing varies across the visual field, and different parts of the visual field may be used differently during functional tasks. However, there is a paucity of data on how low level human visual processing across the visual field is affected by locomotion. We measured contrast detection thresholds at horizontal, vertical, and oblique meridians at increments of 0°, 5°, 15° eccentricity. Seven participants completed the task while walking on a treadmill at a self-selected speed and while seated. Our results showed a significant effect of eccentricity on contrast detection thresholds, consistent with previous results. There was no significant effect of location in the visual field on thresholds. There was also no significant effect of locomotion condition which suggests that, in contrast to experiments in mice, human contrast detection thresholds are not altered during locomotion.

234. High frequency transcranial random noise stimulation can diminish perceptual performance: Computational modelling evidence

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Internal neural noise is an inherent property of all nervous systems. It is characterised by random/fluctuating neural activity and may substantially influence our perceptions. However, a causal link between internal noise and perceptual performance remains unclear. To explore this relationship, we require techniques that can experimentally manipulate internal noise. Transcranial random noise stimulation (tRNS), a form of electrical brain stimulation, appears to modulate cortical activity affecting perceptual and cognitive functions. We investigated if tRNS could worsen perceptual performance by substantially increasing internal noise using the perceptual template model (PTM); a computational model that can be used to quantify intrinsic mechanisms underlying changes in perceptual performance. We applied 3mA high-frequency tRNS to V1 during an orientation discrimination task across increasing external visual noise levels, and fit the PTM to contrast thresholds obtained. We find that 3mA high-frequency tRNS increased observer’s internal noise and reduced their ability to filter external noise compared to sham. These PTM estimates manifest as worse perceptual performance (i.e., higher contrast thresholds) across low and high levels of external visual noise, respectively. Our findings provide important implications for the application of high-frequency tRNS to investigate the detrimental impact of internal noise on perception in typically healthy populations.

235. Believing is seeing: the link between paranormal beliefs and perceiving signal in noise

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Research suggests that at the core of paranormal beliefs is a tendency to attribute meaning to ambiguous stimuli. However, no conclusive evidence exists to show that paranormal believers are more sensitive to perceiving meaningful patterns in noise. Using a two-alternative forced choice task, we tested the relationship between paranormal belief and perceptual bias. Participants were shown two stimuli presented in temporal succession. In one interval a Mooney Face (i.e., ambiguous signal) was presented, in the other interval a scrambled version of the image (i.e., ambiguous noise) was presented. Participants chose in which of the two intervals the face appeared. Our results showed that participants with stronger beliefs in paranormal phenomena were worse at discriminating the signal from noise. This may reflect the treatment of noise as also comprising a face-like signal. Our findings support previous research using “yes/no” tasks, but importantly disentangle differences in perceptual experience from response biases.

236. Link between vascular, brain and cognitive systems: A promising key to variability in age-related cognitive decline.

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Cognitive control processes and the prefrontal cortical (PFC) networks that support them are especially sensitive to ageing. The prevalence of cardiovascular risk factors (CVRF) increases with age and may contribute to the high variability in cognitive ability amongst older adults. CVRFs (e.g., hypertension, hypercholesterolemia) produce changes in cerebral arterial properties, including reduced elasticity and reactivity. The hierarchical cascade model of cognitive ageing argues that these vascular changes may create a cascade of impact on regional cortical perfusion and arterial pulsatility, and associated changes in brain structure and function and ultimately cognitive
ability. Pulse-diffuse optical tomography (pulse-DOT) measures provide a unique window into regional changes in cerebral arterial properties that are associated with variability in age, cardiorespiratory fitness, white and grey matter thickness and cognitive control functioning. This paper will overview early evidence from our ACTIVate (n=445, 60-70yrs) and ABC (n=150, 55-85 yrs) studies showing relationships between pulse-DOT measures and both cardiovascular risk factors and cognitive ability. We aim to establish foundational evidence that pulse-DOT may provide sensitive early biomarkers of subclinical brain and cognitive changes and may guide early detection approaches to reduce dementia risk.

237. A comparison of lesion mapping analyses based on CT versus MR imaging in stroke
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Mark Jenkinson, University of Adelaide
Ludovica Griffanti, University of Oxford
Hanne Huugeler, KU Leuven
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It is commonly asserted that MRI-derived lesion masks outperform CT-derived lesion masks in lesion-mapping analysis. However, no quantitative analysis has been conducted to support or refute this claim. This study reports the first objective comparison of lesion-mapping analyses based on CT/MRI-derived lesion masks to clarify how imaging type may impact results. CT and MRI data were collected from 85 acute stroke survivors in two cognitive screening studies at Oxford and Leuven. These data were employed to create normalised, binarised lesion masks and conduct lesion-symptom mapping analyses on simulated behavioural data. The analyses iteratively considered each impacted voxel as the underlying “target” within CT/MRI data independently. The resulting thresholded z-maps were compared between matched CT- and MRI-based analyses. MRI/CT-derived lesion masks were found to exhibit good agreement in location, overlap, and size. MRI-based lesion-mapping was able to include more voxels than CT analyses, but CT results were closer to targets. The results yielded by CT and MRI analyses demonstrated good agreement in terms of Dice similarity coefficient when systematic differences in cluster size are accounted for. These results suggest that CT/MRI lesion-mapping analyses produce comparable results. This finding is important as it suggests that studies can and should employ CT-derived lesion masks.

238. White matter hyperintensities within the forceps minor are associated with comprehension deficits in poststroke aphasia
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Laura Ziraldo, School of Health and Rehabilitation Sciences, University of Queensland
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David Copland, School of Health and Rehabilitation Sciences, University of Queensland
Sonia L. E. Brownsett

The volume of white matter hyperintensities (WMH), both overall volume and within segments of the corpus callosum, has been associated with cognitive deficits in pathological aging and poststroke1-3, but has yet to be studied in poststroke aphasia. This study investigates WMH volume and distribution’s impact on language in aphasia. Spoken Comprehension (SpoComp) and Production (SpoProd) abilities were assessed at subacute (37) and chronic (28) timepoints. Total WMH volume and % WMH load within the sub-divisions of the corpus callosum, forceps minor, major and the body were calculated. Multivariate linear regressions were used to predict variance in SpoComp and SpoProd, combined with stroke variables (stroke...
volume, lesion load within language network ROIs: insula, Broca’s, STG, AG+SMG). There was an effect of stroke lesion volume and WMH within forceps minor on baseline SpoComp ($R^2 = .36, p < .001$) and an effect of stroke lesion load within insula and Broca’s area and WMH within forceps minor on chronic SpoComp ($R^2 = .45, p = .001$). WMH did not explain variance in SpoProd. We provide novel evidence that a) corpus callosum WMH volume, rather than overall WMH volume, is associated with language recovery and b) comprehension and production show differential sensitivity to WMH.

239. Stroke Subtypes Classification using Multi-channel Microwave Signals
Guohun Zhu, Postdoctoral Research Fellow
Shang Gao, Student

Background: Subtypes of stroke can be divided into two main categories: Hemorrhagic (ICH) and Ischemic (IS). Rapid diagnosis of stroke subtypes is very important as stroke is an emergency. However, Prehospital CT is difficult to classify both ICH and IS. Recent studies show that microwave imaging has potential to provide a non-invasive, cost-effective, and repeatable scans to classify stroke subtypes.

Methods: This study evaluates stroke subtypes classification based on microwave signals using four machine learning methods, logistic regression (LR), K-nearest neighbors (K-NN), multiple neural network (MLP), and XGBoost. Firstly, an ICH and IS targets are moved in a skin and skull bucket with average brain emulating liquid to generate 188 brain stroke models. Then, 256 channel scattering signals are collected from each model. Next, 16 features are extracted by a principle component analysis method. Finally, features are forwarded into four classifiers to predict the stroke subtype.

Results and discussion: Unlike existing studies showing that K-NN has high performance, the results indicate that the LR achieves the best accuracy (98%) than other three methods. The reasons may be that deep stroke targets demonstrate non-Euclidean geometry patterns.

240. Improving Parcellation Accuracy of T1w MRI Images in the Presence of Large Bilateral Lesions Using ENIGMA TBI Data
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MRI processing in moderate to severe TBI (msTBI) patients is frequently hindered by large bilateral lesions introducing errors in morphological measurements (King, 2020), and often causing processing failures warranting patient exclusion. This study aims to validate Virtual Brain Grainging (VBG) in bilaterally lesioned patients. Previously, VBG improved parcellation accuracy in unilaterally lesioned patients by virtually repairing them prior to parcellation. We also test a new protocol for conducting manual quality analysis (QA) of FastSurfer (Henschel, 2020) output. T1w MRI scans were collated from the ENIGMA TBI working groups (14 msTBI, 100 HCs). First, native space TBI images underwent VBG repair. This repaired brain was registered onto 10 age and sex matched HCs, creating 140 lesion free synthetic-controls (LF-SC). Manually drawn native space lesion masks were then registered and inflicted onto the LF-SCs, generating 140 synthetically lesioned TBI patients (SL-TBI). Dice Score (DSC) comparisons of parcellations in SL-TBIs and LF-SCs will reveal the parcellation errors induced by msTBI lesions. DSC comparisons between SL-TBI parcellations pre- and post- VBG, will show improvements gained using VBG. Lastly, Inter-Rater Reliability scores between multiple manual classifications of each FS
parcellation will assess the reliability of our new protocol for conducting manual QA.

241. Evidence against long-term cognitive impairment after mild traumatic brain injury

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Recently, there has been a significant increase in research investigating the long-term cognitive consequences of mild traumatic brain injury (mTBI). However, the findings from these studies are largely inconsistent. In this preregistered study, we investigated cognitive performance among individuals in the chronic stage of mild traumatic brain injury (mTBI) using a battery of cognitively demanding behavioural tasks. Importantly, more than half of the participants in the mTBI group had experienced multiple mild head injuries. Compared to control participants (n = 49), participants with a history of mTBI (n = 30) did not demonstrate deficits in working memory, multitasking ability, cognitive flexibility, visuospatial ability, response inhibition, information processing speed or social cognition. There was anecdotal to moderate evidence that the mTBI group performed better than the control group on measures of visual working memory and social cognition. These results indicate that handedness influences lateralisation effects during facial emotion processing. The lack of influence of autistic traits on LQ might reflect the diversity of features measured by the AQ. Future planned analyses will investigate the relationship between AQ sub-scales (specifically social and communication sub-scales) and LQ, and whether autistic traits, and other individual differences are associated with laterality as measured by reaction time on the Chimeric Faces Test.

242. An Online Investigation of Factors Affecting Lateralisation in Facial Emotion Processing

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Right-hemisphere brain regions are strongly implicated in facial emotion processing, a phenomenon termed right-hemisphere bias (RHB). Differences in hemispheric-bias (laterality) of facial emotion processing have been associated with autistic traits. 415 neurotypical adults aged 18–67 years completed the Autism-Spectrum Quotient (AQ). We also assessed covariates previously linked with laterality including age, handedness, and gender. We indexed hemispheric-bias using laterality quotients (LQ) calculated from a Chimeric Faces Test, whereby participants indicate which of two identical (but mirrored) faces is more emotive. Preliminary results showed that AQ total scores did not significantly predict LQ. LQ was, however, predicted by handedness, whereby RHB was stronger in right- compared to left-handed participants. These results indicate that handedness influences lateralisation effects during facial emotion processing. The lack of influence of autistic traits on LQ might reflect the diversity of features measured by the AQ. Future planned analyses will investigate the relationship between AQ sub-scales (specifically social and communication sub-scales) and LQ, and whether autistic traits, and other individual differences are associated with laterality as measured by reaction time on the Chimeric Faces Test.

243. Working memory load does not reduce Emotion-Induced-Blindness magnitude

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Emotionally-salient stimuli can influence visual attention, even when they are not relevant to the task at hand. In one particularly dramatic demonstration of this, an
emotionally-salient task-irrelevant distractor that appears prior to a target in a rapid serial visual presentation stream can impair perception of a subsequent target for several hundred milliseconds, an effect known as emotion-induced blindness (EIB). Emotion-induced blindness reflects a temporal attentional bias to emotionally-salient stimuli. Here we sought to test the role of top-down attentional control in emotion-induced blindness. We manipulated working memory load (WM) to consume top-down attentional resources. Participants completed a task designed to elicit emotion-induced blindness under no, low, and high WM load conditions. Emotion-induced blindness was present in all conditions, and its magnitude was unaffected by load. This suggests that emotion-induced blindness is not contingent on the availability of top-down attentional resources. This contrasts with work demonstrating that spatial attentional biases (e.g., from dot-probe paradigm) are sensitive to load, highlighting the need to consider the distinction between spatial and temporal attention in understanding the influence of emotionally-salient stimuli on attention.

244. Heart Rate Variability, Emotion Regulation and Anxiety
Daniella Iskaf*, PhD student

Heart rate variability (HRV), a marker of sympathetic and parasympathetic activity, has been associated with emotion regulation and anxiety, though empirical evidence is mixed. We used an adult lifespan dataset (N=230, 18-87 years, 123 female) of healthy participants from the Cambridge Centre for Ageing and Neuroscience (Cam-CAN; Shafto et al., 2014) to examine links between cognitive reappraisal, anxiety and HRV. We hypothesised that higher HRV would be associated with better emotion regulation and lower anxiety. Data consisted of 9-minute electrocardiogram (ECG) recordings of resting heart rate, a measure of emotion regulation from a cognitive reappraisal task, and ratings of state anxiety using the Hospital Anxiety & Depression Scale (HADS). We derived multiple HRV measures using the NeuroKit2 toolbox (Makowski et al., 2021). Linear regressions and permutation testing with cardiorespiratory as predictors of emotion regulation and anxiety respectively revealed no significant associations of cardiorespiratory measures with emotion regulation, nor with anxiety. We found a significant association between anxiety and emotion regulation, but with higher levels of anxiety associated with better emotion regulation (β=0.06, t=2.10, p=0.038). The primary hypotheses were not supported. We discuss issues with the HRV measures and reappraisal tasks and consider how these issues may impact the field.

245. Aberrant microstructure and functional interactions between default mode network and a nucleus accumbens network in post-stroke depression
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Paul Wright, King’s College London, Department of Biomedical Engineering and Imaging Sciences
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Post-stroke depression is a common sequela of stroke. Yet, no consistent locus of injury has been identified. Based on studies implicating functional aberrations in major depressive disorder, we probed associations between post-stroke depression and functional connectivity in the default mode network, nucleus accumbens-seeded reward network, amygdala-seeded limbic network and dorsolateral prefrontal-cortex-seeded cognitive control network. Forty-four stroke patients underwent 3T structural, diffusion and resting-state fMRI and completed the Geriatric Depression Scale. Aberrant functional networks were further investigated by extracting within-network volumetric and microstructural measurements. Functional connectivity within the nucleus accumbens-seeded reward network and default mode network correlated positively with depression severity. Typical anticorrelations between these two networks were absent in patients with post-stroke depression. Microstructural measures in the posterior cingulate cortex, medial prefrontal cortex, and the medial forebrain bundle, a major projection pathway interconnecting the nucleus accumbens-seeded reward network and default mode network correlated positively with depression severity. Typical anticorrelations between these two networks were absent in patients with post-stroke depression. Microstructural measures in the posterior cingulate cortex, medial prefrontal cortex, and the medial forebrain bundle, a major projection pathway interconnecting the nucleus accumbens-seeded reward network, were associated with depression severity. Depression after stroke is marked by reduced mutual inhibition between functional circuits involving nucleus accumbens and default mode network as well as microstructural changes within these networks. Aberrant network dynamics present in patients with post-stroke depression are therefore likely to be influenced by secondary, pervasive alterations in grey and white matter, remote from the site of injury.
### 246. Beyond faces: Characterizing the response of the amygdala to visual stimuli.

**Jessica Taubert, The University of Queensland**
**Susan Wardle, The National Institute of Mental Health**
**Amanda Patterson, The National Institute of Mental Health**
**Chris I. Baker, The National Institute of Mental Health**

The primate amygdala subcortical structure thought to play a critical role in face processing. Consequently, the response of the amygdala to visually presented faces has received a disproportionate level of attention. However, to better inform theories of amygdala function, our aim was to characterise the amygdala’s response to a broader range of visual stimuli varying in both social relevance and emotional valence. We used event-related fMRI to measure amygdala activity in three macaques, this design permitted us to investigate both neural tuning and representational geometry. The univariate results revealed that at the population level amygdala activity is moderated by both social relevance and emotional valence. As expected, the average fMRI signal was greater for valent stimuli than neutral stimuli. Surprisingly, however, the non-social stimuli drove amygdala activity more so than the social stimuli. The amygdala was driven the most by an assortment of non-social stimuli, including medical syringes. In sum our findings suggest that the visual responses of the macaque amygdala are not easily captured by concepts such as social relevance or emotional valence (as defined by human researchers), and that amygdala function extends beyond the detection of faces and the recognition of facial expressions.

### 247. Brain structural maturation in children born preterm: a brain age prediction study

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Preterm birth can expose infants to many physical, psychological, and sensorial stressors during an important period of brain development. Research suggests that early-life stress may accelerate brain maturation and ageing. Preterm-born children exhibit brain volume and morphology alterations at cross-sectional timepoints; but how these alterations relate to the brain maturational trajectory remains unclear. In this longitudinal study, we investigated the relationship between preterm birth and brain maturation. We constructed a normative ‘brain age’ model to predict age over childhood based on brain cortical and subcortical volume and morphology measures from structural MRI of a large dataset of typically developing children aged 3–21 years. Using this model, we examined deviations from normative brain development in a separate dataset of preterm-born children at ages 7 and 13 years. Brain age delta (brain-predicted age minus chronological age) was, on average, higher in preterm-born children at age 7 and 13 years compared with age-matched term-born children, however this difference was not statistically significant. Under the brain age framework, these results may suggest that preterm-born children have similar brain structural developmental trajectories to term-born peers between ages 7–13 years. These findings provide unique insights on brain maturation following early-life adverse events such as preterm birth.

### 248. Estimating a functional brain age in children and adolescents

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Leena Lauronen, Helsinki University, Children’s Hospital, Helsinki, Finland
Michaela Waak, Queensland Children’s Hospital, Brisbane, Australia
Background: Estimating brain age from neuroradiography (MRI) has emerged as an innovative tool for assessing an individual’s neurodevelopmental trajectory with respect to their chronological age. However, MRI-derived brain age estimates are predominantly reliant on analytics of brain structure as opposed to brain function. Methods: We developed a functional brain age (FBA) based on cortical activity present in N2 sleep stages of the EEG (19 channel) in 1069 typically-developing children (ages 2 weeks to 16 years; 548 males, 520 females). We extracted 32 EEG features comprising common characteristics of amplitude and spectra (19 features) alongside informational/entropy metrics (13 features) and combined them using Gaussian process regression to form an estimate of FBA. The accuracy of the FBA was evaluated using 10-fold cross-validation. Results: Across common EEG montages tested, the bipolar montage yielded the highest accuracy between FBA and chronological age with $R^2=0.92$ and a mean absolute error (MAE) of 2.8 months ages 0 to 2 years and MAE of 1.28 years for ages 2 to 16. Discussion: Our study provides a compelling alternative to the status quo of MRI-based methods to offer an accurate, practical, cost-effective and child-friendly approach for estimating brain age from EEG. Funded by NHMRC IDEAS GRANT #2002135.

250. Higher-order functional brain networks in older adults are less segregated and efficient at rest: A systematic review of large-scale, resting state networks in ageing.


We conducted a qualitative and quantitative systematic review of large-scale, resting state functional networks across the adult lifespan. Studies on functional brain networks in ageing published between 1986 and July 2021 were retrieved from PubMed. After reviewing 2,938...
records, 145 studies were included, in accordance with PRISMA guidelines. The quality of the evidence for age-related changes on 11 network measures were assessed using GRADE criteria. The evidence provides high certainty that older adults display reduced within-network and increased between-network functional connectivity. Older adults also show lower segregation, modularity, local efficiency and hub function, and decreased lateralsation and a posterior to anterior shift at rest. Higher-order networks reliably showed age differences, whereas basic processing and control networks showed more variable results. The inflection point for network changes is often the third or fourth decade of life. Age effects were found with moderate certainty for reduced global efficiency, as well as altered patterns of dynamic functional connectivity. Research on within-subject bold variability and connectivity using glucose uptake provides low certainty of age differences but warrants further study. Taken together, these age-related changes may contribute to the cognitive decline typically seen in older adults.

251. On the relationship between GABA + and glutamate across the brain
Shane Ehrhardt*, University of Queensland - PhD Candidate

Equilibrium between excitation and inhibition (E/I balance) is key to healthy brain function. Magnetic resonance spectroscopy (MRS) provides a non-invasive means of quantifying in vivo concentrations of excitatory (e.g., glutamate, Glu) and inhibitory (e.g., g-aminobutyric acid and macromolecules, GABA+) neurotransmitters. Using the ratio of excitatory and inhibitory neurotransmitters as an index of E/I balance is common practice in MRS work and could be an effective diagnostic biomarker. However, recent studies have shown inconsistent evidence for this proxy’s validity, possibly due to contamination of Glu measures with glutamine (commonly termed Glx) at high field (3T) strength. Only at ultra-high field (7T) MRS can we estimate Glu directly. We used a large MRS dataset obtained at 7T measured from 193 healthy young adults, focussing on two brain regions - prefrontal and occipital cortex - to resolve this inconsistency. Our data reveal a common ratio between GABA+ and glutamate (but not Glx) are a reliable measure of E/I balance.

252. Similar somatotopy for active and passive digit representation in primary somatosensory cortex
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Alexander Puckett, University of Queensland
Hannes Saal, University of Sheffield
Tamar R Makin, University of Cambridge

Scientists traditionally use passive stimulation to examine organisational properties of the primary somatosensory cortex (SI). Recent research has, however, emphasised the close and bidirectional relationship between somatosensory and motor systems. It may be important, therefore, to also consider active contributions (e.g., direct inputs from the motor system to SI) when studying SI representations. Here we used 7 Tesla functional Magnetic Resonance Imaging to compare several hallmark features of SI digit representation between active and passive tasks which were not directly matched on task demands and stimulus properties. We found the spatial location of digit maps, univariate activity gradients across digits and multivariate representational structure were largely consistent between tasks. Despite overall comparability, notable differences were identified. For example, activity was higher overall in the active task and patterns of brain activity were more distinct for the different digits in the active than passive task (greater multivariate inter-digit dissimilarity). Given the high similarity in SI representations produced by the two tasks, we discuss various neurophysiological mechanisms that may underpin this consistency despite top-down and bottom-up task differences. In general, our findings support the utilisation of both active and passive tasks for studying SI somatotopy.
253. Dissociating attribute-specific prediction error responses across the cerebral cortex

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Patrick Johnston, Independent Researcher

It is well understood that orthogonal visual attributes are encoded within functionally segregated brain regions. Consequently, it has been assumed that the propagation of prediction errors is then specialised, with network activation being contingent upon the exact stimulus attribute violating a predicted percept. This assumption, however, remains largely untested, particularly regarding low-level stimulus attributes. As such, we presented subjects with a single two-dimensional stimulus that simultaneously and predictably varied across brightness, size, and orientation, within a five-step image sequence during fMRI scanning. For 50% of trials, the final image violated the implied stimulus prediction within a single attribute. Importantly the physical characteristics of violation and control stimuli did not differ. Preliminary analysis has found partially distinct posterior activation clusters for each attribute violation. Subsequent MVPA analysis will be employed to test the extent to which brain areas share neural representation between violation conditions. Our results support the notion of prediction error propagation being functionally dependent upon the attribute violating a perceptual prediction.

254. Estimating statistical power for ERP studies using the auditory N1, Tb, and P2 components

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The N1, Tb, and P2 components of the event-related potential (ERP) are thought to reflect the sequential processing of auditory stimuli in the human brain. Despite their extensive use, there are no guidelines for how to appropriately power ERP studies using these components. Here, we used Monte Carlo simulations to investigate how the number of trials, number of participants, effect magnitude, and study design influence the probability of finding a statistically significant effect. We found that as the number of trials, number of participants, and effect magnitude increased, so did statistical power. We also found that increasing the number of trials had a bigger effect on statistical power for within-subjects designs than for between-subjects designs, and that within-subjects designs required a smaller number of trials and participants to provide the same level of statistical power for a given effect magnitude than between-subjects designs. These results show that it is important to carefully consider these factors when designing ERP studies, rather than relying on tradition or anecdotal evidence. We hope that these results will allow researchers to estimate the statistical power of previous studies, as well as help design appropriately-powered studies in the future.

255. The opposing influence of the last input, and the last relevant judgment, upon perceptual decisions

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Visual judgments can depend on preceding trials. These serial dependencies usually increase the probability of repeated decisions (an ‘assimilative’ effect), although the opposite tendency has been reported (a ‘contrastive’ effect). There is ambiguity as to whether serial dependencies are driven by the physical properties of preceding inputs, or preceding decisions. We had
participants view trains of 3 - 7 presentations, consisting of pairs of ovals that differed in size, tilt, and colour. Participants attended all presentations, as they were unsure which they must judge, or what judgment (size or tilt) they must make, until after the final presentation. Participants completed two blocks of trials - one with elements matched in average size and tilt, and another mismatched block designed to induce adaptation. Our data suggest the last physical input(s) and the last relevant decision can exert opposite, assimilative input and contrastive decisional influences. Both dependencies were ~5x smaller than contrastive adaptation effects. While adaptation effects were clearly accompanied by changes in what inputs evoked perceptual uncertainty, serial dependencies were too slight to assess this - so it is unclear if these effects were truly perceptual in origin. We plan on further studies, to study serial dependencies of greater magnitude.

256. Parameter estimation for connectome generative models: accuracy, reliability, and a fast parameter fitting method

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Background: Generative models of the human connectome enable in silico generation of brain networks based on probabilistic wiring rules. These wiring rules are governed by a small number of parameters that are typically fitted to individual connectomes. A significant shortcoming of generative modeling in large cohort studies is that parameter estimation is computationally burdensome. Here, we propose a fast, reliable, and accurate parameter estimation method for connectome generative models that is scalable to large sample sizes. Method: Structural connectomes were constructed for 1064 participants in the Human Connectome Project. Parameters of established generative models were fitted to individual connectomes with three methods, namely single-point, multi-point, and multi-landscape. The fitting accuracy and reliability of each method were evaluated. A parameter fitting pipeline named fast landscape generation (FLaG) was developed to improve fitting efficiency. Results: We demonstrate an inherent tradeoff between accuracy, reliability, and computational expense in parameter estimation and provide recommendations for leveraging this tradeoff. Combining FLaG and multi-landscape method achieves improved estimation accuracy and reliability and saves computational cost by orders of magnitude, compared to established methods. Discussion and conclusion: Our work enables faster and more accurate and reliable parameter estimation for connectome generative models.

257. Using NODDI to characterise longitudinal changes in free water diffusion in children with mild traumatic brain injury

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Pediatric mild traumatic brain injury (mTBI) can result in ongoing attention problems persisting for several months following injury. Following mTBI, diffuse axonal injury (DAI) causes blood-brain-barrier disruption and chronic neuroinflammation leading to free water (FW) accumulation in white matter (WM) tracts. Neurite orientation dispersion and density imaging (NODDI) is a recently-developed diffusion tensor imaging (DTI) technique using multiple diffusion-sensitisation gradient strengths, compared to single-gradient strength in conventional DTI, to model brain microstructure in greater detail. NODDI metrics include orientation dispersion index (ODI; analogous to inverse of fractional anisotropy) and isolated FW (fISO). Using NODDI, we compared differences in FW diffusion among children with persistent mTBI.
symptoms and recovered children by one and two-months post-mTBI compared to healthy controls (HCs). Voxel-wise two-sample t-tests were conducted as permutation tests of general linear model statistics, comparing diffusion and FW-fraction across groups. At two-months post-injury, ODI was significantly higher in symptomatic, but not asymptomatic children, compared to HCs (pfDR<0.1). Between one- and two-months post-injury, fISO in grey and WM significantly decreased in symptomatic children (pfDR<0.1). This indicates that persistent mTBI symptoms are associated with increased ODI, likely due to WM axonal injury; compared to decreased WM FW and lesser axonal injury in symptomatic recovery.

258. Mapping cognitive deficits in cancer patients after chemotherapy: an activation likelihood estimation meta-analysis of task-related fMRI studies

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Recent neuroimaging studies have reported alterations in brain activation during cognitive tasks in cancer patients who have undergone chemotherapy treatment. However, the location of these altered brain activation patterns after chemotherapy varies across studies. The aim of the present meta-analysis was to quantitatively synthesise this body of evidence using Activation Likelihood Estimation to identify reliable regions of altered brain activation in cancer patients treated with chemotherapy (CTx+), compared to healthy controls (HC) and no chemotherapy controls (CTx-). Our systematic search identified 12 studies that adopted task-related fMRI on non-central nervous system cancer patients treated with chemotherapy relative to controls. All studies were included in the analysis and were grouped into four contrasts (CTx+ CTx-, CTx+ HC). Cancer patients treated with chemotherapy showed reduced activation in the left superior parietal lobe/precuneus (family-wise error corrected p CTx-; CTx+ HC). The majority of studies did not support an association between altered brain activation and cognitive performance after chemotherapy. Findings point towards a possible chemotherapy-induced alteration, which could inform targeted treatment strategies.

259. Unravelling the link between Media-Multitasking and Executive Functions

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Media-multitasking (using multiple media/devices simultaneously or rapidly switching between media/devices) relies on executive functions (EFs) for successful performance. Research examining the link between heavy and light levels of media-multitasking behaviours and performance on standard EF tasks has produced mixed results to date (see Parry et al., 2021 for a review). Using a task that more closely replicates media-multitasking behaviour may provide greater clarity on the association between media-multitasking and EFs. This project examined the link between media-multitasking and the EFs of task-switching and working memory. Participants completed the UNRAVEL task (participants switch between primary and secondary tasks and return to the correct step in the primary task sequence, Altman et al., 2014), the Media Multitasking Inventory (Ophir et al., 2009), a 2-back task and a fluid intelligence measure. Higher fluid intelligence scores predicted better UNRAVEL task performance and older participants with poorer 2-back performance took longer to complete the secondary/interruption task. Higher media-multitasking scores were associated with fewer mistakes on the primary task after completing the secondary/interruption task. This suggests that greater engagement with media-multitasking is linked with better task-switching and working memory skills.

260. Dynamics of Social Hormones: An investigation of Oxytocin using Electroencephalography

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In recent decades a staggering amount of research has been conducted investigating the impact of the
neuropeptide oxytocin on social cognition. However, evidence regarding the dynamic effects of oxytocin on neural activation is still unclear and, to date, few electrophysiological investigations have addressed this issue. The current investigation therefore aimed at determining the timing of the neural modulation caused by oxytocin. In a double-blind trial using intranasal oxytocin and electroencephalography (EEG), we measured the electrical brain response to faces of adult actors expressing different emotions. Oxytocin was shown to have a modulatory effect on a wide variety of facial stimuli, beginning at around 200ms at the P200, and continuing for several hundreds of milliseconds in a late positive potential. The findings provide the very first evidence of a sustained effect of oxytocin that appears over a large spectrum of socially-meaningful stimuli.

261. Spatial attention shifting to fearful faces depends on visual awareness in attentional blink: an ERP study
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It remains unclear to date whether spatial attention towards emotional faces is contingent on, or independent of visual awareness. To investigate this question, a bilateral attentional blink paradigm was used in which lateralised fearful faces were presented at various levels of detectability. Twenty-six healthy participants were presented with two rapid serial streams of human faces, while they attempted to detect a pair of target faces (T2) displayed in close or distant succession of a first target pair (T1). Spatial attention shifting to the T2 fearful faces, indexed by the N2-posterior-contralateral component, was dependent on visual awareness and its magnitude covaried with the visual awareness negativity, a neural marker of awareness at the perceptual level. Additionally, information consolidation in working memory, indexed by the sustained posterior contralateral negativity, positively correlated with the level of visual awareness and spatial attention shifting. These findings demonstrate that spatial attention shifting to fearful faces depends on visual awareness, and these early processes are closely linked to information maintenance in working memory.

262. Reward bias on attentional selection in reinforcement learning is sensitive to both expected values and Pavlovian signals
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Explicit goals and implicit learning bias attentional selection and behaviour. In some situations, these sources of bias conflict. For example, stimulus associations learned through Pavlovian conditioning can influence gaze, disrupting ocular target responses (Le Pelley et al., 2015). Here we tested whether eye movements would reflect Pavlovian conditioning, even when participants learned through reinforcement and responded via button press. On each trial, participants were presented with two (of six) complex stimuli. Their task was to select the higher-value stimulus. They were given reward feedback after each trial, allowing them to learn both expected value (EV - instrumental) and signalled reward (SR - Pavlovian). Eye gaze, although incidental to the task, was also recorded. Decision responses and first saccade locations were best predicted by models containing both EV and SR predictors. However, first saccades were better predicted by SR than EV, whereas the opposite was observed for decision responses. As such, decision choice more strongly reflected instrumental learning, and incidental eye movements more strongly reflected Pavlovian conditioning. Nevertheless, the two learning mechanisms were likely mutually supportive: Attentional biases from Pavlovian conditioning could lead to a higher probability of deliberate selection, thereby strengthening both signalling and instrumental relationships.

263. Less Age-related Tissue Loss in Long-term Meditation Practitioners within the Orbitofrontal Cortex
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The orbitofrontal cortex (OFC) is a heterogeneous brain region contributing to various processes that have been related to meditation practices. Since the OFC is known to decrease with age, meditators might show a reduced age-related tissue loss within the OFC compared to non-
mendators. We tested this hypothesis in a sample of 50 long-term meditators and 50 matched controls correlating OFC volume and chronological age within seven cytoarchitectonically defined subregions (Fo1 - Fo7) in each hemisphere. All analyses were corrected for multiple comparisons; sex and total intracranial brain volume were treated as nuisance variables. We observed negative correlations in both groups (i.e., the older the participants, the smaller the OFC volumes) but with less steep aging trajectories in meditators. These group-by-age interactions were significant for left and right Fo2, Fo3, Fo4, and Fo7, for left Fo5, and for right Fo6. Altogether, these findings suggest that the age-related volume loss of the OFC is less pronounced in long-term meditators than in controls but longitudinal studies are need to address the causality of the effect. Moreover, given that the subregions of the OCF serve different functions, follow-up research is needed to explore the functional implications of the observed region-specific effects.

264. More male-typical brain structure in women with congenital adrenal hyperplasia
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Congenital adrenal hyperplasia (CAH) is a genetic variant that causes high concentrations of androgens during gestation in females. While CAH has been linked to a persistently increased male-typed behavior in women, there is little consensus with respect to effects on the brain itself. We hypothesized that women with CAH would have a more male-typical brain anatomy than matched controls. Our study sample contained 40 adults with CAH (27 females / 13 males) and 40 controls (27 females / 13 males) closely matched for age. T1-weighted brain scans were tissue-segmented and classified into male and female using a relevance-vector machine. The classifier yielded a continuous probabilistic estimate for being male/female and thus made it possible to test for a more male-typical brain anatomy in women with CAH. Overall, men had significantly more male brains than women (p<0.001). Follow-up tests showed that, while there was no significant difference between men with CAH and control men (p=0.571), women with CAH were classified as significantly more male than control women (p=0.004). The more male-typical brain anatomy in women with CAH suggests that prenatal androgen exposure has formative effects on the brain that persist into adulthood.

265. Brain lesions associated with communication-related quality of life following surgical removal of primary left-hemisphere tumours
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Long-term quality of life (QOL) is an important consideration in planning surgery for individuals with
brain tumours. The current study examined relationships between QOL and anatomical characteristics of the lesion in patients 6-24 months post-surgery. Following left-hemisphere resective surgery, 37 individuals underwent behavioral testing and MRI. A principal component analysis across 10 QOL measures identified two components explaining ~62% of the variance: a communication-related and a mood-related component. Three lesion maps were generated per participant capturing (1) the primary resection, (2) the resection plus residual tumour characteristics (resection+), and (3) the residual tumour alone. Relationships between QOL components and lesion maps were examined using voxel-wise lesion symptom-mapping as well as general linear models predicting tract- and voxel-wise disconnection severities. Communication-related QOL was significantly associated with lesions comprising both the resection+ and residual tumour in the left medial inferior parietal lobe. Voxel-wise analyses of white matter disconnection severities revealed significant associations between communication-related QOL and thalamostratal fibres for the residual tumour lesions. None of the analyses involving mood-related QOL or the primary resection lesion maps were significant. The findings highlight the role of progressive tumour infiltration and associated white matter disconnection in communication-related QOL following treatment.

266. To speak or not to speak: Does the production of inner speech and non-speech sounds use corollary discharge?

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We have previously shown that inner speech—the silent production of words in one’s mind—attenuates the auditory-evoked potential elicited by an audible sound via corollary discharge. In the present study, we sought to determine whether this effect also occurs for non-speech sounds. To test this, participants watched an animation which provided them with precise knowledge about when they should produce an inner sound. At the same time, they heard an audible sound—a synthetic signal which can be perceived as speech or non-speech depending on whether the participant is informed or not, respectively—that either matched or mismatched the content of the inner sound. We found that the inner sound attenuated the N1—a brain signature of auditory processing—compared to passive listening, but only when participants were informed that the audible sound was speech, and only when the inner and audible sounds matched on content. If participants were not informed, or if the inner and audible sounds did not match, there was no attenuation of the N1. This suggests that the N1-attenuation effect is specific to speech, which might have important implications for our understanding of the neural processes associated with auditory verbal and non-verbal hallucinations.

267. Neural correlates of perceptual filling-in of the physiological blind spot

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The physiological blind spot (BS) is a naturally occurring scotoma in each eye that leaves a discontinuity in our visual field. Yet, even during monocular viewing, observers are unaware of the BS due to a process of seamless visual interpolation known as “perceptual filling-in” (PF). While previous electrophysiological work implicates some neurons in V1 in the PF process, neuroimaging studies revealed no neural correlates of PF in V1-V3. Generally, little is known about the neural mechanisms mediating PF. Here we used functional magnetic resonance imaging (fMRI) and a data-driven method to identify cortical areas mapped to the blind spot for each observer (n = 8). In a following fMRI session, we used a ring stimulus to evoke PF at the observer’s BS (filling-in condition), plus stimuli falling well outside and within (small) the BS boundaries. By contrasting activity while viewing with the blind spot eye with the contralateral eye, we observed that PF was associated with greater activity in several higher occipital
and parietal areas. In contrast, we found no neural correlates of PF in early visual areas.

268. Increased subjective sensory sensitivity is related to higher levels of depression and anxiety in the general population

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Our sensory experiences shape the way we interpret the world. Both heightened and diminished sensitivity to perceptual stimuli have been implicated in a range of psychiatric conditions, including autism, schizophrenia and bipolar disorder. Less is known about how individual differences in sensory sensitivity relate to sub-clinical symptoms within the general population, particularly of high prevalence conditions such as depression and anxiety. This project examined associations between self-reported sensory sensitivity and symptoms of depression, anxiety, ADHD, schizotypy and autism in a sample of 519 undergraduate students (72% female, mean age 19.33 years) using an extensive online questionnaire battery. Results showed moderate to strong positive associations between several measures of sensory sensitivity and scales measuring depression, anxiety, and attentional deficits. Higher levels of autism and schizotypy traits were also associated with greater sensory sensitivity. These findings indicate that increased subjective sensory sensitivity is related to higher incidence of symptoms of depression, anxiety and attentional deficits in the general population, and suggest that future work should examine the potential role of sensory sensitivity as a predisposing factor to psychopathology.

269. Characterising inter-individual variation in visual snow appearance and severity

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People with visual snow syndrome report a constant full-field visual disturbance consisting of tiny dynamic dots. We quantified the appearance of this phenomenon for the first time in 23 individuals with visual snow syndrome. Individuals separately estimated their visual snow dot size, separation, luminance and speed in reference to an external stimulus that simulated visual snow in dim illumination using a method of adjustment. Individuals completed a questionnaire on the severity of their habitual visual snow, separately rating visibility, the degree of interference with vision, effort to ignore and level of annoyance on an 11-point numerical scale. Mean and 95% confidence intervals for appearance estimates were: size (6.0, 5.8 - 6.3 seconds of arc), separation (2.0, 1.7 - 2.3 minutes of arc), luminance (72.4, 58.1 - 86.8 cd/m2) and speed (10.5, 3.6 - 17.3 cycles/second). Higher self-rated visibility was associated with finer dot spacing (tau-b=-0.41, p=0.01). Visibility was positively correlated with visual interference (tau-b=0.36, p=0.04) and effort to ignore (tau-b=0.48, p=0.005). We have successfully developed a method for quantifying visual snow appearance that may be useful in stratifying patients. These results reveal the fine spatial scale of visual snow, providing clues to understanding its neural basis and effects on vision.

270. Cognitive correlates of the Useful Field of View task

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The increasing incidence of road accidents in adults over 60 is an emerging public health concern linked to declines in cognitive processing ability. One promising candidate
for predicting and improving the driving performance of older adults is the Useful Field of View task (UFOV), a simple computer-based cognitive task. However, an enduring issue with UFOV has been explaining why it is predictive: despite considerable research, the cognitive mechanisms reflected in UFOV performance remain unclear. We sought to identify the cognitive processes underlying UFOV performance through a research study assessing how a large sample of younger adults (ages 18–40, n=120) and older adults (ages 60–86, n=116) performed on UFOV, compared with performance on four tasks known to measure different attentional and cognitive processes (visual acuity, working memory, shifts of attention, and resizing of attended region). UFOV was not a sensitive measure of performance in the younger sample. Conversely, visual acuity, working memory and attentional shifts all emerged as significant predictors of UFOV performance in the older sample, even when controlling for age. Implications for assessment and intervention in the driving performance in older adults are discussed.

271. Continuous recording of magnetic resonance spectroscopy in young and older healthy individuals during monocular deprivation: a pilot study
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Visual homeostatic plasticity is demonstrated by ocular dominance changes after short term monocular patching, which enhances the patched eye percept. This effect is linked to reductions in resting state GABA levels in visual cortex after patching (Lunghi et al, 2015). We have shown increased visual cortical GABA levels in older adults (Pitchaimuthu et al, 2017), but we do not know whether plasticity is altered. Here we designed a protocol to determine whether monocular deprivation effects differ in older individuals, and whether occipital metabolites are correlated with behavioral effects. We tested 15 young (mean age±SD: 28.3±5.7 years) and 8 older (69.5±4.9 years) individuals to show feasibility of estimating brain metabolites using magnetic resonance spectroscopy at resting state before, and after, 30-min of patching, as well throughout patching while visually active. We acquired high spectral quality single spectroscopy using STEAM (TR/TM/TE=8s/32ms/6ms), on a 7T whole body human MRI system. Acquisitions were binned into 5-min (32 averages) bins for subsequent spectral fitting using LCmodel and brain volume segmentation correction using FSL. Voxel segmentation corrected values of brain metabolites are evaluated against binocular rivalry measures. This successful proof-of-principle investigation opens the doors to a more detailed understanding of neurobiological changes impacting vision in older adults.

272. Perceiving surface colour requires attention
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Kavita Paul Remician, UNSW

Colour constancy refers to our ability to distinguish changes in surface properties from changes in the light illuminating the scene. The apparent ease with which we can tell that objects do not change colour, e.g. when moving from sunlight to the shade, belies the complexity of solving this ill-constrained problem. Although there is a substantial body of work testing which image cues might be used to accomplish this, there is surprisingly little known of how the brain performs this computation. Here, we performed two experiments to test a fundamental aspect of this perceptual process: whether it requires attention. We performed two experiments, testing visual search times and discrimination ability for both surface colour (requiring scission of surface and illuminant properties) and raw colour (which does not). We found a clear difference between the two: visual search for raw colour was fast and parallel, while search for surface colour was slow, requiring serial deployment of attention. Discrimination performance suggested that while raw colour detection is fast and parallel, once attention is directed to the stimulus
and perceptual scission occurs, raw colour information is discarded. Together, these results offer new insights into the processes the brain uses to accomplish colour constancy.

273. Social identity switching: How effective is it?
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Miriam Koschate, University of Exeter

Social identities refer to who we are based on the different category- and group-memberships that we hold. Psychological theories posit that we frequently switch between social identities. Yet, little is known about whether social identity switches are effective or incur cognitive "switch costs". Based on a task-switching paradigm, we used several Implicit Association Tests (IATs) in a within-subjects design to initiate and assess social identity switching. Pilot 1 (n = 24) and Study 1 (n = 64) findings indicate that the IAT congruency effect was no less robust after an identity switch compared to an identity repetition, suggesting that switching social identities is effective. We conducted a second study (n = 48) and a registered report (n = 144) examining differences in effectiveness for switches between identities at different levels of integration into the self-concept. We found that switching from a novel (minimal group) to an established identity (age identity) did not significantly differ in effectiveness from switching between two established identities (national identity and age identity). In future studies, we will aim to replicate the findings with stigmatised and conflicting identities. This work was supported by the Engineering and Physical Sciences Research Council (EPSRC), UK, (Ref.: 2074877 and EP/S001409/1)

274. Intervention is a Better Predictor of tDCS Mind-Wandering Effects than Subjective Beliefs About Experimental Results
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Blinding in non-invasive brain stimulation research is a topic of intense debate, especially regarding the efficacy of sham-controlled methods for transcranial direct current stimulation (tDCS). A common measure of blinding success is the inclusion of correct guess rate. However, this method cannot provide insight into the effect of unblinding on observed stimulation outcomes. Thus, the implementation of measures to systematically evaluate subjective expectation regarding stimulation is needed. Fassi and Cohen Kadosh recently suggested including subjective belief regarding stimulation in key analyses, and using this approach on an existing data set concluded that subjective belief drove the pattern of results observed. Here we consider the relationship between subjective and objective intervention in two data sets examining mind wandering propensity, including key contrasts for the published findings. Our analyses support objective intervention as the strongest predictor of the observed effects of mind-wandering in both re-analyses, over and above that of subjective intervention. Thus conclusions made by the mind-wandering studies are confirmed. Best practice to prevent these issues remains the inclusion of active control conditions.

275. Age Differences in Seated inhibition but not Step Inhibition in a Novel Adaption of the Stop-Signal Task
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The ability to cancel a step in response to a potential hazard can be critical to avoid injuries and falls. The current study adapted the Stop Signal Task (SST) to examine differences in proactive slowing and reactive inhibition during stepping. Older (n = 29, 60–79 years) and younger (n = 27, 18–43 years) participants completed seated Finger Tap, seated Foot Tap, and Step conditions of a 2-choice SST. Reaction time (RT) and stop signal reaction time (SSRT) were analysed using linear mixed models. Step RT was longer than RT in seated conditions, and most steps were preceded by an anticipatory postural adjustment. SSRT did not differ significantly by age; but increased for the Step condition relative to seated conditions. Age differences emerged in proactive slowing. Specifically, for the Finger Tap condition, but interestingly not for the Step condition, older adults exhibited greater proactive slowing than younger adults (evidenced by longer Go RTs when potential stop cues were anticipated). Older adults may perceive a greater need to slow down movements that are fast and easy to initiate (i.e., Finger and Foot Tap) than movements that are slower and more complex (i.e., Stepping) regardless of their actual stopping ability.

276. A reconceptualisation of selective stopping using Bayesian hierarchical modelling and single trial electromyographical (EMG) analyses.

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Modified stop signal tasks (mSST), where only one component of a bimanual action requires cancellation, suggest that selective stopping occurs through ‘global’ cancellation of the initial action, followed by (re)initiation of a unimanual action at some delay (i.e., stopping ‘cost’). 37 participants completed a mSST; stopping either occurred ‘reactively’ (no pre-cue) or ‘proactively’ (pre-cues indicated which action component may require cancellation). Successful selective stop trials were slower than bimanual go trials; this ‘cost’ was reduced (~10%), but not eliminated, by proactive cueing. Stopping efficiency did not differ significantly between reactive and proactive conditions. We developed a Bayesian hierarchical model, which assumes the stop signal (SS) provides a stimulus for both global stopping and unilateral responses, and provides accurate fits of the data. Model rate parameters indicate that the unilateral responses are faster than the bimanual responses. This notion is supported by behavioural data indicating that unimanual responses (relative to the SS) are faster than bimanual go responses (relative to go signal). Single trial electromyography indicates a temporal merging of the (cancelled) bimanual and (reprogrammed) unilateral responses on successful stop trials, together with higher magnitude responses on unilateral compared with bimanual responses, providing further support for the model’s structure and conclusions.

277. Processing, encoding, and sensorimotor factors drive response times of older adults on switch tasks containing interference.

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Previous switching research has provided limited insight into why slower response times (RTs) are observed with advancing age on switch tasks containing interference (e.g., mixed-task switch trials, dual tasks). Switch task performances of 15 healthy younger adults and 102 healthy older adults, split into four groups according to ascending age, were compared on two RT switch tasks with differing levels of interference from the Dalhousie Computerized Attention Battery (DalCAB; Jones et al., 2016). Repeated mixed-measures analyses of variance of diffusion decision model parameters (Ratcliff, 1978) – using both frequentist and Bayesian methodologies – found equal ability and an absence of a difference in switch costs between younger and older adults on both tasks, and greater accuracy and caution for older adults. Processing, encoding, and sensorimotor factors were the main drivers of longer RTs for older adults on both switch tasks, but more prominently
on the switch trials of the Dual Task. These findings support
the positive aspects put forward by the Inhibition Theory
of Aging (Hasher & Zacks, 1988; Amer et al., 2016; Weeks
& Hasher, 2014) - older adults benefit from processing
irrelevant or distracting information (i.e., interference) and
the result is greater accuracy.

278. Prefrontal cortex brain stimulation
paired with multi-tasking training results
in sustained performance transfer
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It is well established that performance on a cognitive task
can benefit from repeated training on that task. However,
the extent to which such training gains can transfer to an
untrained task is still intensely debated. There is evidence
that multitasking training combined with transcranial direct
current stimulation (tDCS) to the left prefrontal cortex can
lead to performance gains on an untrained visual search
task. Here, in this preregistered study, we recruited a large
sample (N=178) of participants to assess the conditions in
which tDCS related transfer may occur, and investigate the
neurophysiological predictors/changes that may underlie
tDCS + training induced transfer. Participants were split into
five training groups, four of which trained on multitasking
(1mA left prefrontal tDCS, 2mA left prefrontal tDCS, 1mA
right prefrontal tDCS, sham) and one trained on a control
RSVP task (1mA left prefrontal tDCS). Before, 1 day after,
and 1 month after 4 days of combined training and tDCS,
participants completed a battery of cognitive tasks to
assess for changes in performance. We found strong
evidence for transfer to a visual search task for both left
and right prefrontal tDCS that was still apparent 1 month
after training.

279. Time of Day of Preschoolers’
Engagement with Screens and
Associations with Sleep and Cognitive
Development
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Preschool children’s exposure to screen media and
associations with sleep and cognitive development were
investigated using an online questionnaire. Caregivers
answered questions about sleep duration, sleep quality,
durations to screen content and times of day children
engaged with screens. Half of the sample engaged with
screens during the day only and half both during the
day and at night. Longer average time spent engaged
with screen content was associated with shorter sleep
duration and poorer sleep quality and this was the case
regardless of time of day of engagement. Greater screen
time also predicted lower communication and problem
solving scores, and more attention difficulties, but sleep
duration was not a significant predictor or developmental
outcomes. The findings here indicate that preschoolers’
engagement with screens has implications for their sleep
even when engagement is predominantly occurring during
the day. Sleep is important for early neural and cognitive
development, and greater screen time has implications
for cognitive and language development at a time of
rapid changes in cognitive and language development.
The findings raise questions about the time children spend
on screens that could be spent on activities that better
support sleep and development.

280. Statistical learning improves non-
spatial target selection, but not distractor
suppression
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Recent studies have demonstrated that learned statistical
regularities influence attentional prioritisation. For
example, the deployment of spatial attention is influenced
by learning about the location in which a target is likely to
appear, resulting in a faster response to targets appearing
in high-probability locations versus low-probability
locations. Similarly, learning about the location in which a
salient distractor is likely to appear can induce location-
specific suppression, such that distractors appearing in high-probability locations are less likely to capture attention versus when they appear in low-probability locations. Across three preregistered experiments, we investigated whether learned statistical regularities influence the deployment of non-spatial attention. Participants completed a rapid serial visual presentation (RSVP) task in which they searched for a target image while ignoring a salient distractor. The target and/or distractor was presented more often in one position than in all other positions within the RSVP stream. Using a Bayesian sequential testing approach, we provide strong evidence to suggest that statistical learning can improve non-spatial target selection but has no effect on non-spatial attentional capture by physically salient distractors. These findings suggest that the influence of statistical learning on distractor suppression may be restricted to spatial priority.

281. Contextual cueing—what is it that is learnt?
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Contextual cueing refers to a phenomenon in which search of a target is facilitated by repeated exposure to the same configuration of items on visual displays. It has been characterised as an attentional cueing effect in which observers implicitly learn the configuration and use this memory to guide their attention to the target. Although the phenomenon is reliable and well replicated, it remains unclear what exactly is learnt in contextual cueing. To address this issue, we modified a standard contextual cueing paradigm such that once participants acquired the association between particular configurations of distractors and unique locations of targets, they were shown the identical distractor configurations that were now associated with new target locations. Results showed that visual search in these ‘old but new’ configurations was as quick as that in ‘old’ configurations that kept the targets in the original locations. The enhanced performance in the old-but-new condition suggests that it was not just a specific target location that was learnt. Rather, implicit representations of learnt configurations might constitute statistical maps that indicate the likelihood of target appearance at each location of a given display.

282. Do you really want to know, even if it hurts? Trading-off pain for non-instrumental information
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It has been demonstrated that people prefer early information that reduces their uncertainty or lead to pleasurable anticipation, even if it cannot be used to change the outcome (‘non-instrumental’ information). People are willing to incur considerable monetary and effort costs in exchange for this information, suggesting that information has intrinsic value. In this study, we investigated whether people would also endure mild pain in exchange for information. Forty participants performed a computer-based task. In each trial, they observed a coin flip, each side of the coin associated with different monetary rewards. Participants could then choose to endure a mildly painful stimulus (of low, medium, or high intensity) to learn the outcome of the coin flip immediately. Participants were informed that regardless of their choice, however, the winnings from each coin flip were always earned, rendering this information non-instrumental. Results showed that people were willing to endure pain in exchange for information, with decreasing probability for stronger pain stimuli. However, both higher expected rewards and larger difference between the two possible rewards increased the probability to accept pain. Our results suggest that the intrinsic value of non-instrumental information is sufficient to offset adverse experiences, such as physical pain.
283. Using unobserved causes to explain unexpected outcomes: the role of prior belief in protection from extinction with a hidden cause

Julie Chow, UNSW, early career researcher

People often rely on the covariation between events to infer causality. However, covariation between cues and outcomes may change over time. When such changes occur, how do people reconcile conflicting causal information? In the associative learning literature, protection from extinction is a phenomenon where the predictive properties of a cue following acquisition are preserved after repeated presentations without the outcome if a second stimulus is concurrently physically present during extinction (e.g., A+ -> AB-). One explanation for this effect is that the learner attributes the unexpected outcome to the added stimulus B, and therefore does not need to revise the causal status of the target cue A. Here, we ask whether the protection from extinction effect depends on the protective stimulus being physically present. In three human causal learning experiments, we investigate whether an inferred hidden cause might be sufficient to protect an excitatory stimulus from extinction. We additionally tested whether prior belief about the causal efficacy of the hidden cause determines whether protection from extinction occurs. These findings are important for understanding how and when people fail to update their causal beliefs, and the role of unobserved causes in the preservation of existing causal knowledge.

284. Signalling unpaired unconditional stimuli during extinction does not reduce their effect to strengthen extinction learning

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Allison Waters, Griffith University
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Presenting unpaired unconditional stimuli (US) during extinction reduces return of fear as indexed by renewal and extinction re-tests and slows reacquisition. The present study investigated whether this is mediated by fear conditioning to the context and inhibitory conditioning to the conditional stimulus (CS) that had been paired with the US during acquisition (CS+) when this stimulus presented without the US during extinction. Using an ABA renewal paradigm that trained extinction in a context different from acquisition and test, participants (N=120) either received no USs (Standard), five unpaired US presentations (Unpaired) or five presentations of the US preceded by a novel CS (Paired) during extinction training. Extinction was followed by tests for renewal and re-acquisition. Replicating previous results, renewal of electrodermal conditional responses was observed in group Standard, but not in group Unpaired and re-acquisition was slower in group Unpaired than in group Standard. Signalling the additional USs, and thus reducing context conditioning and eliminating the possibility for inhibitory conditioning, did not reduce their effects in that renewal was absent and re-acquisition slow in group Paired. Presenting unpaired USs during extinction training strengthens extinction learning, but the mechanism underlying this strengthening remains unclear.

285. Age-related functional brain changes in language regions during vocal music listening

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Music listening is an important and meaningful activity to people of all ages. Music listening interventions are used for ageing clinical populations, but our understanding of music processing in healthy older adults is still limited. Gaps in our understanding of the interactions between music and language brain networks still remain. The aims of this study were to identify age-related changes in processing vocal music, and to determine the involvement of word processing brain regions in vocal music listening. Participants passively listened to familiar Songs, Instrumental music, and Spoken Lyrics in an MRI scanner. Older adults showed greater activity in left temporal and occipital regions for Song processing over Lyrics.
processing, whereas greater recruitment of frontal regions were observed for Lyrics over Song processing. Using a word recognition mask revealed that older adults showed greater activity than younger adults for processing Lyrics than Instrumental music in the right mid-orbital gyrus. Lyrics also showed greater activity in the right supramarginal gyrus than Songs. The increased activity observed in the frontal, temporal, and occipital regions in older adults may reflect increased processing demands or compensatory mechanisms associated with ageing. This study was funded by an NHMRC grant awarded to Professor Copland.

286. Semantic knowledge of words is necessary to produce an incidental self-reference effect

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Self-related information is afforded a memory advantage over non-self-related information (self-reference effect: SRE). For example, evaluative self-referencing paradigms (eSRE) require participants to judge if a trait-word presented above or below a referent-name is self-descriptive (are you ‘honest’?) vs. other-descriptive (is Angelina Jolie ‘agreeable’?). The SRE is also produced when non-evaluative associations are formed between the self and stimuli, when trait-words appear above or below the self- or other-referent name (incidental SRE; iSRE). However, the eSRE is not produced when concrete nouns are encoded. Trait-specific eSREs may occur because traits can be encoded in relation to an individual’s self-schema, whereas concrete nouns cannot. Conversely, iSRE word type modulation is unknown. We investigated whether the iSRE is produced at least in part due to an interaction between the relative semantic elaboration of words and referencing to the self. Ninety-three participants encoded trait-, concrete noun-, or pseudo-words incidentally to the self vs. stranger by indicating if the words appeared on the left or right of the referent-names. An iSRE was produced with trait- and concrete noun- but not pseudo-words. Our novel results suggest participants must have semantic knowledge of to be encoded words in reference to an individual’s self-schema to produce an iSRE.

287. The influence of attention on propositional language production in the context of ageing

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Propositional language is the voluntary generation of novel ideas, which involves both core language skills and other cognitive processes, such as attention and executive functions. Changes to propositional language occur early in neurocognitive disorders, such as Alzheimer’s Disease. We examined the influence of attention and executive functions on propositional language production. Forty-two young adults and 38 older adults completed two novel picture-description tasks. Participants produced two sentences about the images under different interference conditions that manipulated attention demands. The first task used meaningless interference (control, auditory, visual), while the second task used meaningful interference (congruent, incongruent, unrelated, no distractor). We measured the quality and quantity of ideas produced (propositional density and speech rate), the time to start responding (response latency) and errors (grammatical, semantic, anticipatory). Distinct distractor effects were found, however generally, older adults produced more errors, had slower response latencies and speech rates compared to younger adults. There were no significant differences between younger and older adults for propositional density. Overall, interferences to attention influenced propositional language output to a greater extent for older adults compared to younger adults. Our findings also suggest that distractors without words does not interfere with idea generation when producing propositional language production.
The role of non-acoustic sublexical probabilistic phonotactic cues during speech perception

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All current models of speech perception assume language processing is grounded in acoustic properties of the speech signal (e.g., Mattys et al., 2012). However, considerable empirical evidence shows access to word meaning may be bootstrapped by non-acoustic, sublexical probabilistic cues acquired early in life via statistical learning (e.g., Auer & Luce, 2005). The present study aimed to investigate the contribution of these probabilistic cues to comprehension of noise-vocoded speech. In three experiments, each using a probe-prime-probe design with congruent, incongruent and neutral conditions, we presented participants with three different types of noise-vocoded probe sentences: real English, nonsense (containing real English words but semantically empty), and pseudo sentences (containing nonwords). In the nonsense and pseudo-sentence experiments, words and nonwords were matched in terms of phonotactic probabilities to the reference words but mismatched acoustically. For real sentences, we observed accuracy rates of 95% in the congruent condition. Crucially, accuracy rates for congruent nonsense and pseudo-sentences were also high (70.4% and 74%, respectively). These novel findings demonstrate that perception of noise-vocoded speech is largely achieved by processing non-acoustic, sublexical probabilistic phonotactic information. We discuss how models of speech perception may be enhanced by including this alternative route to accessing meaning.

Neural correlates of natural speech errors during continuous picture naming

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The majority of our knowledge about the neuroanatomy of speech errors comes from lesion-symptom mapping studies in people with aphasia (PWA) and laboratory paradigms designed to elicit primarily phonological errors in healthy adults, with comparatively little evidence from naturalistic speech production. Here, we analysed perfusion fMRI data from 24 healthy participants during continuous picture naming and classified their responses into correct and speech error types. Total speech errors engaged a wide set of left-lateralized frontal, parietal and temporal regions that were almost identical to those involved when producing correct responses. We observed significant perfusion signal decreases in the left posterior middle temporal gyrus and angular gyrus for semantic paraphasias compared to correct trials matched on various psycholinguistic variables. In addition, the left dorsal caudate nucleus showed a significant perfusion signal decrease for omission (i.e., anomic) errors. We did not observe any significant perfusion signal changes in brain regions proposed to be associated with monitoring mechanisms during speech production (e.g., anterior cingulate cortex, superior temporal gyrus). Overall, our findings provide evidence for distinct neural correlates of semantic and omission error types, and indicate that mechanisms responsible for speech errors in healthy participants might vary with those reported for PWA.