EPS

Experimental
Psychology
Society

BELFAST MEETING

10-12 April 2017

Open exchange of new ideas is central to EPS meetings. To foster up-to-date discussion, presenters are mandated to report work that is not yet published. We ask that attendees respect this mandate. Please do not record or publish presented material (e.g. via Twitter or Facebook) without the presenter's permission. For explicit guidance on reporting at EPS meetings, please refer to the EPS handbook.

A scientific meeting will be held at the School of Psychology, Queen's University Belfast, David Keir Building, 18-30 Malone Road, Belfast, BT9 5BN between 10 – 12 April 2017. The local organiser is Teresa McCormack.

Sixth Frith Prize Lecture
Tuesday 11th April, 6:00pm

> The contribution of alexithymia to impaired socio-affective processing across disorders
> Dr Rebecca Brewer, University of East London

EPS/BSA Undergraduate Project Prize
Monday 10th April, 5:00pm

> Social risk amplification in computer-mediated diffusion chains: Effectiveness of information reactivation applied to risk taxonomy
> Robert Jagiello, University of Warwick

Symposium
Monday 10th April, 2:00pm

> Time and causality
> Organiser: Professor Marc Buehner, Cardiff University

Symposium
Tuesday 11th April, 9:00am

> Metacognitions: dissociations or commonalities
> Organiser: Professor Patrick Haggard, University College London

Symposium
Tuesday 11th April, 2:00pm

> Moral reasoning and counterfactuals
> Organiser: Professor Ruth Byrne, Trinity College Dublin

Poster Session – drinks reception

The poster session and drinks reception will be held on Monday evening at 6:00pm in Room OG/533. Delegates may put up posters from 1:00pm and the boards will be dismantled on Tuesday morning. The posters may be collected from that room anytime on Tuesday.

Platform Presentations

Sessions will be held in the Lecture Theatres OG/110 and OG/012 at the David Keir Building at Queen's. This building has two entrances, one on the Malone Road, and one on the Stranmillis Road. The lecture theatres are closest to the Stranmillis Road entrance, although it is possible to walk through the building from the Malone Road entrance to the lecture theatres.

Both theatres have data projectors available for PowerPoint presentations. Presenters may provide their own laptops and connector leads, or bring USB keys for the on-site computers. Any queries about facilities in the theatres should be sent to the local organiser Teresa McCormack (t.mccormack@qub.ac.uk).

Conference Dinner

The conference dinner will be held on Tuesday 11th April at 8:00pm in Deane's at Queen's, http://www.michaeldeane.co.uk/deanes-at-queens/ (1 College Gardens, Belfast, BT9 6BQ). Deane's at Queen's is located immediately adjacent to the University, at the corner of College Gardens.

START OF PARALLEL SESSIONS

Session A
Lecture Theatre OG/110

Symposium: **Time & Causality**
Organiser: Marc Buehner

2:00 **Ben Rottman** (University of Pittsburgh)
Learning causal relations in non-stationary time series environments

2:30 **Christos Bechlivanidis and David A Lagnado** (University College London)
Time reordered: how causal beliefs guide judgments of temporal order

3:00 TEA

3:30 **Andrea Desantis** (Université Paris Descartes)
How actions structure time: about the perceived temporal order of action and sensory events

4:00 **Axel Lindner** (University of Tübingen)
The causal attribution of sensory events to one's own actions and its impairment in Schizophrenia

4:30 **Emma Blakey, Sara Lorimer, Christoph Hoerl, David A Lagnado, Teresa McCormack and Marc J Buehner** (Sheffield University, Queen's University Belfast, University of Warwick, University College London, Cardiff University)
When causality shapes the experience of time: Temporal binding across development

End of symposium

EPS/BSA Undergraduate Project Prize winner talk:

5:00 **Robert Jagiello*** (University of Warwick)
Social risk amplification in computer-mediated diffusion chains: Effectiveness of information reactivation applied to risk taxonomy

6:00 POSTERS AND DRINKS RECEPTION – This will be held in Room OG/533on Monday evening at 6:00pm.

START OF PARALLEL SESSIONS

Session B
Lecture Theatre OG/012

2:00   **Helen S Jones*, John Towse, Nicholas Race* and Timothy Harrison*** (Lancaster University and Defence Science and Technology Laboratory)
Cognitive and situational influences on susceptibility to email fraud

2:30   **Stergios Makris* and David Marchant*** (Edge Hill University) (Sponsor: Valentina Cazzato)
The neural correlates of detecting deception in expert soccer players

3:00   TEA

3:30   **Elizabeth Sheppard*, Melissa Drake*, Corinna Swann* and Peter Mitchell** (University of Nottingham)
Can people guess what cognitive task someone is engaged in based on a brief sample of his/her behaviour?

4:00   **Jeff P Hamm* and Michael Han*** (University of Auckland, New Zealand) (Sponsor: Kevin Paterson) An examination of reverse Illusory Line Motion

4:30   **Joseph L Brooks, Anka Davila* and Akul Satish*** (University of Kent)
Inter-Edge Grouping: A new principle of figure-ground organisation and new unifying framework for some classic principles

5:00   **Alexis Makin, Damien Wright*, Giulia Rampone*, Letizia Palumbo and Marco Bertamini** (University of Liverpool, University of Stirling and Liverpool Hope University)
Six claims about the extrastriate symmetry network

6:00   POSTERS AND DRINKS RECEPTION – This will be held in Room OG/533on Monday evening at 6:00pm.

Session A

Lecture Theatre OG/110

Symposium: <u>**Metacognitions: dissociations or commonalities**</u>
Organised by: Patrick Haggard

9:00 **Stephen M Fleming** (University College London)
A psychophysical approach to perceptual confidence

9:30 **Lucie Charles** (University College London)
Dynamics of metacognition and error awareness

10:00 **Redmond G O'Connell, Wouter Rys, Peter R Murphy and Simon P Kelly** (Trinity
College Dublin, University Medical Center Hamburg-Eppendorf)
Neural mechanisms for first- and second-order decisions in the human brain

10:30 COFFEE

11:00 **Elisa Filevich** (Humboldt Universität zu Berlin)
Domain-generality in perceptual metacognition

11:30 **Janet Metcalfe, Bennett L Schwartz and Paul A Bloom** (Columbia University)
A functional view of metacognitive phenomenology

12:00 **Patrick Haggard** (University College London)
How do we know what we are doing?

End of Symposium

12:30 **LUNCH**

Session B

Lecture Theatre OG/012

9:00   **Gemma Fitzsimmons*, Mark J Weal* and Denis Drieghe** (University of Southampton)
Reading for comprehension versus skim reading on the web: How skim reading is informed by hyperlinks

9:30   **Christopher J Hand*, Joanne Ingram* and Graham G Scott*** (Glasgow Caledonian University and University of the West of Scotland) (Sponsor: Ruth Filik)
Raednig trnaspoesd txet: Effects of position, frequency and letter constraint

10:00   **Timothy J Slattery*, Rhiannon S Barrington* and Julie A Kirkby** (Bournemouth University)
Inter-letter and inter-word spacing and dyslexia: An eye movement study

10:30   COFFEE

11:00   **Kayleigh L Warrington*, Sarah J White and Kevin B Paterson** (University of Leicester)
Ageing and the misperception of words during reading

11:30   **Lin Li*, Kayleigh L Warrington*, Fang Xie*, Sha Li*, Jingxin Wang*, Victoria A McGowan*, Sarah J White and Kevin B Paterson** (Tianjin Normal University, China and University of Leicester)
Effects of ageing and pattern complexity on the visual span of Chinese readers

12:00   **Denis Drieghe, Sana Bouamama*, Ehab W Hermena* and Simon P Liversedge** (University of Southampton and Zayed University, UAE)
Age of Acquisition effects in Arabic reading

12:30   **LUNCH**

Session A

Lecture Theatre OG/110

1:30 **Jo Black*, David Williams* and Heather Ferguson** (University of Kent)
Imaging impossible counterfactual worlds in Autism Spectrum Disorder: An eye-tracking study

Symposium: Moral reasoning and counterfactuals
Organiser: Ruth Byrne

2:00 **Bertram F Malle** (Brown University)
In blame and guilt, counterfactuals are for unintentional behaviors

2:30 **Jonathan Phillips** (Harvard University)
The relevance of alternative possibilities

3:00 TEA

3:30 **Ruth Byrne, Mary Parkinson, Shane Timmons and Tiago Almeida** (Trinity College Dublin)
Counterfactual 'if only' and semifactual 'even if' thoughts and moral judgments

4:00 **Daniel A Effron and Lisa L Shu** (London Business School)
Truthy lies: How counterfactual thinking can facilitate dishonesty

4:30 **Teresa McCormack and Brian Uprichard** (Queen's University Belfast)
Moral development and regret

End of symposium

5:00 **Patrick Burns*, Agnieszka Jaroslawska*, Áine Fitzpatrick*, Eugene Caruso* and Teresa McCormack** (Queen's University Belfast, University of Edinburgh and University of Chicago)
Investigating the developmental trajectory of moral judgements in the mini-ultimatum game: Intentionality and temporal asymmetry

5:30 EPS Business Meeting

Sixth Frith Prize winner lecture:
6:00 **Rebecca Brewer** (University of East London)
The contribution of alexithymia to impaired socio-affective processing across disorders

8.00 Conference dinner at Deane's for Queen's

Session B
Lecture Theatre OG/012

1:30   **Patti Adank, Helen E Nuttall, Gwijde Maegherman* and Harold Bekkering*** (University College London, Lancaster University and Radboud University, The Netherlands)
Covert imitation processes affect speech perception but not speech production

2:00   **Dan Kennedy-Higgins*, Joseph T Devlin* and Patti Adank** (University College London)
Exploring the role of cognitive abilities in plasticity in speech processing

2:30   **Renske S Hoedemaker* and Antje S Meyer** (Max Planck Institute for Psycholinguistics)
Coordination and preparation of utterances in a joint-naming task

3:00   TEA

3:30   **Sven L Mattys, James Hutson*, Shekeila D Palmer* and Laurence White** (University of York and Plymouth University)
Lexical knowledge boosts statistically-driven speech segmentation

4:00   **Shekeila D Palmer*, James Hutson* and Sven L Matty** (University of York)
Statistical learning for speech segmentation: Age-related changes and underlying mechanisms

4:30   **James A Hampton and Elisabeth Thwaites*** (City University of London)
Metacognitive awareness of knowledge of word meanings

5:30   EPS Business Meeting (Lecture Theatre OG/110)

Sixth Frith Prize winner lecture (Lecture Theatre OG/110):
6:00   **Rebecca Brewer** (University of East London)
The contribution of alexithymia to impaired socio-affective processing across disorders

8.00   Conference dinner at Deane's for Queen's

Session A
Lecture Theatre OG/110

9:00   **Caren A Frosch and Victoria Simms*** (University of Leicester and Ulster University)
Exploring the relationship between mathematical ability and domain general reasoning abilities in children and adults

9:30   **Kinga Morsanyi*, Teresa McCormack and Eileen O'Mahony*** (Queen's University Belfast)
The link between deductive reasoning and maths

10:00   **Bianca van Bers*, Kinga Morsanyi*, Patrick O'Connor* and Teresa McCormack** (University of Amsterdam and Queen's University Belfast)
Do children with developmental dyscalculia have an order processing deficit?

10:30   COFFEE

11:00   **Katharina M Schnitzspahn*, Franziska Plessow*, Clemens Kirschbaum* and Matthias Kliegel*** (University of Aberdeen, Harvard Medical School, USA, Technische Universitaet Dresden, Germany and University of Geneva, Switzerland) (Sponsor: Louise Phillips)
Stress effects on cognitive control in aging

11:30   **Kate Anne Woodcock*, Eleanor Callaghan*, Katherine Grady*, Gurpavnjit Johal*, Morgan McKenna*, Róisín McKenna* and Krupa Seth*** (Queen's University Belfast and University of Birmingham) (Sponsor: Teresa McCormack)
Measuring executive functioning in individuals with neurodevelopmental disorders

12:00   **Mike Burton, Robin Kramer and Andy Young** (University of York)
Learning the identity of very few faces delivers incidental perception of social categories

12:30   **Devin G Ray*, Sarah Gomillion*, Andrei Pintea* and Iain Hamlin*** (University of Aberdeen and University of Texas, San Antonio) (Sponsor: Louise Phillips)
The psychology of being forgotten

END OF MEETING

Session B

Lecture Theatre OG/012

9:00   **André Vandierendonck (**Ghent University, Belgium)
             Utility of integrated speed-accuracy measures in a study of task and dimension
             switching costs

9:30   **Samuel Sparks*, Maxwell Lyons* and Ada Kritikos*** (University of
             Queensland, Australia) (Sponsor: Simon Liversedge)
             Spatial and selective attentional constraints in motor contagion in reach-to-
             grasp action

10:00   **Joost C Dessing* and Sinéad A Reid*** (Queen's University Belfast) (Sponsor:
             Teresa McCormack)
             Non-predictive coding for manual interception in the posterior parietal cortex

10:30   COFFEE

11:00   **Maria Laura Filippetti*, Louise Kirsch*, Laura Crucianelli* and
             Aikaterini Fotopoulou* (**University College London) (Sponsor: Patrick
             Haggard)
             Certainty of interoceptive and exteroceptive signals modulates body ownership
             in the Rubber Hand Illusion

11:30   **Gethin Hughes*** (University of Essex) (Sponsor: Patrick Haggard)
             The role of the temporoparietal junction in implicit and explicit sense of agency

12:00   **Samuel Sparks*, Virginia Slaughter* and Ada Kritikos*** (University of
             Queensland, Australia) (Sponsor: Simon Liversedge)
             Ownership modulates perceptual judgements of object-directed action

12:30   **Rebecca Weil*, Tomás A Palma* and Bertram Gawronski*** (University of
             Hull, University of Lisbon, Portugal and University of Texas at Austin, USA)
             (Sponsor: Henning Holle)
             At the boundaries of misattribution: Does positivity influence judgments of
             familiarity in the affect misattribution procedure?

END OF MEETING

1. **Amy Atkinson*, Ed Berry*, Richard Allen, Amanda Waterman*, Alan Baddeley and Graham Hitch** (University of Leeds and University of York)
    How does prioritisation and validity affect performance in visual working memory tasks?

2. **Valentina Cazzato and Stergios Makris*** (Liverpool John Moores University and Edge Hill University)
    Off-line rTMS of left Dorsolateral Prefrontal Cortex reduces food cravings in females but not males

3. **Jessica Dully and Redmond O'Connell** (Trinity College Dublin) (Sponsor: Kevin Paterson)
    Efficiency of strategic adaptation in older adults in a perceptual decision making task

4. **Basma Elkhafif*, Anna Weighall, Melanie Burke* and Jelena Havelka (**University of Leeds)
    The effect of syntactic priming on auditory word identification

5. **Tamsin Margary*, Graham Finlayson*, Hannah Nash* and Anna Weighall** (University of Leeds)
    Comparing the effects of post-learning exercise, rest and sleep on memory for newly learned words in adults

6. **Amie Fairs*, Sara Bogels* and Antje S Meyer** (International Max Planck Research School for Language Sciences, Max Planck Institute for Psycholinguistics and Donders Institute for Brain, Cognition and Behaviour. All Nijmegen, The Netherlands)
    Dual-tasking in language: Concurrent production and comprehension interfere at the phonological level

7. **Sha Li*, Maryam A ALjassmi*, Kayleigh L Warrington*, Sarah J White, Jingxin Wang*, Mercedes Sheen, Timothy R Jordan and Kevin B Paterson** (Tianjin Normal University China, Zayed University Dubai and University of Leicester)
    Eye movement control for horizontal and vertical English text

8. **Adam J Parker*, Julie A Kirkby and Timothy J Slattery*** (Bournemouth University)
    Predictability effects during reading in the absence of parafoveal preview

9. **Gerard M Loughnane*, Daniel P Newman*, Sarita Tamang*, Simon P Kelly* and Redmond G O'Connell*** (Trinity College Dublin, Ireland, Monash University,

Melbourne, Australia, City College of the City University of New York and University College Dublin) (Sponsor: Kevin Paterson)
Antagonistic interactions between microsaccades and evidence accumulation processes during decision formation

10.   **Leila Iliffe*, Sonia Rishi* and Sarah R Beck** (University of Birmingham)
Children's difficulty with spontaneous counterfactuals: effects of choice and outcome valence

11.   **Peter Gooding*, Gethin Hughes* and Mitchell Callan*** (University of Essex) (Sponsor: Patrick Haggard)
Do notions of choice and control underpin the relationship between belief in free will and subjective wellbeing?

12.   **Anne Löffler* and Patrick Haggard** (University College London)
Two ways to change your mind: Effects of intentional strength and motor costs on changes of intention

13.   **James N MacGregor, J Barton Cunningham* and Jennifer Walinga*** (University of Victoria, Canada and Royal Roads University, Canada)
Training insight problem solving: Comparing procedures

14.   **James M Ogley* and Caren A Frosch** (University of Leicester)
Non-Functional counterfactual thinking in actors after anticipated regret in a risky decision task

15.   **Amanda C Marshall*, Antje Gentsch* and Simone Schütz-Bosbach*** (Ludwig-Maximilians-University Munich, Germany) (Sponsor: Patrick Haggard)
Interoceptive Inference: global vs. local predictions of internal states

16.   **Emmet McNickle*, Ger Loughnane*, David McGovern*, Simon Kelly* and Redmond O'Connell*** (Trinity College Dublin and University College Dublin) (Sponsor: Kevin Paterson)
Motor and evidence accumulation signals trace stimulus-response incongruity in the Simon Effect

17.   **Ruth S Ogden, Rhiannon McKenzie-Phelan*, John Fisk*, Catharine Montgomery* and John Wearden** (Liverpool John Moores University, University of Central Lancashire and Keele University)
Executive processes and timing: comparing timing with and without reference memory

18. **Elisabeth Pares* and Patrick Haggard** (University College London)
A new way to access intention in voluntary action

19. **Andrea Piovesan*, Laura Mirams, Helen Poole*, David Moore* and Ruth Ogden** (Liverpool John Moores University)
Does pain lengthen time estimation because it increases body arousal? A physiological study

20. **Naya Polychroni*, Love Hedman* and Devin B Terhune*** (Goldsmiths, University of London and University of Oxford) (Sponsor: Gustav Kuhn)
Investigating the behavioural signature of meta-awareness during mind wandering

21. **Wouter Rys* and Redmond O'Connell*** (Trinity College Dublin) (Sponsor: Kevin Paterson)
Exploring the neural basis of metacognition in perceptual decision-making

22. **Nura Sidarus*, Matti Vuorre*, Patrick Haggard and Axel Cleeremans** (Université Libre de Bruxelles, Ecole Normale Supérieure, Paris, Columbia University and University College London)
The relation between the metacognitive monitoring of action and instrumental learning

23. **Devin B Terhune* and Love Hedman*** (Goldsmiths University of London and University of Oxford) (Sponsor: Gustav Kuhn)
Metacognition of agency is reduced in high suggestibility

24. **Jessica Wang, Phillip Tseng*, Chi-Hung Juan*, Steven Frisson and Ian Apperly** (Keele University, University of Birmingham and National Central University, Taiwan)
Perspective-taking across cultures: Shared biases in Taiwanese and British adults

25. **Yuchunzi Wu*, Bronwen G Evans* and Patti Adank** (University College London)
Sensorimotor learning modulates automatic imitation in visual speech

26. **Yi Xie* and Sarah R Beck** (University of Birmingham)
The notion of psychological distance in counterfactual thinking

27. **Fiona Patrick*, Lindsey Marwood*, Renata Cserjesi*, Robert Davis* and Adam Perkins*** (King's College London, Eötvös Loránd University, Budapest and Goldsmiths University of London) (Sponsor: Teresa McCormack)
Exploring a novel tool for the measurement of self-criticism, in anorexia nervosa

Symposium - Time & Causality

Organised by Marc Buehner

Learning causal relations in non-stationary time series environments

Ben Rottman
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Inferring causal relations from time series data is complicated by the fact that there are likely to be non-stationary temporal trends. For example, if two variables are both caused by a third variable that changes over time, it could appear as if there is a causal relation even if there is not, or a negative causal relation could appear positive. In a series of five experiments we tested how people learn the strength of a causal relation in contexts with temporal trends. We found that learners, roughly, examine the correlation between the change in the cause and the change in the effect from one observation to the next. Utilizing change scores instead of the absolute values of the variables controls for nonstationarity in the time series data, which helps learners reach more accurate inferences about causal strength.

Time reordered: how causal beliefs guide judgments of temporal order

Christos Bechlivanidis and David A Lagnado
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We present a novel temporal illusion where people's beliefs about the causal relations between events determine the order in which they perceive these events. Participants view Michotte-style launching sequences with 3 objects, in which one object starts moving before its presumed cause. Participants re-order the events in a causally consistent way, thus violating the objective temporal order; and also fail to recognise the clip they had just seen, preferring a clip in which temporal and causal order matched. We discuss whether causality affects temporal order at an early perceptual stage or whether it distorts an accurately perceived order during retrieval. Instead we propose a mechanism by which temporal order is not misperceived or misremembered, but inferred ''on-demand" given phenomenal causality and the assumption of temporal priority. Finally, we discuss how, contrary to most theories of causal perception, impressions of causality can be generated from dynamic sequences with strong spatiotemporal deviations.

How actions structure time: about the perceived temporal order of action and sensory events

Andrea Desantis
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The perception of causal links between our actions and subsequent sensory events is essential for our survival. However, causality is not directly perceived, but inferred from observable information such as, for instance, the temporal relationship between action and sensory events. In particular, all causal relationships must respect the axiom "causes must precede their effects". The studies that will be presented, investigated people's perception of the temporal order of actions and sensory events, with the aim of identifying some of the factors shaping this kind of perception. Interestingly, we observed that participants perceived sensory events more often after their actions even when they were physically presented before action execution. Moreover, these changes in perception were modulated by participants' expectation of *what* outcome their actions should generate and by the fluency with which participants could select their action. Taken together these results suggest that processes linked to the preparation and execution of actions shape the representation of the temporal structure of the world which might in turn affect our perception of causality.

The causal attribution of sensory events to one's own actions and its impairment in Schizophrenia

Axel Lindner
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We constantly predict the sensory consequences of our actions to distinguish sensory events that are self-produced from events that are caused by our environment. I will demonstrate that these sensory predictions undergo constant calibration, allowing one to account for changes in motor efficacy. This updating is specifically driven by errors attributed to internal (rather than external) causes. I will further show that imprecise sensory predictions could account for delusions of influence in Schizophrenia, namely patients' misattribution of own actions to "alien forces". Recently, we investigated whether Schizophrenia patients do exhibit corresponding deficits in temporal binding, namely the phenomenon that a causal event (such as an intentional- or a machine-action) and its sensory outcome are bound together in subjective time. As compared to healthy controls, Schizophrenia patients with delusions of influence showed reduced temporal binding whenever a sensory action-effect had to be predicted based on an intentional action. Moreover, Schizophrenia patients more strongly related their temporal estimate on the effect itself than on predictive cues. These findings are compatible with the notion of imprecise sensory predictions in Schizophrenia and the idea that perceptual inference in these patients more strongly builds on sensory cues than on their imprecise internal models.

When causality shapes the experience of time: Temporal binding across development

Emma Blakey[1], Sara Lorimer[2], Christoph Hoerl[3], David A Lagnado[4],
Teresa McCormack[2] and Marc J Buehner[5]
[1] Sheffield University

[2] Queen's University Belfast
[3] University of Warwick
[4] University College London
[5] Cardiff University
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We present two studies that used different paradigms to examine the developmental origins of Temporal Binding – the subjective shortening of experienced time between a causal action and its outcome. Using a temporal estimation task, we found that participants of all ages (6- to 10-year olds and adults) reported that a causal interval between a key-press and an on-screen rocket launch felt shorter than that same interval between an on-screen signal and launch. In a stimulus anticipation task, 4- to 11-year olds and adults had to predict (via a keypress) *when* an on-screen event would occur. The event was either caused by a prior action executed by the participant, or it was merely signalled by a predictive cue. Participants of all ages predicted that the event would occur earlier if it was caused compared to when it was not caused. Notably, TB was stronger in younger children and decreased with age. Together the results demonstrate that children's temporal experience, like that of adults, is affected by causal representations. The results point to a bidirectional relation between time and causality that exists early in development and persists into adulthood, and may be privileged very early in development.

End of Symposium

Social risk amplification in computer-mediated diffusion chains: Effectiveness of information reactivation applied to risk taxonomy

Robert Jagiello
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When a message about a risk topic is passed from one person to another within a linear chain of people, the amount of negative information it contains is magnified the further it travels (Moussaid, Brighton & Gaissmaier, 2015). It was hypothesized that dread risk topics, involving uncontrollable and catastrophic outcomes (e.g., nuclear accidents), facilitate such risk amplification. Balanced information about high or low dread topics was given to a set of individuals who then communicated this information through diffusion chains. Additionally, each chain was split into two branches, one of them receiving the information it had started with. The number of negative statements made by each participant, their perceived risk (before and after transmission), as well as personal knowledge were measured. The results confirm that the further a written message diffused the higher the amount of negative statements it contained: an effect that was facilitated by a high dread topic. Increases in risk perception and negativity output were linked to the amount of risk information received during transmission – personal domain knowledge being a mitigating factor of this relation. The communication bias persisted in both dread topics regardless of re-exposure to the

original content, demonstrating the robustness of socially transmitted information.

Cognitive and situational influences on susceptibility to email fraud

Helen S Jones[1], John Towse[1], Nicholas Race[1] and Timothy Harrison[2]
[1] Lancaster University
[2] Defence Science and Technology Laboratory
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The ongoing success of phishing attacks relies on a degree of human error - yet little research has considered whether there are psychological constructs that influence these decision-making errors. We report two studies investigating cognitive and situational influences on email response behaviour. In Study 1, we measured explicit legitimacy judgments about a set of emails, in relation to individual differences amongst a suite of cognitive constructs. We highlighted three relevant constructs – cognitive reflection, inhibition, and sensation seeking. In addition, this study demonstrated the *modest* negative impact of time pressure on response accuracy. Exploring the validity of these findings, Study 2 incorporated an office simulation scenario. In this study, participants were engaged in email management, whilst simultaneously completing a series of other office-based tasks. This ensured that participants remained naïve to the purpose of the study. The same three cognitive constructs as Study 1 mediated response behaviour in some way here. Data also illustrated the behavioural consequences of security priming and email relevance. Across the two studies, findings help to characterise a cognitive profile of users who are particularly susceptible to email fraud, as well as transient situational influences that may affect risk.

The neural correlates of detecting deception in expert soccer players

Stergios Makris and David Marchant
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In sports, athletes exhibit greater ability than novices in predicting other players' actions. This superior ability is modulated by motor expertise and has been associated with a selective activation of motor brain areas. Moreover, there is substantial evidence that expert athletes use motor representations for detecting deception in familiar action sequences. Here, we have investigated by means of tDCS the causative role of motor representations in soccer players' ability to predict the outcome of familiar sport actions with or without deception. In a temporal occlusion task, professional female soccer players from Liverpool FC were observing video clips of penalty kicks performed by another expert and interrupted at a critical point. Before that they had received sham or cathodal tDCS over their left primary motor cortex. There were two types of video clips; penalty kicks executed with or without intended deception by the model. At the end of each clip the subjects had to indicate whether the ball would end at the left or right side of the goalpost. The results have

indicated that after shamtDCS all players were able to detect the deceptive kinematic cues and make appropriate judgments. However, that ability was critically detrimented after cathodaltDCS.

<u>Can people guess what cognitive task someone is engaged in based on a brief sample of his/her behaviour?</u>

Elizabeth Sheppard, Melissa Drake, Corinna Swann and Peter Mitchell
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Previous research suggests that adults (perceivers) are able to make a variety of inferences about other people (targets) based on very brief samples (thin slices) of their behaviour. For instance, perceivers can identify personality traits of the target (Borkenau et al., 2004), what a third party said to a target (Pillai et al., 2012), or whether the target is alone or accompanied (Teoh et al., 2017). In this study, we asked whether perceivers could infer what kind of cognitive task a target is engaged in completing. Targets mentally completed three types of cognitive task presented on the computer screen (maths, memory, brainteaser) each at two levels of difficulty, while being covertly recorded by the laptop camera. Perceivers subsequently viewed the videos were asked to judge the level of difficulty and kind of task that the target was completing based on their behaviour. Analysis revealed that perceivers were able to identify both the task and level of difficulty at above chance levels, but there was no difference in accuracy for the three types of task. This suggests that different types of cognitive task have characteristic associated facial expressions/behaviour, which can be at least to some degree be reliably interpreted by others.

Borkenau, P., Mauer, N., Riemann, R., Spinath, F., & Angleitner, A. (2004). Thin slices of behavior as cues of personality and intelligence. *Journal of Personality and Social Psychology*, *86*, 599-614. doi:10.1037/0022-   3514.86.4.599

Pillai, D., Sheppard, E., Mitchell, P. (2012). Can people guess what happened to others from their reactions? *PLoS ONE*, *7(11),* e49859. doi:10.1371/journal.pone.0049859

Teoh, Y., Wallis, E., Stephen, I. D., & Mitchell, P. (2017). Seeing the world through others' minds: Inferring social context from behaviour. *Cognition*, *159*, 48-60. Doi: 10.1016/j.cognition.2016.11.003

<u>An examination of reverse Illusory Line Motion</u>

Jeff P Hamm and Michael Han
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If a bar appears between two boxes after one flashes then the bar appears to shoot out of the flashed box despite being presented all at once. This is illusory line motion (ILM). ILM also occurs away from the flash if an existing bar is removed. Those who show a large onset illusion tend to show a large offset illusion suggesting the two forms of ILM reflect a common illusion. However, if the bar onsets during the flash rather than after it, no illusion occurs while if the bar offsets the illusion reverses direction (rILM) into the flash. Moreover, rILM is not correlated with ILM, suggesting rILM reflects a different illusion. In previous studies the flash has always been 50ms and the offset bars occur at either 16.67ms (rILM) or 50ms (ILM) after flash onset. It is not clear if rILM occurs because of flash/bar-offset overlap or because the bar offsets at 16.67 ms post flash onset. We examined 3 flash durations (16.67, 50.00, and 83.33 ms) with offset bars at either 16.67 or 50.00 ms post flash onset. Results indicated overlap is required for rILM, replicated the independence of rILM and ILM, and suggested that rILM and ILM summate.

Inter-Edge Grouping: A new principle of figure-ground organisation and new unifying framework for some classic principles

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Figure-ground organization determines the shapes that we see and is well known through experience of Rubin's reversible faces-vase image. Here, we demonstrate a new principle, inter-edge grouping (IEG), which strongly influences figure-ground. Participants saw ambiguous three-region displays (e.g., faces-vase). Two vertical edges divided the images into a central region (e.g., vase) and two flanking regions (e.g., faces). We manipulated grouping between the two edges by colour similarity, common fate motion, flicker synchrony, and four other factors. Across all grouping factors, when the two edges were grouped, participants were significantly more likely to report the common central region as figural. In contrast, when the two edges were not grouped (e.g., different colours, motion, etc.), participants were more likely to report that the central region was background and the edges were assigned to the separate flanking regions (e.g., faces perception). These subjective reports were corroborated by reaction time measures of figure-ground organisation. These results demonstrate novel influences of grouping on figure-ground. We also found that some classic figure-ground principles can be explained as IEG. This creates theoretical unity across classic and new figure-ground influences and demonstrates that, rather than being separate processes, perceptual grouping is at the heart of figure-ground assignment.

Six claims about the extrastriate symmetry network

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Visual symmetry perception has interested scientists since Ernst Mach (1886/1959), although investigations into neural basis of symmetry perception are relatively recent. However, we can now make six strong claims following from our Event Related Potential (ERP) studies. Claim 1) Areas V1 and V2 are not sensitive to symmetry, but there is a symmetry response in a network extrastriate visual brain areas (most prominently the Lateral Occipital Complex). Claim 2) The extrastriate network responds to symmetry automatically, even when people are attending to an orthogonal visual dimension. Claim 3) The amplitude of the symmetry response scales with the perceptual goodness of different regularities. Claim 4) Sometimes the network codes symmetry in the object (independent of view angle). Sometimes the network it only responds to symmetry in the image. Claim 5) The network can code regularity independently in each hemifield. Claim 6) The network can integrate pattern information presented at different points in time, and can hold symmetry representations in memory. The talk will review recent research into the neural basis of symmetry perception. It will also describe cutting-edge results and research questions that remain to be answered.

Symposium - Metacognitions: Dissociations or commonalities
Organised by Patrick Haggard

A psychophysical approach to perceptual confidence

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When we perceive the world we have an accompanying sense of confidence in what we see. This metacognitive aspect of perception is most acutely revealed when we don't know what we're seeing, for instance when taking a visual acuity test at the optician's. Just as we can quantify the sensitivity of a sensory system using the tools and models of psychophysics (d'), we can estimate an individual's metacognitive sensitivity to changes in perceptual performance (meta-d'). Convergent evidence supports a link between variation in metacognitive sensitivity and the structure and function of the human frontal lobes. In my talk I will build on these findings to ask what mechanisms support accurate confidence estimates. From first principles both stimulus and response factors should be involved in a construction of confidence in perception. I will present data from recent studies using TMS and fMRI to probe the components of this construction, and discuss implications of this work for an understanding of what it means to confidently see. Counterintuitively this perspective suggests that when we say we "see" something clearly, what we probably mean is that we have good evidence in support of a potential response to the stimulus.

Dynamics of metacognition and error awareness

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The ability to detect errors in decision-making is a key feature of human cognition: Our decisions are accompanied by a subjective sense of confidence in the accuracy of our choices, and we are able to revise our judgment when confidence in an initial choice is particularly low. Understanding how we detect errors has substantial theoretical interest for basic mechanisms of decision making, action selection and metacognition.

In this talk, I will present a study investigating the relationship between decision processes, error detection and confidence judgments, trying to provide insight on the cause of errors and why we sometimes revise our judgment. We used signal detection and reverse correlation methods to reveal how stochastic fluctuations in a continuous stream of information predicted the occurrence of correct vs. incorrect decisions, changes of mind, detection of errors, and graded levels of confidence. Our findings suggest a shared computational basis for error detection and confidence judgments. This concept is not captured by current models of metacognitive evaluation of decision processes.

Neural mechanisms for first- and second-order decisions in the human brain

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Although laboratory experiments tend to cast decision making as an all-or-nothing choice between a set of alternatives, many real-world decisions are made in a graded fashion. The gambler's challenge is not simply to bet on the horse that is most likely to win; they must also factor in their level of certainty or confidence in their choice in order to decide how much to bet. Theoretical models differ regarding the extent to which decisions and associated confidence judgments arise from shared versus distinct neural mechanisms. With careful paradigm design, the EEG technique enables isolation of neural 'decision variable' signals that trace the evidence accumulation process that underpins decision formation in human subjects. Here, we applied this technique in the context of simple perceptual discrimination tasks in which confidence judgments were sought either simultaneous with or subsequent to a categorical choice. Our results reveal that decision signals predict confidence reports in both contexts but also highlight additional influences from prefrontal signals representing the degree of conflict between competing motor plans.

Domain-generality in perceptual metacognition

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To investigate domain-generality in perceptual metacognition, we explored relationships between the visual, auditory and tactile modalities. We also investigated multimodal metacognition for the first time in an audio-visual task. We found converging evidence for domain-general metacognition in perception. First, metacognitive efficiency correlates between auditory, tactile, visual, and audiovisual tasks. Second, confidence in an audiovisual task was best modelled using integrative representations of auditory and visual signals. Third, the electrophysiological correlates of confidence common for visual and audiovisual tasks are associated with motor preparation for preceding the response. Thus, domain-generality of perceptual metacognition might be based both on supramodal estimates of confidence, and on decisional signals common to all sensory modalities.

We take a broader look and emphasise that, besides these commonalities between modalities in perceptual metacognition, clear dissociations between metacognitive domains exist. Investigating and describing the landscape of metacognitive domains can be a useful strategy to understand and exploit metacognitive monitoring.

A functional view of metacognitive phenomenology

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We investigated the function of awareness of one's own metacognitive states, focusing on the state of 'knowing that one *almost* knows'. The most salient spontaneously occurring example is the tip-of-the-tongue (TOT) state--often negatively portrayed as a failure of retrieval and an annoying nuisance. We suggest, instead, that it is a state in which the individual is highly epistemically motivated. Before conducting the experiments, we asked people on mTURK whether they have the urge to see an answer when they are know they do not know versus when they are in a TOT state. They did not distinguish these two states. However, when we tested people in those states, they wanted to see the answer about twice as much when in TOTs. When shown the answers they remembered those associated with the TOTs at a much higher rate. Finally, this enhanced learning was associated with a prominent late positivity in their ERPs--much like that found when the person is 'on-task' as compared to 'mind wandering.' We conclude that metacognitive phenomenology has a function not just of annoying the person or of marking particular mental states. Rather, it is a 'goad to action'--prodding the person to actualize their learning.

How do we know what we are doing?

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Do we know about our actions by monitoring sensory feedback from our body movements and their consequences, or by monitoring internal signals involved in selecting, preparing and initiating the action? According to one definition of metacognition, an answer to this question in favour of the latter alternative would imply that the sense of agency is at least partly metacognitive. I will report three classes of evidence suggesting that purely internal, premotor signals do indeed contribute to the sense of agency. First, people report feeling more control over the outcomes of their actions when a congruent subliminal prime arrow has facilitated selecting which of two actions to make, compared to an incongruent prime. Second, an implicit measure of sense of agency, based on the perceived time elapsed between a voluntary action and its outcome, suggested stronger sense of agency when people can control an outcome by freely selecting between alternative actions, compared to when they cannot. Third, anodal transcranial direct current stimulation of the dorsolateral prefrontal cortex altered these measures of sense of agency, but only in conditions where participants freely selected which action to make. The process of choice contributes to a metacognitive "feeling of doing".

End of Symposium

Reading for comprehension versus skim reading on the web: How skim reading is informed by hyperlinks

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Studies of reading have focused on reading behaviour when participants read a single, mono-coloured sentence for comprehension. However, everyday reading behaviour such as reading hypertext on Webpages entails people reading or skim reading passages of text containing links in a colour, different from the main text. We recorded participants' eye movement behaviour and asked them to read for comprehension or skim read pages from Wikipedia that were modified to include target words. Target words were either hyperlinked or not, and were either a high- or a low-frequency word. When skim reading, participants read faster and skipped more words, even though comprehension was comparable across the tasks. Linked words were skipped less often than unlinked words when skimming, revealing that participants used the coloured words as 'anchor' points for scanning strategies. Frequency effects were observed during reading for comprehension but not during the skimming task, except when the words were hyperlinked, indicating more advanced lexical processing for these words. Results are discussed in terms of task effects on eye movements during reading and the necessity to also study reading behaviour in more realistic settings.

Raednig trnaspoesd txet: Effects of position, frequency and letter constraint

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We investigated the effects of letter mislocation location and Frequency and Word-Initial Letter Constraint (WILC) of the orthographically correct word form on lexical processing via a lexical decision task (LD; n_1=45) and an eye movement reading task (n_2=50). We hypothesised that External-Beginning transpositions would make target words look least 'word-like' – in LD, these transpositions would facilitate a 'non-word' response (i.e., faster reaction times; RTs), whereas in normal reading, we expected that the less word-like a target, the more difficult processing would be (i.e., longer fixation durations; FDs). A 2 (Frequency: HF, LF) × 2 (WILC: HC, LC) × 5 (Transposition: Normal, External-Beginning, Internal-Beginning, Internal-Ending; External-Ending) design was used. All 120 target words were 5 letters long. Experiment 1 analyses revealed a significant effect of transposition on RTs. External-Beginning transpositions yielded faster RTs than other transposed conditions. Analyses revealed interactions between Frequency, WILC and

transposition. In Experiment 2, target words were placed in single-line sentences, controlled for predictability. Non-target words were transposed according to target condition. Experiment 2 analyses revealed External-Beginning transpositions yielded longer FDs than other transposed conditions. Analyses revealed interactions between Frequency, WILC and transposition. Implications for models of word processing and of eye movements in reading are discussed.

Inter-letter and inter-word spacing and dyslexia: An eye movement study

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Recent research has demonstrated that reading text with increased space improves reading rate for dyslexic readers (Zorzi et al., 2012). Improving accessibility of text is a valuable intervention for dyslexia. However, whether a benefit occurred due to inter-letter or inter-word spacing is unclear. We recorded eye movements from adults with and without dyslexia as they read single-line sentences in these conditions: 1) default spacing, 2) increased inter-word, default inter-letter spacing, 3) increased inter-word and inter-letter spacing, 4) double increased inter-word, increased inter-letter spacing. We found that increased spacing (both inter-letter and inter-word) reduced average fixation durations but increased the number of fixations needed to read the sentence. These apposing effects cancelled each other out with regards to reading rate. Additionally, the spacing effect did not differ between dyslexic and non-dyslexic readers. However, dyslexic readers did skip significantly fewer words, were more influenced by word length during first pass reading, and spent more time re-reading words. Moreover, dyslexic readers evidenced a significantly larger word frequency effect during re-reading than non-dyslexic readers. These findings will be discussed within the frameworks of both the EZ-Reader and SWIFT models of eye movements during reading.

Zorzi, M., Barbiero, C., Facoetti, A., Lonciari, I., Carrozzi, M., Montico, M., Bravar, L., George, F., Pech-Georgel, C., & Ziegler, J. C. (2012). Extra-large letter spacing improves reading in dyslexia. *Proceedings of the National Academy of Sciences*, *109*(28), 11455-11459.

Ageing and the misperception of words during reading

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Research with lexical neighbours (words that differ by a single letter while the number and order of letters is preserved, e.g., stork & story) indicates that readers frequently misperceive a word as its higher frequency neighbour (HFN) even during normal reading (Slattery, 2009). Previous research has not examined age differences in this neighbour frequency effect but if older readers

make riskier decisions about the identities of words (Rayner et al., 2006) they may be more susceptible to such effects, especially when the neighbour word is consistent with prior sentence context. Two experiments addressed this issue. In both, young and older adults read sentences containing target words with and without a HFN, where the HFN was congruent with prior sentence context or not. Further, Experiment 2 considered only visually-similar neighbours (e.g., branch & brunch). Consistent with previous findings for young adults, eye movements were disrupted more for words with than without an HFN when the HFN was congruent with prior context. However, age differences in this effect were found only in Experiment 2, when target words and HFNs were visually as well as orthographically similar. We discuss these findings in relation to the nature of word misperception effects in older age.

Rayner, K., Reichle, E.D., Stroud, M.J., Williams, C.C., & Pollatsek, A. (2006). The effect of word frequency, word predictability, and font difficulty on the eye movements of young and older readers. *Psychology and Aging, 21,* 448-465.

Slattery, T. J. (2009). Word misperception, the neighbor frequency effect, and the role of sentence context: Evidence from eye movements. *Journal of Experimental Psychology: Human, Perception and Performance*, *35*, 1969-1975.

Effects of ageing and pattern complexity on the visual span of Chinese readers

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Research with young adult Chinese readers suggests that pattern complexity (i.e., number of character strokes) limits the visual span (i.e., number of characters that can be recognised accurately on a single glance; Wang, He, & Legge, 2014), and so imposes a fundamental sensory limit on the reading speed for Chinese. Older adults read Chinese more slowly than younger adults (Wang et al., 2016). Moreover, they experience sensory declines that may limit their ability to recognise complex Chinese characters. Nevertheless, whether older adults read more slowly because they have a smaller visual span is unclear. Accordingly, we assessed the visual spans of young and older adult Chinese readers. Participants fixated a central point on a display (and an eye-tracker ensured fixation accuracy) and viewed brief displays of triplets of Chinese characters of varying pattern complexity at different horizontal retinal eccentricities. Visual spans differed as a function of age and pattern complexity, although effects of pattern complexity were greater for the older than younger adults. The findings suggest that visual declines in older age impose important sensory limits on the reading speed for Chinese. We consider these findings in relation to other evidence that ageing affects the span of apprehension during reading.

Wang, H., He, X., & Legge, G. E. (2014). Effect of pattern complexity on the visual span for Chinese and alphabet characters. *Journal of Vision*, *14*, 6.

Wang, J., Li, L, Li, S., Xie, F., Chang, M., Paterson, K.B., White, S.J., & McGowan, V.A. (2016). Adult age differences in eye movements during reading: The evidence from Chinese. *Journals of Gerontology: Psychological Sciences*, in press.

Age of Acquisition effects in Arabic reading

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The Age of Acquisition (AoA) effect on word recognition processes has been found in multiple visual word recognition tasks and during reading where an early acquired word receives shorter fixation durations than a late acquired word (Juhasz & Rayner, 2006). We aimed to investigate the AoA effect in Arabic but were confronted with the lack of a suitable database. After an extensive survey of teaching instruction methods across the Arabic world, we established that instruction at specific ages was tightly linked with specific chapters of the Quran and this was consistent across countries. A stimulus set was created by selecting words based on their first appearance in early versus late taught chapters of the Quran, and matched on word length and frequency. A subsequent eye-tracking experiment during reading showed for the first time the AoA effect in Arabic through shorter fixation durations on early compared to late acquired words.

Juhasz, B. J., & Rayner, K. (2006). The role of age of acquisition and word frequency in reading: Evidence from eye fixation durations, *Visual Cognition, 13*, 846 – 863.

Imaging impossible counterfactual worlds in Autism Spectrum Disorder: An eye-tracking study

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Counterfactual reasoning (i.e. imaging hypothetical alternatives to reality) is an important part of social communication. We report two eye-tracking experiments that explored understanding of counterfactual events that are impossible according to real-world constraints. We compared online reading behaviour in an anomaly detection task for individuals with ASD (who are known to experience difficulty with imaginative thinking, including counterfactuals) and typically developing (TD) participants. Experiment 1 depicted novel scenarios that violate reality and thus require a high degree of imagination (e.g. "If margarine contained soap, mum could use margarine in her washing/baking…"). Experiment 2 described counterfactual alternatives to well-known fictional worlds, where a conflict between reality and fantasy is established (e.g. "If Harry Potter lost his magic powers, he would use his broom to sweep/fly…"). Factual contexts ("Because...") provided a baseline measure of contextual integration. Results revealed rapid anomaly detection in Experiment 1, which was weaker in counterfactual than factual contexts, and earlier and more sustained in TD compared to ASD participants. In Experiment 2, all participants experienced difficulty distinguishing reality from fiction, with weak effects of the inconsistency emerging only in later text regions. Furthermore, participants with ASD were slower overall, and made more regressive eye movements, than TD participants.

Symposium – Moral reasoning and counterfactuals
Organised by Ruth Byrne

In blame and guilt, counterfactuals are for unintentional behaviors

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Few would doubt the importance of counterfactuals in blame and guilt. How those counterfactuals do their cognitive work is less clear. I present a theory of blame in which counterfactuals aid in the moral evaluation of unintentional (not intentional) norm violations: If the agent could have and should have prevented the unintentional violation, blame is deserved. I then present evidence for such preventability considerations in two information processing paradigms: searching for information en route to blame and updating blame in response to new information. Then I apply these considerations to guilt, which is saturated with "could haves" and "should haves." In a robust pattern, we find guilt to be stronger for unintentional than intentional violations, perhaps because counterfactuals and pangs of guilt together maintain an agent's effort to prevent similar unintentional violations in the future.

The relevance of alternative possibilities

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As humans, we think not only about what is, but also what could be. These representations of non-actual possibilities support many important cognitive functions, such as predicting others' future actions, assigning responsibility for past events, and making moral judgments. Prior research on our understanding of non-actual possibilities asks how humans explicitly and deliberatively reason about what is possible (e.g., the foundational work on when and how people consciously reason about counterfactual possibilities). Less well understood is whether or how people have a default, implicit representation of which events are possible. I present three studies that characterize the role of implicit representations of non-actual possibility in cognition. Collectively, these studies differentiate explicit reasoning about possibilities from default implicit representations, demonstrate that human adults often default to treating immoral and irrational events as impossible, and show that high-level cognitive judgments rely on default implicit representations of possibility rather than explicit deliberation.

Counterfactual 'if only' and semifactual 'even if' thoughts and moral judgments

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Evaluations of the morality of an action are affected by thoughts about whether the outcome might have turned out differently. Semi-factual assertions about how an outcome would have turned out the same 'even if…' an agent had acted differently lead people to make different moral judgments compared to counterfactual assertions about how the outcome would have turned out differently 'if only…' the agent had acted differently. We report experiments that show that this 'moral diminishing' effect occurs for judgments about morally bad actions in which an agent carries out an action intended to harm another person, and for judgments about morally good actions in which an agent carries out a self-sacrificial action intended to save another person.

Truthy Lies: How Counterfactual Thinking Can Facilitate Dishonesty

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Three behavioral experiments reveal how counterfactual thinking – i.e., imagining alternatives

to reality – can enable dishonesty. Events that did not occur feel closer to reality when it is easy to imagine multiple ways in which they *could have occurred*. We predicted that the ease of imagining multiple ways in which a lie *could have been true* makes it seem more truthful and increases people's propensity to tell it. Each experiment presented opportunities to lie, undetected, to win money. Holding the odds of winning constant, we manipulated whether the lie could have been true in multiple counterfactual circumstances versus just one. When the lie could have been true in multiple circumstances, people were more likely to tell it. Follow-up data suggested that each experiment's manipulation made the same blatant lies seem less dishonest. We discuss implications for behavioral ethics, counterfactual thinking, and policy.

Moral development and regret

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We examined whether children feel regret when their failure to make a prosocial choice has a negative effect on a peer. In Study 1, 5-to-6-year-olds and 7-to-9-year-olds played a game in which they completed a sticker sheet to win a prize. In the experimental condition, children then had to decide whether to donate a spare sticker to another child. Most children chose not to donate. Children then discovered that the next child did not have enough stickers to win a prize, and rated their emotions. At this point, children did not know whether the next child could have been able to win the prize if they had donated the specific sticker in question. This counterfactual information was then provided, and children rated whether they felt happier, sadder, or the same as before. Only the 7-to-9-year-olds' responses suggested that they experienced interpersonal regret. In Study 2, we tested whether experiencing interpersonal regret in the sticker task resulted in children making more prosocial choices in a separate economic game. We found a significant association between reporting feeling sadder in the sticker task and making kinder choices in the economic task, but only for those children who completed the sticker task first.

End of Symposium

Investigating the developmental trajectory of moral judgements in the mini-ultimatum game: Intentionality and temporal asymmetry

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Most normative theories of morality contend, either implicitly or explicitly, that a condition for attributing moral responsibility to others is that the agent in question acts intentionally. The mini-ultimatum game (MUG) is a task in which sensitivity to the intentions of others can be measured in the context of punishment behaviour. In standard ultimatum games a responder is given the opportunity to punish (at a cost) unfair distributions of resources made by a proposer. In the MUG the options open to proposers are restricted such that on occasion unfair distributions are unavoidable. We investigated the developmental trajectory of sensitivity to intentions in the MUG task. In a second experimental manipulation we varied the temporal context (future vs past) in which responders made judgements, following evidence that adults judge future moral transgressions more harshly than past ones (Caruso, 2010). We find that children as young 6-8 years of age take account of intentions to act unfairly. However, we found no evidence of temporal asymmetry in moral judgements among primary school children. We discuss these findings in relation to the development of temporal and counterfactual cognition.

Frith Prize Winner Lecture

The contribution of alexithymia to impaired socio-affective processing across disorders

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Alexithymia is a condition associated with difficulties identifying and describing one's own emotions, and with impaired recognition of others' emotions, empathy, and moral decision making. Alexithymia frequently co-occurs with psychological disorders, including Autism Spectrum Disorder (ASD) and Eating Disorders (EDs), and may explain some of the emotional difficulties often observed in these populations. A number of studies investigated the independent contributions of alexithymia and disorder presence and severity to emotional processes. Findings suggested that alexithymia, rather than ASD or ED presence or severity, predicts one's ability to recognise others' facial emotion. A further study investigated the independent roles of alexithymia and ASD in moral judgements. Findings indicated that alexithymia predicts moral judgements in the typical, but not ASD, population, suggesting that individuals with ASD may rely on emotional process to a lesser extent when making moral decisions. Finally, the role of alexithymia in judging character traits from novel faces was investigated. Alexithymia was associated with less consistent judgements of others' traits, consistent with the theory that trait judgements rely on subtle emotional cues. Together, these findings suggest that alexithymia affects a broad range of emotional processes, and may account for some of the emotional impairments often associated with psychological disorders.

Covert imitation processes affect speech perception but not speech production

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Observing auditory of visual speech is thought to activate an execution-observation system in humans. Observers thus covertly imitate observable speech. These covert imitation processes are hypothesized to reflect learned associations between observed actions and motor responses. The existence of these associations is demonstrated using the Stimulus Response Compatibility Task (SRC). The SRC interprets slower response times in producing a prompt when an incongruent distracter is presented as activation of the execution-observation system. SRC effects on response times have previously been demonstrated for one specific class of speech sounds, namely consonants, but it is not clear whether the SRC effect extends to vowels. It is also not clear how activation of the execution-observation system affects speech production in the presence of an incongruent distracter. Sixty-five participants performed an SRC task in three modalities: visual, auditory, and audiovisual in a between-group design, while their responses were audio-recorded. Results showed SRC effects extend to spoken vowels in all three modalities. Acoustic analysis of the participants' responses revealed that covert imitation did not affect speech production in a vowel-specific manner, although vowel durations were generally shorter for incongruent distracters. Covert imitation processes therefore affect speech perception but not speech production.

Exploring the role of cognitive abilities in plasticity in speech processing

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We investigated the rate/extent to which participants adapted to three different types of distorted spoken sentences (sentences in noise (SIN); noise-vocoded and time-compressed sentences, compared to a clear speech baseline). Adaptation was predicted to occur for the noise-vocoded and time-compressed conditions only. Additionally, we investigated the degree to which individual differences in adaptation were related to different cognitive mechanisms. Adaptation was defined as a reduction in processing speed. The results indicated adaptation to time-compressed sentences and to a degree for noise-vocoded sentences, and no adaptation for sentences in noise. Notably, performance in each adverse condition was associated with a different cognitive mechanism: SIN was associated with higher scores on the Montreal Cognitive Assessment; Noise-vocoded adaptation was associated with better attention-switching ability and time-compressed performance with better hearing/vocabulary ability. These results contribute to a comprehensive cognitive model that outlines the underlying mechanisms of adaptation in adverse listening conditions.

Coordination and preparation of utterances in a joint-naming task

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According to the model of dialogue as intentional joint action interlocutors continuously predict each other's upcoming utterances, using their own production system to generate these predictions[1,2]. Tasks in which interlocutors are asked to respond simultaneously have yielded evidence in favor of this account, showing that representing an interlocutors speech-planning operations can interfere with the preparation of one's own utterances[3,4]. However, dialogue often involves sequential rather than simultaneous utterances. Therefore, the current study assessed whether similar effects also occur when interlocutors take turns naming pictures on a shared display. Experiment 1 established that speakers took longer to initiate responses naming two pictures compared to naming one. However, Experiment 2 showed that latencies to name one picture were unaffected by the anticipation of another speaker naming a subsequent picture. Thus, in contrast to previous studies, we found no evidence that utterance planning was affected by a representation of an interlocutor preparing to speak. Furthermore, eye movements recorded during the picture-naming task suggested that speakers prioritized planning their own response over simulating their interlocutor, even though simulating another speaker's current or upcoming response might aid the timing of one's own reply.

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Lexical knowledge boosts statistically-driven speech segmentation

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Speech segmentation is constrained by lexical knowledge. In the absence of lexical knowledge, non-lexical heuristics are called upon (acoustic, segmental, prosodic). In three

experiments, we investigated the effect of lexical knowledge on statistical learning. We started with an artificial language containing four trisyllabic nonwords and observed the standard above-chance recognition memory performance in a subsequent 2AFC task. We then replaced one of the four nonwords with a real word (*tomorrow*) and noted improved segmentation of the three nonwords. This improvement was maintained when the real word was a different length than the nonwords (*philosophy*), ruling out an explanation based on rhythmic expectations. The improvement was also maintained when the word was added to the four original nonwords rather than replacing one of them. Together, these results show that recognisable portions of speech in an otherwise meaningless stream serve as anchors for discovering new words. In interpreting the results, we contrast a mechanism where the lexical boost is merely the consequence of attending to the edges of known words, with a mechanism where known words enhance sensitivity to transitional probabilities more generally.

<u>Statistical learning for speech segmentation: Age-related changes and underlying mechanisms</u>

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Statistical learning (SL) is a powerful learning mechanism that supports language acquisition in infants and young adults. However, little is known about how this ability changes over the lifespan. The aims of this study were to: (1) examine the effect of ageing on speech segmentation by SL and (2) explore core mechanisms underlying SL. Across four testing sessions, young, middle-aged, and older adults were exposed to continuous speech streams at two different speech rates, both with and without cognitive load. Learning was assessed using a two-alterative forced-choice task where words from the stream were pitted against either nonwords (W-N trials), which never appeared in the stream, or part-words (W-P trials), which occurred across word boundaries. The results showed that SL was remarkably resilient to ageing, although the effect of age-related decline was visible in the more challenging conditions, namely on W-P trials and when SL was performed under cognitive load. Analysis of neuropsychological test data indicated that performance on W-P trials was predicted by memory updating, whereas performance on W-N trials was predicted by working memory storage capacity. This suggests that performance on W-P and W-N trials relies on distinct underlying processes, which differ in their resilience to age-related decline.

<u>Metacognitive awareness of knowledge of word meanings</u>

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Hampton et al. (2012) found that whereas the test-retest consistency for true/false judgments about general knowledge was improved when people could use an "uncertain" response,

consistency of judgments about conceptual categories was unchanged. The implication is that "known unknowns" occur for general knowledge but not for conceptual judgments such as "chess is a sport". We applied this method to knowledge of word meanings. Where a word is familiar but the meaning uncertain, there may again be no greater consistency with an "uncertain" response option. However, for unknown words, an "uncertain" option should improve consistency.

Seventy-two words of varying obscurity were presented for judgment with true or false meanings. One group gave True/False judgments of the proposed meanings, and a second group gave Definitely True/ Definitely False/ Uncertain judgments. Consistency was measured at retest after a week. After Session 1, participants also circled words they had never seen before (a post-hoc factor in the analysis). Contrary to expectation, judgments of both familiar and unknown words showed greater consistency when an "uncertain" option was allowed, although the effect was greater for unknown words. It appears you <u>can</u> know that you don't know the meaning of a familiar word.

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Exploring the relationship between mathematical ability and domain general reasoning abilities in children and adults

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A theoretical link between reasoning and mathematical ability has been supported by some recent empirical evidence. We argue that some of this evidence is indirect and measure selection may have influenced this relationship. We report three studies in which mathematical ability was measured using standardised fluency and calculation measures and reasoning ability was measured using an extended cognitive reflection test. In Study 1, children aged 9-11 years completed the measures. In Study 2, reasoning was also measured using a belief bias conditional reasoning task in a group of undergraduate students, and in Study 3, we included Ravens Progressive Matrices and a maths anxiety measure with a further sample of undergraduate students. Results from the three studies suggest that mathematical ability is predicted by performance on the cognitive reflection test but not conditional reasoning or Ravens Matrices performance when mathematical fluency and maths anxiety are taken into consideration. We discuss the implications of these findings for research on the link between mathematical ability and reasoning skills and consider the adequacy of the extended CRT as a measure of reasoning.

The link between deductive reasoning and maths

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Recent studies have shown that transitive inferences are related to maths skills in children and adolescents, and conditional inferences are related to maths in late adolescents. Nevertheless, so far the links between mathematical abilities and transitive and conditional inferences have not been investigated together. It is also unclear whether these inference forms are related to both basic and more complex mathematics skills, and whether these relationships still hold if the effects of general cognitive factors (such as intelligence, cognitive styles, and order processing ability) are controlled. This talk presents an overview of studies that investigated the links between deductive reasoning and mathematics so far. Then we present new evidence that transitive inferences were related to performance on a number line task, and conditional inferences were linked to arithmetic skills in adults. Additionally, both types of inference were related to complex mathematical reasoning, although transitive and conditional reasoning ability were unrelated. The results also highlight the important role that ordering abilities play in complex mathematical reasoning, extending findings regarding the role of ordering abilities in basic maths skills. These results have implications for the theories of mathematical and deductive reasoning, and they could inspire the development of novel educational interventions.

Do children with developmental dyscalculia have an orderprocessing deficit?

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Developmental dyscalculia (DD) is a specific impairment of mathematical ability that affects about 3.5 – 6.5% of the population. According to the current dominant approach, DD is linked to a reduced ability to process magnitude information. Nevertheless, alternative accounts have also been proposed. In the current project we examined the link between order processing skills and maths abilities in DD.

We compared the performance of 20 children with DD and 20 children without mathematical difficulties on several order-processing, magnitude estimation, visuo-spatial working memory and response inhibition tasks.

Children in the DD group show evidence of order-processing deficits. They obtained lower scores on the parental order-processing questionnaire and on the serial order working memory task. Additionally, they were slower on the number ordering task. Children with DD also show evidence of magnitude estimation and visuo-spatial memory deficits. They were less accurate on the block comparison task, the number line estimation task, and the visuo-spatial working memory task. Additionally, they were slower at the number comparison task. There were no differences between the two groups on the annual events ordering, and response inhibition tasks.

These findings can inform the development of novel educational interventions and they could possibly be used for diagnostic purposes.

Stress effects on cognitive control in aging

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Acute stress has been shown to impair memory retrieval and cognitive control in young adults. Research on possible adult age differences in acute stress effects on cognition in general and on cognitive control in particular is scarce. Thus, the present research project set out to test these effects in two lab-based studies using two different prospective memory (PM) tasks as measures of cognitive control. An established psychosocial stress procedure was used to induce stress in young

and older adults. Stress responses were measured across the entire procedures using subjective and physiological stress markers. After the stress or an active control condition, 123 participants in Study 1 were asked to perform an event-based PM task. Ninety-seven participants in Study 2 performed a time-based PM task. Results suggest that the stress induction was successful in both studies and both age groups. Event-based PM in Study 1 was reduced under stress in the young adults, but not in the older adults. Stress did not affect time-based PM in young and older adults in Study 2. Findings are discussed in the context of current neurocognitive models on emotion-cognition interactions in aging considering the role of specific task requirements.

Measuring executive functioning in individuals with neurodevelopmental disorders

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Executive functioning (EF) describes the complex cognitive processes that support monitoring and regulation of cognitions and behaviours, particularly in novel and complex situations. Specific EF deficits have been evidenced in individuals with several neurodevelopmental disorders (NDDs) and linked to deficits and clinically important behaviour. However, valid measurement of executive functioning – challenging at the best of times – is subject to important limitations due to patterns of cognitive strength and weakness associated with NDDs.

A battery of 25 EF and matched comparison tests was piloted with 125 typically developing children (6-12yrs) and 12 with genetic NDDs. Tests were designed to minimise the influence of cognitive strengths and weaknesses that do not comprise part of an individual's EF skill. A meta-analysis of functional neuroimaging data from 1,177 children engaging in EF tasks; alongside clinical observations and statistical modelling with the pilot data; informed development of an online EF assessment system comprising 11 tests (CAN MEASURE).

Initial analyses points towards concurrent validity and test-retest reliability of the CAN MEASURE assessment battery in a sample of 880 children (6.5-12.5 years). Plans for further analyses applying statistical modelling with respect to widely applied models of EF and initial results in this area will be discussed.

Learning the identity of very few faces delivers incidental perception of social categories

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Viewers are highly accurate at recognising sex and race from faces. This is often interpreted

as evidence that we compute the visual statistics of socially important dimensions from our exposure to many people. In this paper we take a different approach, examining the properties of a system which is trained to recognise the identity of a very few people, over multiple exposures. Using ambient images (i.e. unconstrained , naturally varying photos), we trained models to compute the identity of a few 'known' individuals. Despite receiving no information about the sex or race of faces, these social dimensions emerged as important classifiers, even when the number of familiar individuals was unbalanced (e.g. different numbers of men and women). Furthermore, these computationally-derived dimensions of sex and race generalised accurately to many hundreds of other faces, previously unseen. A system designed primarily to identify a small number of individuals delivers important social dimensions of faces incidentally. This seems to offer an explanation for the fact that infants, and people growing up in small groups, develop highly generalizable social-perceptual discrimination without explicit training. It also emphasises the importance of studying naturalistic exposure patterns – for a large part of our lives we see the same few people many times, and this has statistical consequences.

The psychology of being forgotten

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The experience of being forgotten in social interactions is impactful and, perhaps, universal. Yet modern science possesses no explanatory framework with which to understand such experiences. We propose that being forgotten or remembered is a powerful signal of the subjective importance attached to an object of memory and that interpretation of such signals has important consequences for interpersonal relationships. Additionally, we propose three moderators on these relationships: why forgetting occurs, who forgets, and what gets forgotten. We tested this framework in four experiments. Experiment 1 examined our core model of being remembered or forgotten in firsthand experience through constructed but non-trivial interactions in the laboratory. Experiments 2-4 tested moderators of our core model by examining how evidence of memory is interpreted by third-party observers. Experiment 2 focused on the antecedent circumstance that led to forgetting. Experiment 3 focused on who it was that did the forgetting. And, Experiment 4 focused on the type of information that was forgotten. Our relational framework and proposed moderators were consistently supported. Being forgotten led participants to feel less valued by and less committed to others relative to being remembered but these relationships depended on why forgetting occurred, who forgot, and what was forgotten.

Utility of integrated speed-accuracy measures in a study of task and dimension switching costs

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Performance in reaction-time tasks depends on both accuracy and speed of responding. Typically, these two aspects of performance lead to divergent results. Usage of integrated measures of speed and accuracy may help to obtain a balanced view of the data. Three such integrated measures (inverse efficiency, rate correct and a linear integrated speed-accuracy) were applied to data from a series of experiments of task- and dimension switching. In these experiments, subjects were required categorise digits or numbers on the basis of a parity or a magnitude judgment. On each trial a composite cue was presented that indicated which of the two tasks (parity or magnitude) was to be applied to which of the two stimulus aspects (number or digit). Over three studies, the three measures were very successful at detecting the effects present in analyses of speed and/or accuracy, but the rate correct score produced an important number of false alarms. However, detection efficiency of all three measures was worse as the level of incorrect responding increased, with the largest vulnerability for inverse efficiency. Overall, detection performance of the linear integrated measure was the best.

Spatial and selective attentional constraints in motor contagion in each-to-grasp action

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Motor contagion refers to observed actions altering the kinematics of observer's concurrent or subsequent actions. In two tasks, we tested the contribution of top-down factors to motor contagion. In Task 1, observers viewed a human model reaching to grasp a target with either a direct or exaggerated, high-lifting trajectory. Observers were instructed to execute a direct reach to their target regardless of observed trajectory. Additionally, observers monitored a white dot for a colour-change go signal. This dot either followed the model's wrist or remained stationary within the model's action space. When the dot followed the model's wrist, observers' wrist trajectories showed higher vertical deviation after observation of exaggerated trajectories (compared with direct). No such difference emerged when the dot remained stationary. In Task 2, the dot always followed either a direct or exaggerated trajectory (equivalent to those in Task 1), but the model either reached (with the same trajectory as the dot) or remained stationary. Regardless of whether the model reached, observers' trajectories deviated higher after observation of an exaggerated dot trajectory. This suggests that motor contagion occurs involuntarily when observers attend spatially to the relevant stimulus, but can be inhibited when it falls outside the locus of spatial attention.

Non-predictive coding for manual interception in the posterior parietal cortex

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The posterior parietal cortex (PPC) codes the gaze-centered goal position of reaches to stationary targets, but during manual interception the goal position is not the same as the target position. The question is whether PPC during interception codes the current target position or movement goal (i.e., final target position). We studied manual interception for trajectories crossing visual fields to ensure the current and final target position were in different visual hemifields. In combination with hemisphere-specific repetitive Transcranial Magnetic Stimulation (TMS) to parts of the PPC this allowed us to dissociate between current and final spatial coding in PPC. 24 participants received 6 10Hz TMS pulses to left and right PPC while they prepared their interceptive movement to a moving target. We analysed the variance of initial movement direction and lateral interception error. TMS to the superior parietal occipital cortex (SPOC) increased variance of initial movement direction only when applied in the hemisphere coding the current target position. This effect disappeared after the TMS pulses stopped (i.e., no effect for interception error). Follow-up analyses showed that current position effect stemmed from participants initiating early (i.e., receiving most TMS during their movement). These findings argue against simple predictive control for manual interception.

Certainty of interoceptive and exteroceptive signals modulates body ownership in the Rubber Hand Illusion

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Body awareness results from the optimal weighting of exteroceptive and interoceptive information (e.g. Ernst & Banks, 2002; Friston et al., 2010). Importantly, Tsakiris et al (2011) have shown that, when an accurate interoceptive body representation is lacking, exteroceptive signals are predominant. An important yet unaddressed question is whether reducing the certainty of exteroceptive signals may enhance the certainty of 'felt' signals, grounding the self into a coherent body. Over two Rubber Hand Illusion experiments, we used interoceptive 'affective' touch to test the hypothesis that enhancing the weighting of interoceptive signals can counter-act the influence of vision.

Participants' unseen hand was stroked using a pleasant or unpleasant fabric, whilst they watched a rubber hand being stroked in synchrony either by the same fabric (certainty/compatibility), or by a fabric that was visually 'uncertain' (Experiment 1) or incompatible (Experiment 2). Both uncertainty and incompatibility of the 'seen' touch on the rubber hand reduced visual capture effects and hence subjective feelings of the illusion in comparison to

certainty and congruency (Effect of Certainty: Z =−2.56, p = 0.010; Effect of Compatibility: Z =−3.52, *p* < 0.001). These results suggest that interoceptive manipulations can offer 'resistance' against the effects of visual capture on body ownership.

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The role of the temporoparietal junction in implicit and explicit sense of agency

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The sense of agency refers to the feeling of being in control of one's actions and their outcomes. This can be measured explicitly, by asking people to report their experience of agency, or implicitly by recording the perceived time interval between actions and outcomes (temporal binding). The involvement of the left and right temporal-parietal junction in both implicit and explicit sense of agency was investigated in two experiments. Participants were informed that they could control the volume output of the computer with one of two buttons. However, during the experiment the volume of ensuing sound did not always follow this expectation. On each trial, participants reported both the perceived time of the tone, and the degree to which they felt like they controlled the action outcome. In Experiment 1 anodal transcranial direct current stimulation was applied to the right temporoparietal junction (TPJ), while in Experiment 2, stimulation was applied to the left TPJ. We observed significant changes in explicit reports of agency following right TPJ stimulation but not left TPJ stimulation. Implicit agency was not affected in either stimulation condition. These results will be discussed with reference to the possible neural mechanisms underlying the sense of agency.

Ownership modulates perceptual judgements of object-directed action

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Ownership is a common way in which objects are associated with the self and others. We present evidence that the ownership status of objects modulates perceptual judgements of nearby actions. Participants viewed life-sized videos of an actor reaching to grasp one of three coffee mugs: self-owned, actor-owned, and blank (unowned). Participants had painted the self-owned mug and used it for 5-20 days before test. The actor-owned mug was also painted whereas the unowned mug was blank. On each trial, videos paused before the actor touched the mug. Participants pressed a button to estimate when in time the actor would have first touched the mug if the action continued (estimated time to contact). Reaches varied in speed trial-by-trial (fast, medium, or slow). Participants estimated that the time to contact was earlier for fast reaches when the self-owned mug, compared with actor-owned mug, was the target. We did not observe this bias for medium or slow reaches. These results mirror studies showing that participants estimate an earlier time to contact for threatening stimuli moving toward their body. We suggest that space around self-owned objects is perceived in a similar manner to space around the physical body.

At the boundaries of misattribution: Does positivity influence judgments of familiarity in the affect misattribution procedure?

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Priming effects in the Affect Misattribution Procedure (AMP) have been explained by a misattribution of prime-related affect to neutral targets. However, the measure has been criticized for being susceptible to intentional use of prime features in judgments of the targets. To isolate the contribution of unintentional processes, the present research expanded on the finding that positive affect can be misattributed to familiarity (i.e., positivity-familiarity effect). To the extent that prime valence is deemed irrelevant for judgments of target familiarity, positivity-familiarity effects in the AMP could potentially rule out intentional use of the primes. Seven experiments show that positivity-familiarity effects in the AMP only occur under specific conditions. Only when participants were not motivated to judge the targets in the AMP accurately a positivity-familiarity effect was obtained. This effect seemed to be independent of intentional prime use. Implications for the AMP and misattribution effects are discussed.

How does prioritisation and validity affect performance in visual working memory tasks?

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Recent research (Hu et al., 2014; 2016) has demonstrated that memory for an item is enhanced if participants prioritise that particular serial position during the encoding phase of visual working memory tasks. However, to date, studies have probed the prioritised item as frequently as others within the set. It is therefore unclear how prioritisation affects performance if the to-be-prioritised item is assessed to differing extents. The current study explored this in young adults. Participants completed a task in which they were presented with four coloured shapes and then asked to recall the colour of one item following a brief delay. Participants were either told to prioritise the first item or try equally hard to remember all the items. The to-be-prioritised first item was either assessed as frequently (low validity condition) or more frequently than the other items (high validity condition). Performance at the first item was enhanced by both prioritisation and increased probe validity, whilst performance at other items was negatively affected. The benefits and costs associated with prioritisation and increased probe validity were additive, suggesting these effects reflect differing mechanisms.

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Off-line rTMS of left Dorsolateral Prefrontal Cortex reduces food cravings in females but not males

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Dysfunction of the left dorsolateral prefrontal cortex (DLFPC) has been crucially implicated in craving for food. Here, we aimed at expanding this result by investigating gender differences in food cravings in female (n=8; age=20.38yrs; BMI=22.54) and male (n=9; age=20.67yrs; BMI=20.89) healthy participants. Off-line repetitive transcranial magnetic stimulation (rTMS; 15 mins, 900 pulses) was administered on the left DLPFC and on the vertex (as control condition)

before and after exposure to sweet food. Desire for salty and sweet food consumption was assessed by visual analogue scales (VAS) and calories consumed before and after rTMS. While after vertex-rTMS women expressed higher desire for sweet but not for salty foods with respect to men, desire for food did not change and remained stable before and after DLPFC-rTMS. No differences were observed in the consumed calories after the two rTMS stimulation. Our results provide preliminary evidence of a brain mechanism by which cognitive inhibition decreases the desire for sweet foods and implicates lower ability to suppress cravings in women as a contributing factor to gender differences possibly in binge eating disorder and obesity.

Efficiency of strategic adaptation in older adults in a perceptual decision making task

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A well-replicated finding in the domain of cognitive aging is that older adults exhibit slowed response times in choice reaction tasks, including tasks requiring participants to switch between an emphasis on responding as quickly as possible versus responding as accurately as possible. It remains unclear whether this is due to poorer strategic adaptation, some other age-related factor (e.g. delays in sensory encoding or motor execution), or both. Previous experiments in this area have mainly involved trial-by-trial variation in speed/accuracy condition, potentially preventing participants from fully implementing an entirely new strategy. In the present experiment, healthy older adults (65 – 80 years) and younger adults (18 – 35 years) engaged in a two-alternative contrast discrimination task (n = 24), consisting of two superimposed leftward/rightward gratings which gradually changed in relative contrast. Stimuli were presented under two different speed pressure conditions, imposed via verbal instruction to participants, as well as feedback in the form of points. Instructions to switch between tasks were given on a block-by-block basis, allowing for more comprehensive analysis of task switching performance across longer time windows. Analysis of behavioural results will investigate the success and efficiency with which older adults can adapt their speed-accuracy trade-off in a choice reaction task.

The effect of syntactic priming on auditory word identification

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The influence of the listener's grammatical knowledge on word recognition is well known (Frazier, 1987), but previous research does not enable investigation of the syntactic effects in isolation from other contextual effects (e.g. semantic or phonological). The present study used syntactic priming to isolate the syntactic level of representation and examine its separate role in

auditory word identification. Participants (n=48) performed a lexical decision task (LDT) and an auditory masked word identification task in which the target word is heard through white noise. Critical words are embedded in sentences with either a complex or a simple syntactic structure primed by either a congruent or incongruent preceding sentence. LDT results revealed that priming the sentence syntactic structure with a congruent sentence facilitates the recognition of the final target word relative to when a syntactically incongruent prime sentence precedes the target sentence. The masked word identification results showed an accumulative priming effect which unfolds over time leading to faster responses to the trials occurring later in the experiment as compared to earlier trials. Results suggest that there are crucial dependencies in comprehension between the word and the syntactic context in which it occurs.

Comparing the effects of post-learning exercise, rest and sleep on memory for newly learned words in adults

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Sleep-related gains in explicit and implicit memory for newly-learned words are widely reported (Dumay & Gaskell, 2007). Emerging evidence suggests memory consolidation might also benefit from bouts of rest (Dewar et al., 2012) and exercise (Roig et al., 2012). We used a word learning paradigm to examine whether exercising after learning can strengthen new memories in a manner similar to sleep. Young adults learned novel words before completing one of three 20-minute activity intervals (rest, low or moderate-intensity cycling). To examine both the immediate and enduring effects of exercise and rest on memory; explicit retention and implicit lexicalisation were measured after learning, after activity, after sleep, and after a week. All groups showed significantly impaired explicit recall immediately after activity, followed by the expected overnight improvement that was maintained until the following week. The exercise groups showed evidence of a lexical competition effect immediately after activity, which remained the following week. The rest group only showed a numerical trend towards a competition effect after a week. The results suggest exercise may accelerate the time course of lexical consolidation, independent of dose, but pose questions about the effects of unoccupied rest on lexicalisation.

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Dual-tasking in language: Concurrent production and comprehension interfere at the phonological level

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Conversation often involves simultaneous production and comprehension, yet little research has investigated whether these two processes interfere with one another. We tested participants' ability to dual-task with production and comprehension tasks. Task one (production task) was picture naming. Task two (comprehension task) was either syllable identification (linguistic condition) or tone identification (non-linguistic condition). The two identification tasks were matched for difficulty. Three SOAs (50ms, 300ms, and 1800ms) resulted in different amounts of overlap between the production and comprehension tasks. We hypothesized that as production and comprehension use similar resources there would be greater interference with concurrent linguistic than non-linguistic tasks.

At the 50ms SOA, picture naming latencies were slower in the linguistic compared to the non-linguistic condition, suggesting that the resources required for production and comprehension overlap more in the linguistic condition. As the syllables were non-words without lexical representations, this interference likely occurs primarily at the phonological level. Across all SOAs, identification RTs were longer in the linguistic condition, showing that such phonological interference percolates through to the comprehension task, regardless of SOA. In sum, these results demonstrate that concurrent access to the phonological level in production and comprehension results in measurable interference in both speaking and comprehending.

Eye movement control for horizontal and vertical English text

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Text in English usually is read horizontally from left-to-right, and the mechanisms of eye

movement control for this conventional reading direction are relatively well understood. However, text sometimes is displayed in unconventional formats and findings show that reading typically is slower for vertical than horizontal reading directions (e.g., Yu, Park, Gerold, & Legge, 2010). Whether this slower reading results from impaired word identification or poorer saccade-targeting for unconventional reading directions is unclear. Accordingly, we assessed effects of reading direction on eye movements for sentences that included a short (4-letter) or long (10-letter) target word matched for lexical frequency and predictability. The sentences were displayed normally, rotated 90° clockwise or counter-clockwise, or in a marquee format in which upright letters were arranged vertically. Reading was slower for vertical than horizontal displays. Moreover, while standard word length effects (longer fixation times for short compared to long words) were obtained for all displays, these effects were larger for vertical displays, indicating that word identification was disrupted during vertical reading. Crucially, however, text format did not affect the location of initial fixations in target words, indicating that saccade-targeting was unimpaired. We discuss these findings in relation to models of eye movement control during reading.

Yu, D., Park, H., Gerold, D., & Legge, G. E. (2010). Comparing reading speed for horizontal and vertical English text. *Journal of Vision*, *10*, 21, 1–17.

Predictability effects during reading in the absence of parafoveal preview

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The predictability of upcoming words facilitates both spoken and written language comprehension (Kuperberg & Jaeger, 2016 for a review). One interesting difference between these language modalities is that readers' routinely have access to upcoming words in parafoveal vision while listeners must wait for each fleeting word from a speaker. Despite this potential glimpse into the future afforded to readers, it isn't clear if and how this bottom up information is used to aid top down prediction. For instance, it has been recently noted that predictability effects have not been reported under conditions where readers are denied accurate parafoveal preview of the predictable target word (Staub, 2015). The current eye movement experiment is the first to demonstrate reliable word predictability effects in the absence of parafoveal preview. We introduce an innovative method of manipulating parafoveal preview which utilizes return sweeps (the large saccades which bring fixation from the end of one line of text to the beginning of the next) to deny access to parafoveal preview of our target words without the use of invalid preview.

Kuperberg, G.R., & Jaeger, T. F. (2016). What do we mean by prediction in language comprehension? *Language, cognition and neuroscience, 31*(1), 32-59.

Staub, A. (2015). The effect of lexical predictability on eye movements in reading: Critical review and theoretical interpretation. *Language and Linguistics Compass*, *9*, 311-327.

Antagonistic interactions between microsaccades and evidence accumulation processes during decision formation

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Despite their small size, microsaccades (tiny eye movements) have a profound impact on vision, supporting perceptual stability but also impeding stimulus detections if executed at inopportune times. Neurophysiological studies have thus far demonstrated that microsaccades evoke a combination of inhibitory and excitatory responses in a variety of visual regions. However, the impact that microsaccades have on the higher-level neural decision processes that bridge sensory responses to action selection has yet to be examined. Here we show that when human observers monitor stimuli for subtle changes in either contrast or dot-motion coherence, the occurrence of microsaccades over a long timeframe (>1000ms) following change onset predicts lower detection probability and slower reaction times, and that the latter is accounted for by momentary suppression of neural signals at each key stage of decision formation - sensory evidence encoding, evidence accumulation, and motor preparation. Our data further reveal that, independent of the timing of the change events, the onset of neural decision formation coincides with a systematic inhibition of microsaccade production that persists until the perceptual report is executed. These findings demonstrate that microsaccades account for within- and between-trial variance in decision-relevant neural activity and highlight antagonistic interactions between microsaccade occurrence and evidence accumulation.

Children's difficulty with spontaneous counterfactuals: effects of choice and outcome valence

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We explored when children produce counterfactuals spontaneously. Guajardo and colleagues presented children with stories that culminated in positive or negative outcomes. When reflecting on the story, children under the age of 8 rarely produced counterfactuals. We simplified the structure of the story so that there were multiple events with individual causes and explored a null result from Guajardo's studies that children were not influenced by whether the cause of an event was a choice. In Study 1 (49 4;6- to 7;6-year-olds; 19 boys and 69 7;6- to 10;6-year-olds; 34 boys) older children

who were prompted to think what could have been different were more likely to generate counterfactuals, $\chi2(69,1) = 12.84$, p<.001, than those unprompted, but spontaneous counterfactuals were rare. In Study 2 (40 6;10 – 7;11-year-olds, 17 boys; 39 8;0- to 9;10-year-olds, 21 boys) children made choices for the protagonist. Older and younger children were influenced by the valence of the outcome, younger; p=.039, older p=.004. Older children produced more counterfactuals when the event resulted from a choice, p=.004.We discuss these results in the context of adults' counterfactual thinking.

Do notions of choice and control underpin the relationship between belief in free will and subjective wellbeing?

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We sought to demonstrate that peoples' sense of possessing choice and control is both fundamental to their notions of having free will and underpins the utility of free will beliefs to predict subjective wellbeing. In Study 1, participants' sense of personal control better predicted both satisfaction with life and life stress than their free will beliefs. In Study 2, participants' sense of possessing choice and control better predicted life stress and depression over a two-week period. An exploration of participants' qualitative free will definitions suggested that people see free will as something that is chiefly constrained by external social influences. Across both studies, the associations between participants' FWBs and Subjective Wellbeing were due to the co-variation between FWB and participants' sense of possessing control and choice. These findings suggest that the previously established relationship between Free will beliefs and subjective wellbeing are due to participants' belief in their capacity to make and exercise choices in a social arena.

Two ways to change your mind: Effects of intentional strength and motor costs on changes of intention

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Previous studies on Changes of Mind largely focused on perceptual choice. This study investigated reversals of voluntary action decisions. In a new version of the random-dot motion task, participants moved to a target that matched both the dot-motion direction and an internally-generated intention about the target colour. Analysis of movement trajectories indicated if and when participants 1) changed their mind about a perceptual decision, or 2) additionally changed their intention regarding the target colour. Changes of Intention were more frequent when initial intentions were weak, as indicated by the degree of performance costs when external evidence conflicted with the endogenous intention (Exp. 1). Additionally, Changes of Intention were more frequent when motor costs of intention pursuit were high, especially when intentions were not

implemented into motor commands prior to dot-motion onset (Exp. 2). These results provide new insights into the dynamic decision-making processes that shape voluntary actions as they unfold, with implications for our understanding of goal pursuit and its disturbances.

Training insight problem solving: Comparing procedures

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Previously we found that training focused on barriers and assumptions improved insight performance (Walinga, Cunningham & MacGregor, 2011). More recently, we reported that barrier/assumption training was more effective than divergent thinking training when delivered by instructor, but not in script form (MacGregor, Cunningham & Walinga, 2014). Here, we used more extensive script-based training to compare barrier/assumption, flexibility (Chrysikou, 2006) and originality training. Performance was measured using the seven insight problems used by Chrysikou.

Sixty-eight participants were randomly assigned to three conditions. The mean number of problems solved (and standard deviations) were 3.80 (1.78) for barrier/assumption training, 2.67 (1.59) for originality training and 1.95 (1.50) for flexibility training. There was a significant difference among means, $F(2,65)=7.66$, Mse=2.67, $p<.001$, $\eta p^2 = 0.19$, while Bonferroni multiple comparisons indicated barrier/assumption training was significantly better than flexibility training ($p<.001$). The difference between originality and flexibility training was not significant ($p=.47$). Previously, flexibility training has improved performance with the same set of insight problems and provided a baseline. Results indicated that barrier/assumption training was at least as effective as training in original thinking and more effective than flexibility training. The results also demonstrated that barrier/assumption training can be effective when delivered by script.

Chrysikou, E. G. (2006). When shoes become hammers: Goal-derived categorization training enhances problem solving performance. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 32,* 935-942.

MacGregor, J., Cunningham, J.B., & Walinga, J. (2015). *Further tests of a procedure for training insight problem solving.* Poster presentation, EPS Meeting, Durham, 2015,

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Non-Functional counterfactual thinking in actors after anticipated regret in a risky decision task

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The reliance on scenarios to examine counterfactual thinking has been criticised (Girotto, Ferrante, Pighin & Gonzalez, 2007). This study aimed to replicate and build on findings that actors involved in a task and readers of scenarios describing someone performing the task generate different types of counterfactuals: actors desire to change elements of the task where readers consider changes to decisions made. We report one study in which actors and readers generated counterfactuals after actors completed a risky decision task during which they made a number of choices involving potential-risk reward trade-offs. Additionally, half of participants considered potential post-decisional regrets before making/considering their choices in order to determine if this factor modulates the decisions made and counterfactuals generated. No significant differences were found between anticipated regret conditions. Consistent with previous findings, results showed that actors were significantly more likely to wish to change aspects of the task to improve performance where readers more frequently wanted to change decisions made. Furthermore, a large proportion of counterfactuals were deemed 'non-functional' where participants blamed uncontrollable aspects, such as intelligence. We discuss these findings within the context of a growing body of research suggesting counterfactuals may not play a functional role in negative consequence prevention.

Girotto, V., Ferrante, D., Pighin, S. & Gonzalez, M. (2007). Postdecisional counterfactual thinking by actors and readers. *Psychological Science, 18* (6), 510-515.

Interoceptive Inference: Global vs. local predictions of internal states

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Interoception refers to the awareness of internal bodily states. A growing consensus views this awareness as an interaction of top-down predictions and bottom-up sensory feedback. We explore the contributions of predictive coding to interoception across two experiments. In addition, we differentiate between the ability to form predictions at a local (within a trial) and global (across trials) level. Participants completed an established repetition suppression paradigm in which they viewed angry or neutral facial expressions in a repeated or alternating fashion. Multichannel EEG was recorded to explore the amplitude of the Heartrate Evoked Potential (HEP) as a marker of internal awareness. To explore the effect of global predictions, half of the experimental blocks contained a cue which predicted a repetition of facial expression. This was made either implicit (experiment 1) or explicit (experiment 2). Results of experiment 1 found an enhancement of HEP amplitude for repeated neutral faces, confirming the idea that local predictions shape the generation of internal awareness. By making the global rule explicit in experiment 2, we hypothesize a joint

effect of local and global predictions in which elevated HEP amplitude in repeated trials (local) is further enhanced in blocks where a global cue enables more accurate predictions.

Motor and evidence accumulation signals trace stimulus-response incongruity in the Simon Effect

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The 'Simon Effect' is characterised by slower reaction times when a stimulus is presented on the opposite side of the visual field to the responding effector. This behavioural effect is commonly assumed to arise from conflict at the motor level but the possibility that other processing levels in the sensorimotor hierarchy may also play a role has not been examined. To this end, we used EEG to simultaneously track indices of evidence accumulation and motor preparation during performance of a motion discrimination task in which participants indicated the direction of coherent motion in one of two bilateral patches. Participants detected coherent motion at near ceiling accuracy; however 'congruent' trials (where coherent motion side matched correct response side) were reported significantly earlier than 'incongruent' trials. The lateralised readiness potential (LRP) exhibited an early lateralisation reflecting the location of coherent motion, followed by a lateralisation that reflected the motion direction. In addition, the build-up of the Centro-Parietal Positivity evidence accumulation signal was faster on congruent than incongruent trials; an effect that occurred significantly later than the initial LRP deviation. These results indicate that the Simon Effect does not solely arise from conflict at the motor level but also from subtler effects on the perceptual decision making process itself.

Executive processes and timing: comparing timing with and without reference memory

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Participants received eight timing tasks: temporal generalization and bisection, in their normal versions involving reference memory, and episodic versions without reference memory. In addition, each task was presented at two levels of difficulty. Aspects of performance on these tasks were correlated with performance on measures of executive function involving updating, inhibition, task switching, and access to semantic memory. Accuracy on the temporal generalization task was

correlated with memory access for all versions of the task. Updating correlated with accuracy only for the reference memory-based version of the task. Temporal bisection performance presented a different pattern of correlations. The bisection point was negatively correlated with inhibition scores, except for the easy episodic condition. The Weber ratio, considered a measure of temporal sensitivity was negatively correlated with memory access only in the hard episodic condition. Therefore, in spite of the fact that temporal generalization and bisection have been treated as conceptually similar, with their data fitted by similar models, they appear to be based on different psychological processes. In addition, only temporal generalization showed different correlations for the normal and episodic conditions, perhaps suggesting that temporal bisection is not in fact based on the use of reference memory, whatever procedure is used.

A new way to access intention in voluntary action

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An important aspect of voluntary action is the conscious experience of intention to move that precedes action execution. The Readiness Potential (RP) is an increasing negativity over motor cortical areas that is thought to reflect motor preparation and starts before the conscious intention to move spontaneously arises (Libet, Gleason, Wright & Pearl, 1983). However, it has been suggested that this ongoing preparation may be accessible before it becomes spontaneously conscious (Matsuhashi & Hallet, 2008). In order to test this hypothesis we designed a task where participants performed self-paced actions and were sometimes interrupted by cues that prompted them to introspect and evaluate whether or not they were preparing to move at that moment. They were told to respond to the cue by pressing a key if they were or to ignore it if they were not. We hypothesize that people are able to correctly detect motor preparation at early stages. In particular, we expect to detect a negative trend over motor areas corresponding to an incipient RP preceding the cues that elicited a response, whereas no such trend is expected to precede the cues that were ignored.

Libet, B., Gleason, C. a., Wright, E. W., & Pearl, D. K. (1983). Time of Conscious Intention To Act in Relation To Onset of Cerebral Activity (Readiness-Potential). *Brain*, *106*(3), 623–642.

Matsuhashi, M., & Hallett, M. (2008). The timing of the conscious intention to move, *European Journal of Neuroscience, 28*(October), 2344–2351.

Does pain lengthen time estimation because it increases body arousal? A physiological study

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Changes in physiological arousal are thought to be causal in the subjective lengthening and shortening of the perceived duration of events. In Scalar Expectancy Theory[1] for example, arousal increases the number of pulses that the pacemaker of our internal clock releases, lengthening the time estimation. Whilst this "arousal hypothesis" is used to explain how emotion distorts perceived duration, the relationship between measures of physiological arousal and perceived duration have not been explicitly tested.

Pain is an effective way of creating large distortions to perceived duration[2], possibly because it modifies the arousal level of individuals. In the current study we explicitly tested the arousal hypothesis by establishing the relationship between individuals' physiological arousal (measured by skin conductance level and high frequency heart rate variability) and their perception of duration.

Participants were asked to estimate the duration of a series of electrical discharges. Different blocks of discharges corresponded to different pain intensities. Results confirm the lengthening effect of pain on time judgments: higher intensities of painful stimulus has longer estimated duration. Additionally, although relationships between physiological arousal and perceived duration were observed, they were complex, suggesting that physiological arousal cannot be the sole determinant of distortions to perceived duration.

Gibbon, J., Church, R. M., & Meck, W. H. (1984). Scalar timing in memory. *Annals of the New York Academy of sciences*, *423*(1), 52-77.

Ogden, R. S., Moore, D., Redfern, L., & McGlone, F. (2014). The effect of pain and the anticipation of pain on temporal perception: A role for attention and arousal. *Cognition and Emotion*, *29*(5), 910-922.

Investigating the behavioural signature of meta-awareness during mind wandering

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The behavioural signatures of meta-awareness during mind wandering (MW) are poorly understood. This study aimed to determine whether states of meta-awareness pertaining to attentional states could be predicted from behavioural responses. Using an experience sampling method, 74 participants were prompted to subjectively report their attentional state and their meta-awareness of attentional state while performing a simple go/no go task (Sustained Attention to Response Task; SART). We applied principal components analysis (PCA) to behavioural response patterns prior to targets and experiential probes. A 3-component model accounted for 73% and 72% of the variance in the two analyses, respectively. In line with previous results, the PCA component characterized by reliably slow response times (RTs) positively predicted target accuracy whereas a second component, characterized by a progressive speeding-up of RTs negatively predicted target accuracy. By contrast, only the first component predicted self-reports of MW and meta-awareness

with the pattern of slow RTs being associated with more off-task reports and reduced awareness of attentional state. These results suggest a potential dissociation in the behavioural signatures of behavioural and subjective MW episodes and have implications for the measurement of mind wandering.

Exploring the neural basis of metacognition in perceptual decision-making

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Establishing the neural mechanisms through which the brain enables us to evaluate the quality of our choices has gathered considerable interest from neuroscience over the past decade. Much research within this domain focused on the extent to which confidence and perceptual decision-making rely on shared versus distinct mechanisms, however it has proven difficult to definitively address this issue using non-invasive human brain recordings. Previous work has identified a. Centro-Parietal Positivity (CPP) in the human event-related potential which traces the evidence accumulation process underpinning decision making and which predicts the timing and accuracy of perceptual reports. Here, we sought to determine whether the CPP also accounts for graded reports of decision confidence. We adopted a novel version of the random dot motion paradigms in which stimulus presentation was interrupted at random intervals by the presentation of a confidence dial on which participants simultaneously indicated the direction of motion and their confidence in their choice via a saccade. We found that subjects adopted behavioural strategies congruent with dimensional reports of confidence. Observed on other paradigms (e.g. lower confidence for correct vs incorrect decisions). Electrophysiological analyses will determine the extent to which the amplitude of the CPP at dial onset accounts for reported confidence.

Metacognition of agency is reduced in high suggestibility

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Disrupted sense of agency is the primary feature of response to hypnotic suggestions but its cognitive basis remains elusive. Here we tested the proposal that distorted volition during response to suggestions arises from poor metacognition pertaining to the sources of one's control. Highly suggestible and control participants completed a motor response task in which performance was reduced through manipulations of cursor lag and stimuli speed. Highly suggestible participants did not differ from controls in performance or in awareness of performance, but their sense of agency

was less sensitive to cursor lag manipulations. These results indicate that highly suggestible individuals have aberrant metacognition of agency and may be a valuable population for studying distortions in the sense of agency.

Perspective-taking across cultures: Shared biases in Taiwanese and British adults

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A growing body of evidence suggests that there are two forces at work during perspective-taking. Egocentrism is the tendency to consider the world according to one's own view. Altercentrism is the spontaneous consideration of others' perspectives when unnecessary and compromises performance on the task at hand. Both types of interference were observed in visual perspective judgements (Samson et al., 2010). However, it is unclear whether these interferences affect communication where perspectival information has to be integrated with linguistic input. Typically, listeners appear egocentric by failing to account for a speaker's limited perspective when interpreting her utterances (Keysar et al., 2003). We added a second speaker, who shared participants' privileged perspective, to the communication task to capture egocentrism and any altercentrism. Sixty-two Taiwanese and British adults were tested on the communication task and the visual perspective-taking task in their native languages. Results revealed egocentrism and altercentrism on both tasks, with similar degrees of interference between the two cultural groups. We demonstrated for the first time that listeners accounted for speaker's limited perspective at the cost of performance. The shared biases point towards a common mechanism underlying perspective-taking across cultures operating distinct social relationships between self and others (e.g., independence vs interdependence).

Keysar, B., Lin, S., & Barr, D. J. (2003). Limits on theory of mind use in adults. *Cognition*, *89*(1), 25-41.

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Sensorimotor learning modulates automatic imitation in visual speech

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Observing a hand gesture facilitates performance of that gesture and interferes with performance of a different gesture (Stürmer et al., 2000). This phenomenon is known as 'automatic imitation' (AI) and is thought to occur as a result of associations between observation and execution of the same actions (Heyes, 2005; 2011). A short period of sensorimotor training has been shown to abolish or enhance AI in hand gestures (Heyes et al., 2005; Press et al., 2007). The present study investigated whether sensorimotor training also modulates AI in speech actions. We tested the compatible and incompatible training effects on AI for syllable articulations in a between-group design. Both groups were tested to establish their AI before training following Kerzel & Bekkering (2000); they then received training and repeated the AI task. During training the compatible group said "ba" in response to a speaker saying "ba" in a video and likewise for "da", while the incompatible group said "da" in response to the speaker saying "ba" and vice versa. The results showed no change in AI after compatible training and a decrease in AI after incompatible training. AI in speech actions can therefore be modulated by sensorimotor experience.

Heyes, C. (2005). Imitation by association. In S. Hurley & N. Chater (Eds.), Perspectives on imitation: From *Neuroscience to social science* (pp.157-176). Cambridge, MA: MIT Press.

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Kerzel, D., & Bekkering, H. (2000). Motor activation from visible speech: evidence from stimulus response compatibility. *Journal of Experimental Psychology: Human Perception and Performance, 26*(2), 634.

Press, C., Gillmeister, H., & Heyes, C. (2007). Sensorimotor experience enhances automatic imitation of robotic action. *Proceedings of the Royal Society B: Biological Sciences, 274,* 2509–2514.

Stürmer, B., Aschersleben, G., & Prinz, W. (2000). Correspondence effects with manual gestures and postures: a study of imitation. Journal of Experimental Psychology: *Human Perception and Performance, 26*(6), 1746-1759.

The notion of psychological distance in counterfactual thinking

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Counterfactual thinking is our ability to speculate about what might have been, but was not, in

the past. In two studies we used Construal Level Theory (CLT) to explore the interrelation between counterfactual thinking and temporal distance. Construal Level Theory proposes that temporal distance, spatial distance, social distance, and probability distance have a common meaning, that people access this common meaning automatically, and people use higher level of construal to construe an object as the psychological distance from the object becomes further.

In Study 1 (N=80) we extended previous CLT results, showing that similar effects (participants described distant events in more abstract terms) were seen in the past as well as the future (p-<-.01).

In Study 2 (N=60), we explored whether learning that a protagonist had engaged in counterfactual thinking resulted in participants inferring that the past event was more recent in time to the protagonist (p-<-.001).

We concluded that the effect of temporal distance on participants' construal level is seen in the past and that exposure to counterfactual thoughts can led participants to infer that events are more recent. We discuss whether the notion of psychological distance put forward by CLT can advance our understanding of counterfactual thought.

Exploring a novel tool for the measurement of self-criticism, in anorexia nervosa

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High self-criticism has been related to increased negative self-evaluations, negative comparison of the self with others (Thompson & Zuroff, 2004) and reduced performance satisfaction (Dunkley & Grilo, 2007). Raised self-criticism has been linked to anorexia nervosa (AN; Dunkley & Grilo, 2007). This experiment explored a novel computerised task-specific self-criticism measure, the False Visual Perception Task (FVPT).

An all-female sample of 10 current anorexia nervosa (AN) patients, with 20 gender- matched controls (HC) completed the FVPT.

A significant difference in perceived performance was found between groups (f(1)= 6.306, p <.019), with HC scoring higher than AN. Compared to HC group, AN were shown to have significantly higher levels of dissatisfaction with their performance (f(1) = 23.67, p <.001) and higher expectation that their performance was worse than peers (f(1) = 20.42, p <.001). A significant correlation was found between perceived performance and satisfaction in the HC group (r = .759, p < .001) but not in the AN group (r =.354, p = .351).

The results support the current literature surround self-criticism in AN (Ehret et al, 2015; Dunkley & Grilo, 2007) and offers support for the FVPT as a useful tool, which would easily translate to fMRI and EEG methodologies.

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Travelling to Belfast

Belfast is serviced by two airports, George Best Belfast City Airport and Belfast International. Most flights from the UK take less an hour and are reasonably priced if booked in advance. George Best is closer to the city of Belfast and the University, and thus is preferable if there is an appropriate flight. If travelling from outside the UK, it is also possible to fly to Dublin; there are very regular coaches that take around 2 hours to Belfast. Please contact the local organizer, Teresa McCormack (t.mccormack@qub.ac.uk) if you have travel queries.

Belfast International Airport

•Located 13 miles (21 kilometres) northwest of Belfast.

Getting from the airport to the City
•By Bus: The Airport Express Bus Service (Service 300) operates a regular service on weekdays and weekends. The bus leaves from the bus stop located opposite the terminal exit. More information
•By Taxi: The International Airport Taxi Company, official taxi operator for the Belfast International Airport, are available for hire 24 hours a day 7 days a week outside the right hand door of the airport Exit lobby. A list of sample fares is displayed in the exit hall of the terminal building. A taxi share scheme to Belfast is available for those who wish to use it. For bookings, contact the Belfast International Airport Taxi Company on +44 (0)28 9448 4353.

For more information and to book online visit: www.belfastairporttaxis.com. You can also book taxis that will come from Belfast to pick you up from the airport; these will typically either meet you in Arrivals or wait in the Short Stay area. The two biggest taxi companies are Fonacab (02890 333333) and Value Cabs (02890 809080). Taxis are likely to be around £30.

George Best Belfast City Airport

•Located just three miles (5 kilometres) from Belfast City Centre.

Getting from the airport to the City
•By Bus: The Airport Express Bus Service (Service 600) operates every 30 minutes Monday to Saturday and every 40 minutes on Sunday from outside the airport to the Belfast Europa Bus Centre adjacent to the Europa Hotel, in the heart of the city. The service, Airport Express 600, operates between 5.45am and 9.25pm.
•By Train (not straightforward): When travelling to the airport by train, you'll want to disembark at Sydenham train station. Translink operates a rail service (0600-2300) Monday-Saturday to Central and Victoria Street Stations every 20 minutes. The service is hourly on Sundays (0900-2200). A shuttle bus service operates between the airport terminal and the rail halt at Sydenham. Please go to the information desk and ask for the service. You'll be instructed to wait by the taxi rank where the shuttle bus will collect you.
•By Taxi: Approved taxis operate from the Airport taxi rank outside the terminal building. Wheel-chair accessible taxis are available. The approximate cost of a taxi to Belfast City Centre

from Belfast City Airport with the approved taxi provider is £10.00 (including £2 surcharge). You can book a taxi (02890 809080) but it is often just as easy to wait at the rank. There is no cost difference.

If you are planning to travel using either train or bus transport in Northern Ireland, it is worth being aware that there is a single integrated organization that runs both the buses and trains. This is Translink: http://www.translink.co.uk/. You can buy bus tickets on the bus itself and exact change is not necessary. Train tickets must be purchased at the station; for some longer journeys you can book train tickets online but, unlike in the rest of the UK, there is not always a large discount for doing so.

It is also worth noting that there is a public hire bike scheme in Belfast that has a docking station at the University: http://www.belfastbikes.co.uk/en/belfast/. There is a three-day fee of £5 and then the first half hour of travel is free (you can cycle into the centre and leave a bike there, and then get a different bike back, costing nothing).

Accommodation

Queen's is located about a 20-25 minute walk from the City Centre; there are also very regular buses. However, there are many hotels and guest houses in the University area itself. The following list is not comprehensive.

Hotels next to the University
Malone Lodge, 60 Eglantine Avenue (also does apartments).
        4*. Approx £76 per night
Wellington Park Hotel, 21 Malone Road (immediately opposite the conference venue; a bit dated but convenient).
        3*. Approx £75 per night
Duke's Hotel at Queen's, 65-67 University Road.
        4*. Approx £127 per night
Tara Lodge, 36 Cromwell Road, Botanic Avenue (not expensive and famously friendly).
        4*. Approx £105 per night
Holiday Inn Express Queen's Quarter, 106 University Road.
        3*. Approx £110 per night
Benedict's of Belfast, 7-21 Bradbury Place (about 10 minute walk).
        4*. Approx £94 per night

B&Bs and Guesthouses next to the University
All of the following are very close to the conference venue.
Windermere Guest House, 60 Wellington Park.
        Approx £38 per night
Camera Guest House, 44 Wellington Park.
        Approx £38 per night
Avenue Guest House, 23 Eglantine Avenue.
        Approx £80 per night
Eglantine Guest House, 21 Eglantine Avenue
Marine Guest House, 30 Eglantine Avenue

City Centre
If you would prefer to stay in the City Centre, there are numerous hotels to choose from. The most well-known are:
Europa Hotel, Great Victoria Street.
        4*. Approx £105 per night
Merchant Hotel, 15 Skipper Street.
        5*. Approx £180 per night
Malmaison Belfast, 34-38 Victoria Street.
        4*. Approx £135 per night
Bullitt Hotel, 40a Church Lane (new and quirky).
        4*. Approx £120 per night

Cafes and Restaurants

Lunch
There are many places along the Stranmillis Road to get lunch, all less than 5 minutes from the conference building. Some of these are:

Turning left out of David Keir Building at the Stranmillis Road entrance
- IHO, 17 Stranmillis Road (vegetarian and vegan only)
- Café Connor, 11a Stranmillis Road (bistro type food)
- Ulster Museum café, Botanic Gardens
- Ravenous, 3 Stranmillis Road (sandwich bar)
- Maggie May's, 2 Malone Road (café with huge menu, popular with students)
-

Turning right out of David Keir Building
- Indie Spice, 159 Stranmillis Road (Indian with a great value £5.95 set lunch)
- That Vegan Café, 141, Stranmillis Road
- Sinnamon, 80 Stranmillis Road (coffee shop)
- Gangnan, 54 Stranmillis Road (Japanese and Chinese)

Evening
Belfast has a thriving café and restaurant culture. Some suggestions to try are:

- Barking Dog, 33-35 Malone Road (University area, good quality food)
- Molly's Yard, 1 College Green Mews, Botanic (University area, food with a local flavour)
- Ox Belfast, 1 Oxford Street (Michelin star restaurant, recommended)
- Coppi, St Anne's Square (good modern Italian)
- Mourne Seafood Bar, 34-36 Bank Street (local seafood)
- Ginger Bistro, 7-8 Hope Street

Places to visit

Ulster Museum: extremely close to the conference venue, located in the Botanic Gardens. Entry is free, but it is closed on Mondays.

Botanic Gardens: adjacent to the University, although undergoing renovation

Crown Bar: 46 Great Victoria Street, about 20 minute walk. National Trust property, Belfast's most famous bar.

Titanic Centre: definitely worth a visit for those interested in the Titanic and ship building history

Belfast Black Taxi Tours: these tours are of the areas affected during the Troubles, and involve visiting existing murals and peace walls. These areas are not within easy walking distance of the University, and a tour is recommended if you would like to find out more about the history of the conflict. A number of companies offer these:
 - http://www.niblacktaxitours.com/
 - http://www.belfasttours.com/
 - http://www.belfastblackcabtours.co.uk/
and the content of the tour will depend on which driver you get and is therefore unpredictable. If there are any things you would particularly like to see, it is advisable to talk to the driver at the start. Costs are around £35 for a 90-minute tour (many cabs will take 5+ people).

Further afield, other popular destinations are the Giant's Causeway, other locations on the scenic North Antrim coast associated with the Game of Thrones series, and the Bushmills distillery. Some companies offer one day bus tours from Belfast to a set of these locations:
 - http://causewaycoasttour.com/
 - https://www.mccombscoaches.com/tours/giants-causeway-tour
and these are around £25 per person. For those who like walking, the Mourne Mountains are less than hour from Belfast. It is also possible to walk on the hills overlooking Belfast itself. The easiest way to do this is to take a bus (Metro service 1).

EPS Conference Dinner

The dinner for the EPS meeting in Belfast will be held on Tuesday 11th April at 8pm in Deane's at Queen's http://www.michaeldeane.co.uk/deanes-at-queens/.

Deane's at Queen's is located immediately adjacent to the University, at the corner of College Gardens. It holds a Michelin Bib Gourmand for "good food at moderate prices", and the head chef, Chris Fearon, is a former regional winner in the BBC's Great British Menu. The dinner will cost £30 per person. Postgraduates can attend at a reduced price of £15. Postgraduates should request their supervisor to email the local organizer, Teresa McCormack, t.mccormack@qub.ac.uk, to confirm their status as postgraduate students.

The menu will be determined by the availability of fresh produce, but will include meat, fish and vegetarian options and tea/coffee after the meal.

To book a place at the dinner, please visit:
http://www.qub.ac.uk/schools/psy/EPS/ExperimentalPsychologySocietyConferenceDinner.html and fill out the booking form. Special dietary requirements (other than vegetarian) should be specified on the form. We can only accept electronic payment; please do not send cheques or cash.

Dinner bookings must be made by Friday 31st March and unfortunately late bookings cannot be accepted. If you have any queries about the dinner, please contact the local organizer, Teresa McCormack t.mccormack@qub.ac.uk.

EPS
Experimental
Psychology
Society

Membership Proposal Form

(also available at: http://www.eps.ac.uk/index.php/applying-to-join)

Please use BLACK ink

Title: **Age:**

First Name:

Last Name:

Full current professional address

Email

Telephone

Degrees

Date	Degree	Class	University

Experience

Dates	Post

Current research interests

Oral Papers delivered to EPS meetings, with dates *(In the case of jointly authored papers, indicate speaker)*

Publications (at least two examples of senior authored and peer reviewed: published articles, not "in press")

Print copy of QJEP? (please circle preference   Yes / No

Signature of applicant   Date

In supporting this candidate , we are agreeing that the applicant has made independent contributions to the publications cited above and merits membership of the Society

Proposer (print name)   Seconder (print name)

Signature   Signature

Email address: Email address:

NOMINATIONS

Nominations for new members should be made using the form on the preceding page. Entries should be made in clear black type, using one side of the form only.
All information should be included on the form, not on additional sheets.

Under "Publications", only articles that have appeared in print by the time of nomination, in peer-reviewed psychological or cognate journals, should be listed. Because of space limitations, a complete publication list is not required; up to two recent examples, where the nominee is single or first author, are sufficient.

Applicants must be nominated by two EPS members.

These forms should be returned by 1st September to the EPS administrator: Sandra Harris, Department of Psychology, University of Lancaster, Lancaster, LA1 4YF.

CRITERIA AND PROCEDURES

Soon after the closing date of 1st September, brief details of all candidates will be circulated to members of the Society, who may request further information if they wish. The nomination forms will be considered by the Committee, usually in October. The Committee will decide whether each candidate is eligible for admission to Ordinary Membership, i.e. those candidates who have:

a)   secured a PhD
b)   published an independent account of their work in a reputable, peer-reviewed psychological journal, and
c)   personally delivered an oral paper to the Society.

Candidates who do not meet all these criteria can be considered only in exceptional circumstances. Those who are resident outside Europe will be asked for assurance that they can attend meetings reasonably often.

Any Candidate not selected as eligible by the Committee will be informed of this and will be advised whether he/she may again be proposed for membership in a future year and if so subject to what conditions. The list of those selected as eligible will be put to the Annual General Meeting in January for approval.

EXPERIMENTAL PSYCHOLOGY SOCIETY

<u>April Meeting, 10th - 12th April 2017</u>

The programme for the April meeting is enclosed with this mailing.

Conference dinner:

Booking forms are enclosed for the conference dinner at Deane's at Queen's on Thursday 11th April at 8:00pm. Bookings can be made via the QUB online system only. http://www.qub.ac.uk/schools/psy/EPS/ExperimentalPsychologySocietyConferenceDinner.html and fill out the booking form. Special dietary requirements (other than vegetarian) should be specified on the form. We can only accept electronic payment; please do not send cheques or cash. Meals must be booked by Friday 31st March 2017.

Some places at the dinner are available to postgraduate students at half-price. Postgraduates should request their supervisor to email the local organiser, Teresa McCormack t.mccormack@qub.ac.uk to confirm their status as postgraduate students before making their bookings.

The programme also includes:

Tuesday 11th April, 6:00pm - Sixth Frith Prize Lecture:

> **The contribution of alexithymia to impaired socio-affective processing across disorder**
> *Dr Rebecca Brewer (University of East London)*

Monday 10th April, 5:00pm - EPS/BSA Undergraduate Project Prize winner talk:

> **Social risk amplification in computer-mediated diffusion chains: Effectiveness of information reactivation applied to risk taxonomy**
> *Robert Jagiello (University of Warwick)*

Monday 10th April, 2:00pm Symposium:

> **Time and causality**
> *Organiser: Professor Marc Buehner (Cardiff University)*

Tuesday 11th April 9:00am Symposium:

> **Metacognitions: dissociations or commonalities**
> *Organiser: Professor Patrick Haggard (University College London)*

Tuesday 11th April, 2:00pm Symposium:

Moral reasoning and counterfactuals
Organiser: Professor Ruth Byrne (Trinity College Dublin)

Reading Meeting, 12-14 July 2017

The portals for submissions to this meeting will open on the website week commencing 17th April 2017.

The meeting will include:

15th Mid-Career award lecture by Professor Kathy Rastle with the title:
Writing systems, reading and language,
plus an accompanying symposium organised by Matt Davis.

24th EPS Prize Lecture by Professor Frederick Verbruggen entitled:
Executive control of (impulsive) action
plus an accompanying symposium organised by Chris Chambers.

The local organisers are Patricia Riddell and Katie Gray.

A copy of the EPS Handbook 2017 is included in this mailing for members

Dr John Towse
Hon Secretary

E|P|S

Experimental
Psychology
Society

EXPERIMENTAL PSYCHOLOGY SOCIETY

The Business meeting will be held at 5:30pm on Tuesday 11th April, 2017 in Lecture Theatre OG/110, School of Psychology, Queen's University Belfast, David Keir Building, 18-30 Malone Road, Belfast, BT9 5BN

AGENDA

17/16	Minutes of the 69th Annual General Meeting held at University College London, 26 Bedford Way on Thursday 5th January 2017
17/17	Matters arising
17/18	Secretary's Report
17/19	Treasurer's Report
17/20	QJEP Editor's Report
17/21	Arrangements for future meetings
17/22	Any Other Business

Date, time and place of next meeting

EXPERIMENTAL PSYCHOLOGY SOCIETY

Annual General Meeting

The 69th Annual General Meeting was held on Thursday 5th January 2017 at 5:00pm in the Lower Ground Floor Lecture Theatre, Department of Cognitive, Perceptual & Brain Sciences, University College London, 26 Bedford Way,

MINUTES

The meeting was quorate: over 50 members were present.

17/1   Minutes of the Business Meeting held at University of Oxford, on Saturday 9th   July, 2016

As there were no issues raised, the Minutes of the July 2016 Business Meeting were approved by the President.

17/2   Matters arising

None

17/3   Hon Secretary's Report

The Hon Sec delivered a verbal report to the meeting. The Society has continued to enjoy great success and vitality. The Hon Sec noted that a central aspect of the Society is the ability to make awards of Small Grants, Study Visits, Research bursaries and the support of Research Workshops. The Society has helped psychologists to innovate, pursue research excellence, and to offer opportunities to nurture early career researchers and help them develop their research networks and connections.

The Hon Sec also noted that we have been able to celebrate the 70th anniversary of the EPS. The Oxford meeting in July 2016, held together with SEPEX, was a terrific success and we brought together current and former members to be able to celebrate the vigour of the Society. And the feedback was that the cakes were not only visually arresting and amusing, they were also delicious!

The Hon Sec outlined some of the Society developments, including the uplift to grant award limits and opening to more EPS members, implementation of a new Social Media policy, plans to redevelop our website and reflections on how to support the success of the scientific meetings. The Hon Sec also outlined some of the planned investment in QJEP, and discussed the context of the decision to change publisher contract to Sage in 2018. Questions about the QJEP contract, which had been announced previously by email, included comments about open access issues. QJEP will continue to offer open access routes to publication, but also be targeting key Prize papers as open access, and will be developing a stronger online media support for publications.

17/4   Hon Treasurer's Report

The Treasurer presented a detailed financial report. The Society has a small surplus in the past year of approx. £29,000, which balances a deficit of broadly the same amount last year. The Treasurer identified key items of Society expenditure, including grants and awards, the running of meetings, administrative and Journal costs. In response to questions, the Treasurer confirmed that awards are made on the basis of the merits of the case and not just on a fixed budget available, and reinforced that award success rates are comparatively good. He also outlined the reasons why we have bank deposit profile we do and the committee views on that. We also noted a request from a member to consider funding more overseas speakers to meetings. In summary, the Treasurer encouraged members to keep applying for grants with high quality work.

17/5   QJEP Editor's Report

The new QJEP Editor presented his first report to the meeting. He emphasized that he wanted to continue the tradition from Marc Brysbaert of making QJEP a friendly experience for authors that delivers very high quality papers for the Society. He also noted that QJEP is now undergoing two sets of transitions. One is with respect to the Editorial teams - his team are handling all new submissions whilst Marc's team continues to deal with submissions already in the system. A second transition is with respect to the publishers, as we prepare for the Journal to be supported by a new publisher from 2018. As part of that transition, we will be introducing open data policies and resources to support QJEP authors. The committee also confirmed that members will continue to be able to request print copies of the Journal.

The President reminded Members of the option to nominate candidates for the various EPS prizes. Following final selection at EPS committee, the selected candidates were put to the AGM for ratification by acclamation. The following Prize winners were confirmed and congratulated

17/6   This item was postponed to a subsequent meeting

17/7   Announcement of 46th Bartlett Lecturer
            Professor Stephen Monsell

17/8   Announcement of 16th EPS Mid–Career Award
            Professor Neil Burgess

17/9   Announcement of 25th EPS Prize Lecturer
            Professor Courtenay Norbury

17/10   Announcement of 6th Frith Prize winner
            Dr Rebecca Brewer

17/11   Election of Officers and Committee Members 2017

The following election was confirmed by acclamation

Officers of the Society

President Elect   Professor Cecelia Heyes

The current Officers, eligible for continuation in 2017, were also formally approved by acclamation from the meeting.

The following committee members were also approved by acclamation:

Dr Patti Adank (co-opted)
Dr Ruth Filik
Dr Jeremy Tree
Dr Anna Weighall

17/12   Admission of Honorary members
            No honorary members selected

17/13   Admission of Ordinary members

The October Committee recommendations for admission to membership were all ratified at the AGM.

17/14   Arrangements for future meetings

Belfast, 10-12 April 2017

This meeting will include the 6th Frith Prize talk delivered by Dr Rebecca Brewer. The EPS/BSA Undergraduate Project Prize winner, Robert Jagiello (University of Warwick) will present a talk based on his winning project. The meeting will include 3 symposia:
1.   'Metacognitions: dissociations or commonalities' organised by Patrick Haggard
2.   'Time and causality' organised by Marc Buehner
3.   'Moral reasoning and counterfactuals' has been organised by Ruth Byrne
Local organiser Teresa McCormack

Reading, 12-14 July 2017

This meeting will include the 15th Mid-Career Award by Professor Kathy Rastle with an accompanying symposium organised by Matt Davis entitled 'Convergent approaches to studying reading acquisition'. The meeting will also include the 24th Prize Lecture by Professor Frederick Verbruggen with an accompanying symposium 'Advances in basic and applied cognitive control research' organised by Chris Chambers. Two other symposia have been arranged:
1.   'Food for thought: Brain fuelling and cognitive function' organised by Kaz Brandt.
2.   'Social perception and its atypicalities' has been organised by Bhisma Chakrabarti and Katie Gray.

Local organisers Patricia Riddell and Katie Gray

The meeting expressed its considerable thanks to Patti Adank as local organiser for this meeting.

17/15   Any other business

None

Next meeting will be a Business meeting at the Belfast scientific meeting. Details will be circulated.

Queen's University Belfast campus map