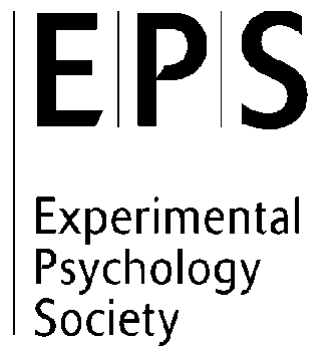




# EPS ONLINE

2 July 2020





*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. To remove any ambiguity regarding permission, this programme now includes a symbol next to every abstract (the hashtag shown on this page), where the presenter has agreed permission for their work to be shared on social media. Where no symbol is shown for a given presentation, there should be absolutely no filming, pictures, or social media of any kind. For explicit guidance on reporting at EPS meetings, please refer to the EPS handbook.*



A scientific meeting will be held online on 2<sup>nd</sup> July 2020.

### **Mentoring Session**

The mentoring session for those registered will be running between 12.15 and 13.30.

### **Poster Session**

The poster session for EPS Online will run between 13.30 and 14.30 on Thursday 2<sup>nd</sup> July, but the posters will be available to view in an OSF repository from Monday 29<sup>th</sup> June via the link below:

<https://osf.io/meetings/EPSOnline2020/>

As well as our usual President's Commendation for Student Posters prize, the EPS invites you to help us choose a 'People's Poster Vote' prize.

### **HOW IT WORKS**

ALL posters presented at the EPS Online event are eligible for nomination.

EPS members and non-members are invited to vote.

You may only vote once.

You may NOT vote for a poster on which your name or institution is featured.

Voting will open at 9am on Wednesday 1<sup>st</sup> July and close at 5pm on Thursday 2<sup>nd</sup> July.

To nominate your favourite poster please go to:

[https://kentpsych.eu.qualtrics.com/jfe/form/SV\\_7WZIk04UDJQ3f1z](https://kentpsych.eu.qualtrics.com/jfe/form/SV_7WZIk04UDJQ3f1z)

### **Symposia Presentations**

Please visit <https://eps.stream7.tv> to register (for free) to view the parallel sessions.

Any queries about the online event should be sent to Sam Hurn at [expsychsoc@kent.ac.uk](mailto:expsychsoc@kent.ac.uk)

START OF PARALLEL SESSIONS

Symposium A

What is special about social cognition?

Organised by Antonia Hamilton.

- |              |                                                                                                                                                                                     |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>10:00</b> | <b>Gustav Kuhn</b> (Goldsmiths, University of London) What is special about social attention?                                                                                       |
| <b>10:30</b> | <b>Bert Timmermans, Crystal Silver and Ramakrishna Chakravarthi</b> (University of Aberdeen) Social agency: Social interaction changes the time course of implicit sense of agency. |
| <b>11:00</b> | <b>Break</b>                                                                                                                                                                        |
| <b>11:15</b> | <b>Ivana Konvalinka</b> (Technical University of Denmark) Neural and behavioural mechanisms underlying interaction and observation in a mirror game paradigm.                       |
| <b>11:45</b> | <b>Natalie Sebanz</b> (Central European University, Hungary) Coordinating decisions in joint action.                                                                                |
| <b>12:15</b> | <b>Mentoring Session</b>                                                                                                                                                            |
| <b>13.30</b> | <b>Poster Session</b>                                                                                                                                                               |

START OF PARALLEL SESSIONS

Symposium B

Space, Memory and Representation.

Organised by Patrick Haggard.

- 10:00**      **Neil Burgess** (University College London) Place cells, grid cells and coherent representation of states and actions.
- 10:30**      **Seralynne Vann** (Cardiff University) The mammillary body-anterior thalamic axis: a pathway for space and time.
- 11:00**      **Break**
- 11:15**      **Faraneh Vargha-Khadem** (UCL Great Ormond Street Institute of Child Health) Double dissociation between the uncus and the subiculum in relation to recall versus spatial perception in Developmental Amnesia.
- 11:45**      **Tim Behrens** (University of Oxford) Abstraction and inference in the prefrontal hippocampal circuitry.
- 12.15**      **Mentoring Session**
- 13:30**      **Poster Session**

Symposium C

Affective Embodiment.

Organised by Manos Tsakiris.

- 15:00**      **Micah Allen** (Aarhus University, Denmark, Cambridge Psychiatry) Interoceptive self-inference: A computational approach to modelling brain-body interaction.
- 15:30**      **Sarah Garfinkel** (Brighton and Sussex Medical School, University of Sussex) Interoceptive cardiac signals selectively enhance fear memories.
- 16:00**      **Break**
- 16:15**      **Catherine Tallon-Baudry** (Ecole Normale Supérieure, France) Subjective experience and the brain-viscera dialogue.
- 16:45**      **Antonio Damasio** (Brain and Creativity Institute, University of Southern California, USA) About the physiology of feeling.

**End of Meeting**

Symposium D

Studying human language outside the laboratory: The challenges and benefits of online data collection.

Organised by Jennifer Rodd.

- 15:00**      **Jennifer Rodd** (University College London) Collecting data online: How to maintain data quality when you can't see your participants.
- 15:30**      **Carolyn McGettigan and Nadine Lavan** (University College London) Studying voice perception via online experiments.
- 16:00**      **Break**
- 16:15**      **Adam Parker, Zoe Woodhead, Paul Thompson, Mike Burt, Kenneth Hugdahl, Josef Bless and Dorothy Bishop** (University of Oxford, University of Durham, University of Bergen, Norway) Assessing reliability of an online behavioural laterality battery: a pre-registered study.
- 16:45**      **Joshua Hartshorne** (Boston College, USA) Studying development and aging with massive online experiments: Results & prospects.

**End of Meeting**

1. **Alejandro Estudillo\*, Ye Ji Lee\*, Juan Álvarez-Montesinos\* and Javier García-Orza\*** (Bournemouth University, University of Nottingham, Malaysia, Universidad de Malaga, Spain) (Sponsor: Peter Hills) Transcranial random noise stimulation enhances unfamiliar face matching performance of unaltered and low-resolution images.
2. **Siew Kei Kho\*, David Keeble and Alejandro Estudillo\*** (University of Nottingham, Malaysia, University of Bournemouth) (Sponsor: David Keeble) *Research Plan* - The effect of anodal and cathodal transcranial direct current stimulation (tDCS) on the recognition of other-race faces.
3. **Natalie Butcher\* and Kazuyo Nakabayashi** (Teesside University, University of Hull) (Sponsor: Kazuyo Nakabayashi) Effects of race and verbalization on attentional and behavioural processes underpinning image and face recognition performance.
4. **Jasmine Kar Wye Lee\*, Steve Janssen\* and Alejandro Estudillo\*** (University of Nottingham, Malaysia, Bournemouth University) (Sponsor: Peter Hills) Chinese do not find their own face faster: Cultural modulation effects on the self-face advantage?
5. **Sarah Alharbi\*, Iris Holzleitner\*, Anthony Lee\*, S Adil Saribay\* and Benedict Jones** (University of Glasgow, University of Stirling, Boğaziçi Üniversitesi, Turkey) (Sponsor: Benedict Jones) Women's preferences for sexual dimorphism in faces: Data from a sample of Arab women.
6. **Bryan Qi Zheng Leong\*, Ahamed Miflah Hussain Ismail\* and Alejandro Estudillo\*** (University of Nottingham, Malaysia, Bournemouth University) (Sponsor: Peter Hills) Individual differences in face recognition and spatial frequency processing.
7. **Mirta Stantic\*, Rebecca Brewer, Bradley Duchaine\*, Caroline Catmur and Geoffrey Bird** (University of Oxford, Royal Holloway, University of London, Dartmouth College, USA, King's College London, Social, Genetic and Developmental Psychiatry Centre, Institute of Psychiatry, Psychology, and Neuroscience) (Sponsor: Geoffrey Bird) Human face matching performance is predicted by deviation from algorithmic similarity.
8. **Alice Towler, James Dunn, Reuben Moreton, Sergio Martinez, Fredrik Eklöf, Arnout Ruifrok, Richard Kemp and David White** (University of New South Wales, Australia, Qumodo, United Kingdom, Comisaría General de Policía Científica, Spain, National Forensic Centre of the Swedish Police Authority, Sweden, Netherlands Forensic Institute, The Netherlands) (Sponsor: David White) A detailed comparison of the best available face recognition solutions on a challenging real-world task.
9. **James Dunn, Stephanie Summersby, Alice Towler, Josh Davis and David White** (University of New South Wales, Australia, University of Greenwich) (Sponsor: David White) UNSW Face Test: A screening tool for super-recognizers.

10. **Ebony Murray and Sarah Bate** (Bournemouth University) (Sponsor: Sarah Bate) Diagnosing developmental prosopagnosia: Repeat assessment using the Cambridge face memory test.
11. **Tsvetomila Popova and Holger Wiese** (Durham University) (Sponsor: Holger Wiese) Neural correlates of face identity learning in a naturalistic setting.
12. **Laura Sexton, Natalie Butcher and Jonathon Reay** (Teesside University) (Sponsor: Karen Lander) Examining the social signals hypothesis in face perception and recognition.
13. **Benjamin Hamblin-Pyke, Karen Lander and Emma Gowen** (University of Manchester) (Sponsor: Karen Lander) Differences in perception of emotion from dynamic and static faces – Testing a novel methodology.
14. **Michael Jeanne Childs and Alex Jones** (Swansea University) (Sponsor: Jeremy Tree) Differences in social perception using static and dynamic faces.
15. **Anne Richards and Marie Smith** (Birkbeck, University of London) Social status and reward value of socially significant stimuli.
16. **Abigail Bradshaw and Carolyn McGettigan** (University College London) (Sponsor: Carolyn McGettigan) Instrumental learning in social interactions: Trait learning from faces and voices.
17. **Aleksandra Mrowiec\* and Adrian von Mühlenen** (University of Warwick) (Sponsor: Adrian von Mühlenen) When honesty doesn't pay out: Social presence evokes gender differences in an ambiguous dishonesty task.
18. **Crystal Silver\*, Rama Chakravarthi\*, Ben Tatler and Bert Timmermans\*** (University of Aberdeen) (Sponsor: Ben Tatler) *Research Plan* - How gaze is deployed in visual target choice and how we identify if like-wise choices are human or computer-generated when observing and interacting.
19. **Frouke Hermens, Gemma Ezard\* and Timothy Hodgson** (University of Lincoln) Social gaze-speech coordination in Parkinson's disease.
20. **Ioana Mihai\*, Simona Skripkauskaitė\* and Kami Koldewyn\*** (Bangor University) (Sponsor: Paloma Mari-Beffa) Development of social attention to complex social scenes.
21. **Julia Landsiedel and Kami Koldewyn** (Bangor University) (Sponsor: Amir-Homayoun Javadi) The role of emotion and physical distance when remembering social interactions.

22. **Ruth Corps\*, Charlotte Brooke\* and Martin Pickering** (University of Edinburgh) (Sponsor: Martin Pickering) Do comprehenders predict from their own or their partner's perspective?
23. **Xun He, Andrea Iglesias Yanes\*, Georgia McGlasson\* and Sanjidha Hassan\*** (Bournemouth University) Effect of embodied perspective on the sensory-level processing of self-relevant information.
24. **Emma Tecwyn\*** (Birmingham City University) (Sponsor: Teresa McCormack) *Research Plan* - Development of overimitation and its relation to theory of mind.
25. **Bianca Schuster\*, Dagmar Fraser\*, Jasper van den Bosch\*, Sophie Sowden\*, Andrew Gordon\* and Jennifer Cook** (University of Birmingham, University of Southern California, USA) (Sponsor: Jennifer Cook) Frith-Happé animations: Stimulus kinematic jerkiness predicts ease with which neurotypical participants can correctly interpret mental states.
26. **Emma Morgan\*, Daniel Smith\* and Megan Freeth** (University of Sheffield, Durham University) (Sponsor: Megan Freeth) Gaze cueing, mental states and the effect of autistic traits.
27. **Carrie Ballantyne\*, Heather Mckechnie\* and Stephen Stewart\*** (University of the West of Scotland) (Sponsor: Karri Gillespie-Smith) Perceptual bias and AQ traits: An eye-tracking study.
28. **Christopher Hand, Ashley Kennedy\*, Ruth Filik, Melanie Pitchford\* and Christopher Robus\*** (Glasgow Caledonian University, University of Nottingham, University of Bedfordshire) Emoji identification and emoji effects on sentence emotionality in ASD and neurotypical controls.
29. **Elif Bastan\*, Sarah Beck and Andrew Surtees** (University of Birmingham) (Sponsor: Andrew Surtees) *Research Plan* - Social reasoning and autism spectrum traits.
30. **Alicia Rybicki\*, Joseph Galea\*, Cleo Fabian\*, Chloe Hiles\* and Jennifer Cook** (University of Birmingham) (Sponsor: Jennifer Cook) Autistic adults show a typical response to surprising events during motor sequence learning.
31. **Catherine Manning, Lisa Toffoli\*, Margaret Snowling\*, Anthony Norcia and Gaia Scerif\*** (University of Oxford, University of Padua, Italy, Stanford University, USA) Global motion evoked potentials in autistic and dyslexic children: a cross-syndrome comparison.
32. **Astrid Priscilla Martinez-Cedillo\* and Tom Foulsham** (University of Essex) (Sponsor: Tom Foulsham) What affects performance during an online WM task? Visual load, maintenance, distractor processing, emotion identification, and ADHD-like traits.

33. **Danielle Beaton\*, Fuschia Sirois\* and Elizabeth Milne** (University of Sheffield) (Sponsor: Elizabeth Milne) *Research Plan* - Testing the effect of criticism on self-compassion and self-criticism between adults with and without ADHD traits using an implicit experimental design.
34. **Jayne Morriss\*, Nicolo Biagi\* and Helen Dodd\*** (University of Reading) (Sponsor: Katie Gray) Your guess is as good as mine: Assessing physiological markers of fear and anxiety to the unknown in individuals with varying levels of intolerance of uncertainty.
35. **Ellen Seiss\*, Camila Gomez Victorino\*, Ziyi Wang\*, Johann Briffa\*, Markus Vinicius Baldo\* and Annette Sterr\*** (Bournemouth University, University of Surrey, University of Malta, Universidade de São Paulo, Brazil) (Sponsor: Xun He) When obsessive compulsive checking symptoms make you better: Reward-based learning of hidden pattern sequences in positive vs. negative feedback conditions.
36. **Lydia Hickman\*, Connor Keating\*, Ambra Ferrari\* and Jennifer Cook** (University of Birmingham, Radboud University, The Netherlands) (Sponsor: Jennifer Cook) Reduced subjective and objective arousal responses as an index of alexithymic traits in the general population.
37. **Hannah Hobson\*, Evangeline Grace Chiu\*, Geoffrey Bird and Nele Demeyere\*** (University of York, University of Oxford) (Sponsor: Geoffrey Bird) Alexithymia in stroke survivors: associations with self-reported and behavioural communication impairments.
38. **Karolina Czarna\*, Jason Taylor, Rebecca Elliott\* and Deborah Talmi** (University of Manchester, University of Cambridge) (Sponsor: Deborah Talmi) Down-regulation of emotion using self-focused reappraisal is a cognitively-costly strategy.
39. **Laura Vuillier\*, Matthew Somerville\* and Amy Harrison\*** (Bournemouth University, University College London) (Sponsor: Andrew Johnson) Neural evidence of a deficit in reappraisal in people with sub-threshold eating disorders.
40. **Ivan Ezquerro-Romano\* and Patrick Haggard** (University College London) (Sponsor: Patrick Haggard) *Research Plan* – “Filling out” and “Emptying in” of skin sensations.
41. **Madeleine Pownall\*, Mark Conner\* and Russell Hutter** (University of Leeds) (Sponsor: Russell Hutter) *Research Plan* - Stereotype threat and pregnant women's cognitive functioning.
42. **Lily FitzGibbon, Gabija Mieliauskaite\* and Kou Murayama\*** (University of Reading, Kochi University of Technology, Japan) *Research Plan* - What makes children feel curious? Investigating the ‘Goldilocks effect’ in children’s viewing preferences.

43. **Alexander Green\*, Barbora Siposova\*, Sotaro Kita and John Michael\*** (University of Warwick, Central European University, Budapest) (Sponsor: Sotaro Kita) Stopping at nothing: Can 2-year-olds differentiate between interrupted and abandoned goals?
44. **Helgi Clayton McClure\* and Scott Cole** (York St John University) (Sponsor: Scott Cole) *Research Plan* - Do spontaneous thoughts about an academic goal mediate the benefits of mental contrasting? A prospective experimental study.
45. **Mei Ling Soh\*, Javier Garcia Orza\*, Achille Pasqualotto\*, Neil Mennie\* and Alejandro Estudillo\*** (University of Nottingham, Malaysia, Universidad de Malaga, Spain, University of Bournemouth) (Sponsor: Peter Hills) The relation between linguistic factors and simple multiplication problem-solving.
46. **Rossana Barros\*, Terezinha Nunes\* and Lars Eric Malmber\*** (University of Oxford) (Sponsor: Peter Bryant) The origins of the concept of fractions.
47. **Jayne Trickett\* and Camilla Gilmore** (Loughborough University) (Sponsor: Camilla Gilmore) *Research Plan* - Multiplication and sleep: Does learning before sleep improve recall?
48. **Chloe Newbury\*, Rebecca Crowley\*, Kathleen Rastle and Jakke Tamminen\*** (Royal Holloway, University of London) (Sponsor: Kathleen Rastle) The effect of targeted memory reactivation on generalisation in language learning.
49. **Rebecca Crowley\*, Chloe Newbury\*, Kathleen Rastle and Jakke Tamminen\*** (Royal Holloway, University of London) (Sponsor: Kathleen Rastle) The effect of sleep deprivation before and after encoding on memory: A meta-analysis.
50. **Bethanie Richards\* and Shane Lindsay\*** (University of Hull) (Sponsor: David George) Nasal respiration does not influence declarative memory consolidation during waking rest.
51. **Shane Lindsay\*, Alfie Hunt\*, Kieran McCaffer\* and Bethanie Richards\*** (University of Hull) (Sponsor: David George) No correspondence between breathing phase and memory encoding or performance in a self-paced memory task.
52. **Shanti Shanker, Michael Anderson, Oliver Turnbull, Martyn Bracewell and Tilak Das** (Bournemouth University, University of Cambridge, Bangor University, Department of Radiography, Cambridge University Hospitals NHS Trust) (Sponsor: Andrew Johnson) Right, but not the left prefrontal cortex is necessary for the suppression of unwanted memories.
53. **Saima Noreen\* and Malcolm MacLeod\*** (De Montfort University, University of Stirling) (Sponsor: Shira Elqayam) Moving On or Deciding to Let Go? A pathway exploring the effects of emotional and decisional forgiveness on intentional forgetting.

54. **Vanessa Loaiza\*** (University of Essex) (Sponsor: Motonori Yamaguchi) Does forgetting in working memory depend on the type of representation?
55. **Candice Morey, Claudia von Bastian, Ralitsa Kostova\* and Evie Vergauwe\*** (Cardiff University, University of Sheffield, University of Geneva, Switzerland) A single, domain-general resource explains temporary storage in working memory.
56. **Christopher Atkin\*, Duncan Guest, Christina Howard\* and Thom Baguley** (Nottingham Trent University) (Sponsor: Duncan Guest) The impact of test format on change detection performance in imagery, VWM and VSTM.
57. **Stuart Moore\* and James Grange** (Keele University) (Sponsor: James Grange) Multidimensional change detection: An initial investigation of resource allocation in visual short-term memory.
58. **Shuangke Jiang\*, Myles Jones\* and Claudia von Bastian** (University of Sheffield) (Sponsor: Claudia von Bastian) *Research Plan* - Effects of tDCS over DLPFC and PPC on visual working memory.
59. **Siobhan McAteer\* and Daniel Smith** (Durham University) (Sponsor: Daniel Smith) Examination of the representation of spatial locations in visuospatial working memory.
60. **Soazig Casteau\*, Charlotte Bush\*, Mary Chalkley\*, Natalie Rogerson\* and Daniel Smith** (Durham University) (Sponsor: Daniel Smith) How holding an item in visual working memory affects pre-saccadic shift of attention.
61. **Rebecca Frost\*, Yevheniy Skyra\* and Evan Kidd** (Max Planck Institute for Psycholinguistics, The Netherlands, Radboud University, The Netherlands, The Australian National University) (Sponsor: Padraic Monaghan) Hebbian learning of language structure in adults: Evidence from a speech production task.
62. **Alexandra Iuliana Negoita\* and Georgia Niolaki** (Coventry University) (Sponsor: Georgia Niolaki) Every letter counts in the new interpretative spelling test.
63. **María Fernández-López\*, Ana Marcet\* and Manuel Perea\*** (Universitat de València, Spain, Basque Center on Brain, Cognition and Language, Spain, Universidad Nebrija, Spain) (Sponsor: Bernhard Angele) Does orthographic processing emerge rapidly after learning a new script?
64. **Marie-Josée Bisson** (De Monfort University) Learning words with unfamiliar orthography: the role of cognitive abilities.

65. **Suzanne Aussems\***, **Katherine Mumford\*** and **Sotaro Kita** (University of Warwick, Words First, United Kingdom) (Sponsor: Sotaro Kita) Seeing iconic gestures with unlabelled action exemplars facilitates children's verb learning.
66. **Ana Baciero\***, **Manuel Perea\***, **Pablo Gomez\*** and **Jon Andoni Duñabeitia\*** (Universidad Nebrija, Spain, DePaul University, USA, Universitat de València, Spain, California State University, USA) (Sponsor: Bernhard Angele) How word recognition abilities develop across our life span: Insights from a crowdsourcing megastudy.
67. **Adam Parker** and **Zoe Woodhead\*** (University of Oxford) Further support for enhanced lexical competition in the left hemisphere: Evidence from an online visual-half field technique.
68. **Benedetta Cevoli\***, **Chris Watkins\*** and **Kathleen Rastle** (Psychology Department, Royal Holloway, University of London, Computer Science Department, Royal Holloway, University of London) (Sponsor: Kathleen Rastle) What is semantic diversity and why does it facilitate visual word recognition?
69. **Yicheng Qiu\*** and **Walter van Heuven** (University of Nottingham) (Sponsor: Walter van Heuven) Distinct components of Stroop interference in Chinese.
70. **Caitlin-Ellen O'Riordan\***, **Aliza Tariq\*** and **Debra Mills** (Bangor University) (Sponsor: Debra Mills) Effects of bilingualism and lifestyle choices on the neural indices of cognitive control in older adults.
71. **Johanna Tomczak\***, **Jean-François Delvenne** and **Ekaterini Klepousniotou\*** (University of Leeds) (Sponsor: Jean-François Delvenne) Interhemispheric transfer times in bilinguals and monolinguals.
72. **Maryam AlJassmi\***, **Victoria McGowan\***, **Sarah White** and **Kevin Paterson** (Zayed University, UAE, University of Leicester) (Sponsor: Kevin Paterson) Foveal and parafoveal processing of letter information in Arabic reading.
73. **Francisco Rocabado\***, **Bernhard Angele**, and **Jon Andoni Duñabeitia\*** (Universidad Nebrija, Spain, Bournemouth University) (Sponsor: Bernhard Angele) Predicting the unpredicted: No relationship between "the"-skipping and response inhibition.
74. **Jessica Dawson\***, **Tom Foulsham** and **Alan Kingstone\*** (University of Essex, University of British Columbia, Canada) (Sponsor: Tom Foulsham) Is this a 'hit'? How the lay person codes subjective mobile eye-tracking data.

75. **Veronika Hadjipanayi\*, Christopher Kent and Casimir Ludwig** (University of Bristol) (Sponsor: Christopher Kent) Eye movements during unequal attention splitting in a multiple object tracking task.
76. **Daniel Smith and Soazig Casteau\*** (Durham University) The temporal profile of covert, exogenous attention.
77. **William Sheppard\*, Polly Dickerson\*, Rigmor Baraas\*, Mark Mon-Williams\*, Richard Wilkie and Rachel Coats\*** (University of Leeds, Department of Ophthalmology, York Teaching Hospital NHS Foundation Trust, Department of Optometry, Radiography and Lighting Design, University of South-Eastern Norway, Kongsberg, Norway, Bradford Institute of Health Research, Bradford Teaching Hospital NHS Foundation Trust) (Sponsor: Richard Wilkie) Quantifying the functional significance of reduced eyesight.
78. **Mauro Manassi\*** (University of Aberdeen) (Sponsor: Clare Sutherland) Illusion of visual stability through active perceptual serial dependence.
79. **Dominic McLean\*, Louis Renoult\* and George Malcolm\*** (University of East Anglia) (Sponsor: Louise Ewing) Top-down expectations facilitate rapid scene processing: a behavioural and ERP study.
80. **Tara Zaksaitė\*, Catherine Loveday\*, Trudi Edginton\*, Hugo Spiers\* and Alastair Smith** (University of Plymouth, University of Westminster, City, University of London, University College London) (Sponsor: Alastair Smith) Cognitive determinants of individual differences in spatial navigation.
81. **Rory Baxter\* and Alastair Smith** (University of Plymouth) (Sponsor: Alastair Smith) Probability cueing in large scale immersive virtual environments.
82. **Chanel Larche\*, Emily Williams\*, Dayne Randa\* and Mike Dixon\*** (University of Waterloo, Canada, University of Leeds) (Sponsor: Faisal Mushtaq) *Research Plan* - Time distortion, flow, and problem video-game play.
83. **Ashleigh Johnstone\* and Paloma Mari-Beffa** (Bangor University) (Sponsor: Paloma Mari-Beffa) The influence of martial arts experience on task switching.
84. **Helen Hodgetts\*, Craig Williams\*, Candice Morey, Bill Macken, Dylan Jones\* and Phillip Morgan** (Cardiff University, Cardiff Metropolitan University) (Sponsor: Phillip Morgan) Action slips in a procedural task: The effect of interruption complexity and modality.

85. **Courtney Michael Goodridge\*, Callum Mole\*, Jac Billington, Gustav Markkula\*, Will Sheppard\* and Richard Wilkie** (University of Leeds) (Sponsor: Richard Wilkie) Threshold versus accumulator frameworks of steering action initiation.
86. **Lucy Porter\*, Katherine Button\*, Rachel Adams\*, Charlotte Pennington\*, Chris Chambers\*, Samantha van Beurden\*, Olivia Johansson\*, Sophie Powell\*, Bea Townsend\*, Sophie Chong\*, Charlie Follett\*, Alisa Zingman\*, Rebecca Goldie\*, Lucie Smith\*, Helen Marlowe\*, Elliot Watters\*, Natalie Evans\*, Melita Mastrogiannopoulou\*, Jessica Roy\*, Britani Lipskis\* and Natalia Lawrence** (University of Exeter, University of Bath, Cardiff University, University of the West of England) (Sponsor: Natalia Lawrence) Does device matter? Impacts of food-specific inhibition training on food choice, liking and approach bias when delivered by smartphone or computer.
87. **Daniel Jolles\*, Marie Juanchich and Beatrice Piccoli\*** (University of Essex) (Sponsor: Marie Juanchich) Too old for the job? Isolated choice effect and its implications for age diversity hiring for organisations.
88. **Thomas Wilson\*** (De Montfort University) (Sponsor: Meredith Wilkinson) Promoting self-disclosure with nonconscious priming: Does it and is it?



Please find below the best ways to engage with our poster presenters during EPS Online.

We encourage you to interact with presenters, either by posting a comment or question on the poster's OSF listing or linking up with presenters during a one-hour live tweet Q&A session on Twitter. Please use #EPSPosterQs to help others follow the discussion!

You are also welcome to arrange a 1:1 Zoom discussion directly with specific poster presenters.

If you do not receive a response straight away during the poster session, it means you have chosen a popular poster! A reply may reach you outside of the poster session.

| Poster No. | Name of Presenter                                                                  | OSF                                                                                 | Zoom                                                                                 | Twitter                                                                                                 |
|------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| 1          | Alejandro Estudillo                                                                |    |    | <br>@AJEstudillo     |
|            | <a href="mailto:aestudillo@bournemouth.ac.uk">aestudillo@bournemouth.ac.uk</a>     |                                                                                     |                                                                                      |                                                                                                         |
| 2          | Siew Kei Kho                                                                       |   |   |                                                                                                         |
|            | <a href="mailto:khpy5ksk@nottingham.edu.my">khpy5ksk@nottingham.edu.my</a>         |                                                                                     |                                                                                      |                                                                                                         |
| 3          | Natalie Butcher                                                                    |  |  | <br>@Dr_N_Butcher  |
|            | <a href="mailto:n.butcher@tees.ac.uk">n.butcher@tees.ac.uk</a>                     |                                                                                     |                                                                                      |                                                                                                         |
| 4          | Jasmine Kar Wye Lee                                                                |  |  |                                                                                                         |
|            | <a href="mailto:khpy5jlk@nottingham.edu.my">khpy5jlk@nottingham.edu.my</a>         |                                                                                     |                                                                                      |                                                                                                         |
| 5          | Sarah Alharbi                                                                      |  |  | <br>@SarahA_h1     |
|            | <a href="mailto:s.alharbi.1@research.gla.ac.uk">s.alharbi.1@research.gla.ac.uk</a> |                                                                                     |                                                                                      |                                                                                                         |
| 6          | Bryan Qi Zheng Leong                                                               |  |  | <br>@qizhenggg     |
|            | <a href="mailto:khpy6blq@nottingham.edu.my">khpy6blq@nottingham.edu.my</a>         |                                                                                     |                                                                                      |                                                                                                         |
| 7          | Mirta Stantic                                                                      |  |                                                                                      | <br>@MirtaStantic  |
|            | <a href="mailto:mirta.stantic@psy.ox.ac.uk">mirta.stantic@psy.ox.ac.uk</a>         |                                                                                     |                                                                                      |                                                                                                         |
| 8          | Alice Towler                                                                       |  |  | <br>@DrAliceTowler |
|            | <a href="mailto:a.towler@unsw.edu.au">a.towler@unsw.edu.au</a>                     |                                                                                     |                                                                                      |                                                                                                         |
| 9          | James Dunn                                                                         |  |  | <br>@dunnhappy     |
|            | <a href="mailto:j.d.dunn@unsw.edu.au">j.d.dunn@unsw.edu.au</a>                     |                                                                                     |                                                                                      |                                                                                                         |
| 10         | Ebony Murray                                                                       |  |  |                                                                                                         |
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## How to Engage with Poster Presenters

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Symposium A

What is special about social cognition?

Organised by Antonia Hamilton.

What is special about social attention?

Gustav Kuhn

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Over the last three decades there has been much interest in understanding how the presence of others influences where we look and what we attend to. One of the central questions has focused on whether these social attentional processes are unique, and if so, what makes them so special? In this talk I will examine some of the methodological challenges we face in studying social attentional orienting. In particular, I will examine the importance of controlling low-level perceptual features, and the importance of creating contexts that allow for real social interactions. In the final part I will present a novel experimental paradigm that borrows tricks from the world of illusionism that allow us to emulate “real” social interactions whilst maintaining full control over the perceptual features and the nature of the interaction itself. Our results show that the belief that you are engaging with a real person results in people avoiding looking at the other speaker’s eyes, but not the face in general. Moreover, our results provide more detailed insights into social attentional biases in individuals with gaze anxiety and social interaction difficulties.

Social agency: Social interaction changes the time course of implicit sense of agency.

Bert Timmermans, Crystal Silver and Ramakrishna Chakravarthi

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Sense of Agency (SA) refers to the experienced causal link between our actions and their consequences. Most studies on SA focus on non-social effects of our actions, or on experiencing agency when cooperating with others towards a shared goal. Five studies investigate how we experience our own sense of agency when we interact with another person, and the effect of our action is the action of the other. In all studies, participants press a key on a keyboard and see another person’s hand on the screen reacting to them by pressing a key on their own keyboard. In the social condition, participants think they and a confederate are seeing each other’s hands live via webcams. In the non-social condition, they think they watch a keypress video. In both, we vary the action-reaction interval (ARI). SA is measured implicitly through intentional binding (IB; participants estimate ARIs by pressing the spacebar for the same time, with shorter-than actual estimates indicating stronger SA). Three studies show stronger SA in social compared to non-social conditions, with the third experiment, inserting a tone between action and reaction, showing social SA to be reflected predominantly in strong IB of the action-tone intervals. A fourth study has the other choose their action (key press), showing stronger SA at longer action-reaction intervals. We discuss how sense of agency may be related to perceiving others as independent agents, and propose a framework whereby social agency can be either stronger or weaker than non-social agency depending on task characteristics.

Neural and behavioural mechanisms underlying interaction and observation in a mirror game paradigm.

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Two-person neuroscience has begun to tap into behavioural and neural mechanisms underlying engagement in dynamic social interaction, moving away from the first person observer approach, with the proposal that social cognition is fundamentally different when we engage in interaction. However, overlapping neural mechanisms have been found in studies of interaction as in those of observation, with a notable gap in studies directly comparing the two. Moreover, social mechanisms have scarcely been considered from the point of view of the actor being observed – for example, how performers are affected by their audience in theatre or music performance. Here, we aimed to study effects of interaction and observation on movement, coordination, and neural mechanisms in dyads interacting or observing/being observed in a mirror game improvisation task. 27 dyads were asked to create free synchronized movements with their partner by sliding their finger along one axis. We measured finger movements and dual EEG under the following conditions: uncoupled (no vision of partner), coupled, observation (one moving, one observing), and externally coupled (unidirectional to common driver). I will present preliminary data showing how movement/coordination patterns and the power of occipital alpha and rolandic mu oscillations are modulated across the action, interaction, and observation conditions.

Coordinating decisions in joint action.

Natalie Sebanz  
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In this talk I will present two studies investigating how we make decisions in the context of joint action. In a first series of experiments, we asked whether co-actors choosing between different courses of action minimize their own movement cost, act altruistically so as to reduce a partner's costs, or try to reduce their common costs. The results showed a strong preference for “co-efficient” choices that minimize the common costs. This demonstrates that people tend to act rationally from a group-level perspective. However, there are limitations to making rational decisions together. In a second study, participants made choices in a coordination game where the task was to pick the same item as a partner among competing alternatives. The rational strategy in this task is to pick the item that stands out the most. Participants did not follow this strategy and made suboptimal decisions, although they could identify the most salient item. Thus, thinking too much about a partner's mental states can get in the way of acting rationally, thereby impairing coordination. Together, the two studies provide a first indication that optimizing decisions in joint action is easier when real effort is at stake.

Symposium B

Space, Memory and Representation.

Organised by Patrick Haggard.

Place cells, grid cells and coherent representation of states and actions.

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In the spatial domain, place cells and grid cells in hippocampal formation show complementary representations of environmental location. I will present data and models suggesting that they combine environmental sensory information with self-motion (or 'path integration') to form a coherent representation, in which non-local 'replay' should play an important role. I will discuss how this view fits with, and makes predictions for, the neural organisation of episodic memory. I will also show how this view corresponds to the idea that place and grid cells respectively support the processing of states or concepts and the transitions between them for prediction and planning, and how including the idea of directed transitions or actions links back to path integration and phase coding in grid cell firing.

The mammillary body-anterior thalamic axis: a pathway for space and time.

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Medial diencephalic structures, in particular the mammillary bodies and anterior thalamic nuclei, have a long-standing association with memory; the mammillary bodies were, in fact, the first brain region to be linked to mnemonic processing. Damage to the mammillary bodies, anterior thalamic nuclei or the fibre tract that connects them - the mamillothalamic tract - all result in pronounced memory impairments in both patients and animal models. Temporal and spatial memory are particularly sensitive to the loss of the mammillary body–anterior thalamic axis. Our recent work has shown that the mammillary bodies can exert long-range modulatory control over hippocampal-cortical activity by integrating and propagating signals from their subcortical inputs. This may be one of the mechanisms via which the mammillary body-anterior thalamic pathway can support temporal and contextual memory. The mammillary bodies and anterior thalamic nuclei are compromised in a wide range of neurological conditions that present with memory impairments, as such, understanding their role in memory processing becomes increasingly important.

Double dissociation between the uncus and the subiculum in relation to recall versus spatial perception in Developmental Amnesia.

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We had previously reported that neonatal hypoxic-ischaemic events can result in selective hippocampal damage and emergence of developmental amnesia (DA) later in childhood.

Patients diagnosed with DA typically present with a (i) severe impairment in episodic memory, but relatively spared semantic memory, (ii) pronounced deficits in recall, along with near normal recognition, and (iii) profound difficulty with spatial memory. This constellation of deficits has been attributed to the atrophy of the hippocampus as a whole. However, our recent evidence from volumetric measurement of the hippocampal sub-regions suggests that patients' recall, but not recognition memory, correlates with the residual uncus, whereas their spatial perception and immediate spatial memory correlates with the residual subiculum. These dissociations reflect the interactions of extent of atrophy differentially affecting the hippocampal sub-regions, with compensatory mechanisms of the developing brain.

Abstraction and inference in the prefrontal hippocampal circuitry.

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The cellular representations and computations that allow rodents to navigate in space have been described with beautiful precision. In this talk, I will show that some of these same computations can be found in humans doing tasks that appear very different from spatial navigation. I will describe some theory that allows us to think about spatial and non-spatial problems in the same framework, and I will try to use this theory to give a new perspective on the beautiful spatial computations that inspired it. The overall goal of this work is to find a framework where we can talk about complicated non-spatial inference problems with the same precision that is only currently available in space.

Symposium C

Affective Embodiment.

Organised by Manos Tsakiris.

Interoceptive self-inference: A computational approach to modelling brain-body interaction.

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Beginning with William James, psychological theory has long placed interoception – the processing, perception, and awareness of signals arising from within the visceral body – at the core of emotional self-awareness. Today, interest in understanding the neurobiology and psychology of interoception is greater than ever, driven in part by the possibility that disordered interoception is a trans-diagnostic risk factor for mental illness. This has led to the rise of various theories of interoceptive inference, based in the notion of predictive processing, in which interoceptive awareness is argued to arise from the precision-weighted integration of interoceptive predictions and prediction errors in the central nervous system. While initially promising, the excitement surrounding this research paradigm is currently limited by the generally poor quality of existing means to measure, manipulate, and quantitatively model interoceptive inference. In this talk, I will first review some of the existing limitations of measuring interoception and present a new psychophysical approach that overcomes many of these issues. I will further present a new computational model characterizing the interplay of interoceptive and exteroceptive predictions in emotional awareness and give a sketch of our upcoming large-scale neuroimaging study of interoceptive inference.

Interoceptive cardiac signals selectively enhance fear memories.

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Fear is coupled to states of physiological arousal. We tested how learning and memory of threat, i.e. conditioned fear, is influenced by interoceptive signals. Forty healthy individuals were exposed to two threat (CS+, paired with electrocutaneous shocks) and two safety (CS-) stimuli, specifically time-locked to either cardiac ventricular systole (when arterial baroreceptors signal cardiovascular arousal to brainstem), or diastole (when these afferent signals are quiescent). Fear learning was augmented for stimuli presented at cardiac systole, where SCR to both CS+ and CS- was elevated relative to CS+ and CS- stimuli presented at diastole. This heart-brain channel was heightened in individuals with elevated anxiety, who displayed further augmented fear responses to stimuli at systole. The cardiac facilitation effect of fear extended the next day, where fear memories were greater for stimuli previously presented at systole. A separate manipulation that altered the cardiac contingency of stimulus presentation (CS+ and CS- stimuli previously time-locked to systole were extinguished at diastole, and vice versa) reduced conditioned memory, suggesting cardiac signals are a context for fear memory and that altering this context can disrupt memory. These observations suggest how threat reactivity may be reinforced and maintained by both acute and enduring states of cardiac arousal.

Subjective experience and the brain-viscera dialogue.

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Subjectivity refers to the most fundamental feature of consciousness: when I see a landscape, or when I feel happy, or when I choose red wine, I experience something, this experience is intrinsically mine, and I experience it from a unique and integrated point of view. How is subjectivity implemented in the brain? Consciousness research has so far focused mostly on information processing and high-level cognition, leaving subjectivity unaccounted for. I propose that subjectivity is rooted in the neural monitoring of visceral organs. The hypothesis relies on two vital organs that continuously generate their own rhythmic electrical activity, the stomach and the heart, and therefore continuously send information up to the neocortex. Visceral inputs are usually not perceived consciously as such, but we find that the brain processes visceral inputs, and integrates visceral inputs with sensory information from the environment or with internally generated cognitive content, to generate conscious experience.

About the physiology of feeling.

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The physiological processes behind interoception are often regarded as comparable to those used by exteroceptive channels. That is not the case. The general design of the interoceptive process is distinctive and so is its specific structural and physiological features. The critical products of interoception — the mental experiences we call feelings — are distinct from the products of exteroception.

Symposium D

Studying human language outside the laboratory: The challenges and benefits of online data collection.

Organised by Jennifer Rodd.

Collecting data online: How to maintain data quality when you can't see your participants.

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Researchers are often nervous about collecting experimental data online because unlike lab-based experiments they cannot meet their participants and can't directly observe their behaviour. I will summarise some of the specific issues that arise from 'invisible' participants, and suggest possible solutions that (i) maintain data quality and (ii) allow principled decision about when online data collection is (and is not) appropriate. I will also suggest that this principled approach to data quality control is often missing in lab-based settings and that the lessons we have learned due to running experiments online can be broadly applied to a range of experimental approaches.

Studying voice perception via online experiments.

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Voices are a central part of everyday social interactions. Research questions about how we perceive other people's identities and traits from the voice do not always require specialist audio equipment, and therefore can be addressed using online experiments. However, when using auditory samples, additional considerations are required to ensure good quality data from online participants. In this talk, I will present examples of voice perception studies from my lab that used online platforms for participant recruitment and data collection. I will share details of our approach to implementing audio playback, establishing participant inclusion and exclusion criteria, and other quality assurance checks (e.g. headphone screening).

Assessing reliability of an online behavioural laterality battery: a pre-registered study.

Adam Parker<sup>1</sup>, Zoe Woodhead<sup>1</sup>, Paul Thompson<sup>1</sup>, Mike Burt<sup>2</sup>, Kenneth Hugdahl<sup>3</sup>,  
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Cerebral lateralisation is a ubiquitous characteristic of humans, and yet many questions remain unanswered as to its causes and consequences. Much of the ambiguity in the literature may arise from unreliable measures of lateralisation and underpowered studies. We evaluated reliability of online battery to assess lateralisation, consisting of four tasks; Rhyme Decision (RD): A visual half-

field task, where the participant judges whether a central written word rhymes with the name of a laterally-presented picture. Hugdahl's Dichotic Listening task (DL) using CV syllables. Burt's Chimeric Faces (CF), where the task is to judge emotion in face stimuli that are vertically split at the midline. Finger Tapping (FT): A speeded sequential key-pressing task performed using a computer keyboard with left and right hands. This battery, together with some demographic items, was administered to 300 participants twice within a 3-10-day period, on the online platform Gorilla. All tasks were significantly lateralised in the expected direction (RVF and R Ear advantage for RD and DL; LVF for CF; R hand for FT, but the effect size for RD was minimal. Test-retest reliability was good for dichotic listening, chimeric faces and finger tapping, but poor for rhyme judgement. We discuss challenges and opportunities for using an online platform for behavioural tests of cerebral lateralisation.

Studying development and aging with massive online experiments: Results & prospects.

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The study of development and aging has faced significant challenges. Like many areas of psychology, the reliance on small homogenous datasets has resulted in suboptimal robustness and generalizability. Second, practical difficulties with subject recruitment have led the field to focus on children under the age of 5, college students, and retirees, leaving much of the lifespan nearly unexamined. Massive online experiments simultaneously address all three issues. As results have begun to accumulate, and the gaps left by prior lab-based studies have been filled in, the resulting picture of development and aging is radically different from what was believed only a few years ago. I conclude by discussing the usefulness of massive online experiments for other fields, along with a consideration of both the promise and pitfalls of this method, and a pointer to resources for researchers interested in using massive online experiments.

Transcranial random noise stimulation enhances unfamiliar face matching performance of unaltered and low-resolution images.



Alejandro Estudillo<sup>1,2</sup>, Ye Ji Lee<sup>2</sup>, Juan Álvarez-Montesinos<sup>3</sup> and Javier García-Orza<sup>3</sup>

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Unfamiliar face matching is a remarkably difficult task for our visual system but of paramount importance in applied scenarios, such as ID verification and passport control. Transcranial Random Noise stimulation (TRNS) is an effective technique to improve cognitive and perceptual abilities, however its effectiveness in face identification tasks is less clear. Thus, the present study explores the effect of TRNS in unfamiliar face matching. In a first stage, observers received either high-frequency TRNS or Sham stimulation (i.e., no stimulation) during 20 minutes at occipitotemporal sites (i.e., P7 and P8) aimed to modulate activation in brain areas usually related to face processing. In a second stage, observers performed a face matching task with unaltered and low-resolution pixelated images. Our results show that high-frequency TRNS enhances unfamiliar face matching performance of both unaltered and low-resolution pixelated faces.

Research Plan - The effect of anodal and cathodal transcranial direct current stimulation (tDCS) on the recognition of other-race faces.

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Anodal transcranial direct current stimulation (a-tDCS) tends to improve cognitive performance. However, it has been shown that cathodal tDCS (c-tDCS) over the right occipital cortex decreased recognition accuracy for other-race faces, eliciting the Other Race Effect (ORE) in participants that did not show ORE before stimulation. The present study aims to shed light on the relationship between c-tDCS, a-tDCS and the recognition of own and other-race faces. Chinese Malaysian and Caucasian participants will first complete own and other-race face recognition baseline tasks. Next, participants will receive either sham stimulation, a-tDCS or c-tDCS. Participants will then complete new versions of the own and other-race face recognition tasks. It is hypothesized that a-tDCS will increase recognition of other-race faces whereas c-tDCS will decrease recognition of other-race faces. ANOVA will be performed on the baseline score to check for potential pre-stimulation differences in face recognition ability between the groups. To investigate the effect of stimulation on ORE, a mixed 3 (stimulation: sham vs. c-tDCS vs. a-tDCS) x 2 (task: Caucasian/Australian vs. Chinese (Hong Kong)/Chinese (Malaysian)) ANOVA will be conducted on accuracy and reaction time.

Effects of race and verbalization on attentional and behavioural processes underpinning image and face recognition performance.



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Four experiments examined the effects of race and verbalisation on attentional and behavioural responding to faces during image and face recognition tasks. In both tasks, White British and Japanese participants (N = 80) studied sequentially presented faces one at a time, with a post-encoding task (describe or control) between the faces. This encoding phase was followed immediately by a recognition task involving a two-alternative forced choice recognition test. During the image recognition task, the images of the targets during learning and recognition were identical, whereas during the face recognition task, the images between the two phases were different. Accuracy, response time, and eye movements (i.e., dwell time and fixations) were analysed. The results showed that race of face affected behavioural responses by both groups, but in contrasting directions. Verbal processing facilitated face recognition accuracy by the Japanese group, whereas it aided image recognition accuracy by the British group. Nonetheless, eye movements by both groups showed that verbalization resulted in increased attention to a wider area of the face while no-verbalization narrowed attention allocation to a specific feature. Moreover, both groups directed more attention to non-feature areas of other-race faces and more attention to eyes of own-race faces.

Chinese do not find their own face faster: Cultural modulation effects on the self-face advantage?



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The self-face advantage (SFA) is a phenomenon that shows that, compared to familiar and unfamiliar faces, individuals are faster in identifying their own face among a set of distractor faces. It has been hypothesized that the SFA is modulated by one's self-concept, whereby individuals with a more independent self-concept style show a more evident SFA. Conversely, individuals with a more interdependent self-concept style show a weaker or no SFA. This study explores this hypothesis in Malaysia, an Asian country with a more interdependent society compared to Western countries. Participants were asked to search for frontal view of self, friend, and unfamiliar faces among an array of distractor faces in a visual search task. They also completed the Self-Construal Scale (SCS) which measures the two distinct dimensions of self-concept. Results showed faster search times for the own face compared to the unfamiliar face. However, no differences were found between the own face and the friend's face. In addition, although there was sufficient variance on the interdependence subscale, SFA does not correlate with scores on the interdependence subscale, with the scores on the independent subscale, or with the scores on the continuum, suggesting that self-concept does not fully account for the SFA.

Women's preferences for sexual dimorphism in faces: Data from a sample of Arab women.

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Many previous studies have investigated the effects of manipulating sexually dimorphic shape characteristics in face images on attractiveness judgments. However, results have been mixed and show considerable cross-cultural variability, particularly for women's judgments of men's facial attractiveness. Because very little research has investigated face preferences in Arab samples, we assessed Arab women's preferences for sexually dimorphic face shapes (Study 1) and the effect of sexually dimorphic face shapes on Arab women's dominance perceptions (Study 2). Analyses showed that Arab women preferred feminized versions of both women's and men's faces over masculinized versions (Study 1, N = 272) and that masculinizing face shape had a positive effect on Arab women's perceptions of the dominance of men, but not women (Study 2, N = 270). These image manipulations did not, however, have a significant effect on perceptions of trustworthiness (Study 3, N = 434). Collectively, these results suggest that Arab women prefer relatively feminine face shapes in potential mates that they perceive as being low dominance. We discuss some directions for future research on the ultimate function of Arab women's preferences for sexual dimorphism in faces.

Individual differences in face recognition and spatial frequency processing.



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Multiple studies have shown a critical band of spatial frequencies (SF), involving mostly low-spatial frequencies, in face identification. However, it is unknown whether the use of this critical band is modulated by individual differences in face identification. Thus, the aim of the present study is to investigate whether inter-individual variation in face identification, measured with the Cambridge Face Memory Test–Chinese (CFMT–Chi), influences the use of SF information during an old-new face recognition memory task. In the latter task, our participants recognised unfiltered faces more accurately compared to spatial frequency filtered faces, that were all equated for low-level visibility. Faces retaining only low SF were recognised with comparable (above chance) accuracy to those retaining only high SF. This suggests that both low and high SF information are equally important for face recognition. Furthermore, scores in the CFMT–Chi did not predict performances in all conditions. These findings suggest that face recognition abilities do not modulate the critical band of SF used for face recognition.

Human face matching performance is predicted by deviation from algorithmic similarity.

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Face perception has long been of interest to computer vision scientists, with most comparisons between humans and algorithms focusing on accuracy and few examining mechanisms underlying this ability. We explore the relationship in more detail. Participants (N = 141, Mage = 27.2, 73 female) completed a face similarity judgment task (same and different pairs) and a battery of standard face perception tasks. They were asked to rate similarity of pairs of faces between 0 (very dissimilar) and 100 (very similar) and indicate whether the pair was of the same person or different people. A medium-sized correlation between similarity judgments given by humans and algorithms was observed ( $r = 0.44$ ,  $p < 0.01$ ). More interestingly, participants deviation from algorithmic similarity was a significant predictor of their performance on a variety of other face-recognition tasks ( $F(2, 138) = 2.682$ ,  $p < 0.05$ ,  $R^2 = 0.063$ ). We suggest that the ability to objectively assess the similarity of two faces might be a crucial underpinning in face recognition mechanisms used by established face tests and that similarities from algorithms capture an important aspect of face processing that humans rely on. Potential implications for explaining atypical mechanisms of high-level perception in ASD or developmental prosopagnosia are discussed.

A detailed comparison of the best available face recognition solutions on a challenging real-world task.

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Accurate face recognition is critical for criminal justice, public safety, border control, and national security. However, people make high proportions of errors when performing challenging real-world face recognition tasks. Here we provide the first detailed comparison of the three leading solutions to this problem: super-recognisers, forensic facial examiners and face recognition algorithms. Thirty-five super-recognisers selected on the basis of standard psychometric tests, 16 forensic facial examiners, and a state-of-the-art Deep Convolutional Neural Network face recognition algorithm completed an international proficiency test for forensic experts. All solutions achieved similarly high

levels of accuracy, but demonstrated different patterns of errors, indicating qualitative differences in cognitive strategy. We also found large individual differences among the human groups, despite strict recruitment procedures and extensive on-the-job experience. Finally, we were able to improve accuracy by aggregating individual decisions using a ‘wisdom of crowds’ approach. Our results provide the largest and most detailed comparison of leading face recognition solutions. They show surprising heterogeneity in the patterns of errors across these solutions, suggesting that there are different routes to achieving accurate face recognition. Practical implications for improving face recognition in applied settings will be discussed.

UNSW Face Test: A screening tool for super-recognizers.



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We present a new test – the UNSW Face Test – that has been specifically designed to screen for super-recognizers in large online cohorts and is available free for scientific use. Super-recognizers are people that demonstrate sustained performance in the very top percentiles in tests of face recognition ability. Because they represent a small proportion of the population, screening large online cohorts is an important tool for their initial recruitment, before completing confirmatory testing via standardized measures and more detailed cognitive testing. We provide normative data on the test from 2 cohorts tested in our lab (combined  $n = 182$ ) and 3 tested via the internet (combined  $n = 23,902$ ). The UNSW Face Test: (i) captures both recognition memory and perceptual matching, as confirmed by correlations with existing tests of these abilities; (ii) captures face-specific perceptual and memorial abilities, as confirmed by non-significant correlations with non-face object processing tasks; (iii) enables researchers to apply stricter selection criteria than other available tests, which boosts the average accuracy of the individuals selected in subsequent testing. Together, these properties make the test uniquely suited to screening for super-recognizers in large online cohorts.

Diagnosing developmental prosopagnosia: Repeat assessment using the Cambridge face memory test.

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Developmental prosopagnosia (DP) is a cognitive condition characterised by a relatively selective impairment in face recognition. Currently, people are screened for DP via a single attempt at objective face processing tests, usually all presented on the same day. However, several variables likely influence performance on these tests irrespective of actual ability, and the influence of repeat administration is also unknown. The latter is critical for a full psychometric evaluation of dominant diagnostic tests; given they are widely available online. Here, we assess, for the first known time, the

test-retest reliability of the Cambridge Face Memory Test (CFMT) - the leading task used worldwide to diagnose DP. This value was found to fall just below psychometric standards, and single-case analyses revealed further inconsistencies in performance that were not driven by testing location (online or in person), nor the time-lapse between attempts. Later administration of an alternative version of the CFMT (the CFMT-Aus) was also found to be valuable in confirming borderline cases. We consider the implications of these findings for existing diagnostic protocols, concluding that two independent tasks of unfamiliar face memory should be completed on separate days.

Neural correlates of face identity learning in a naturalistic setting.



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Previous studies have demonstrated that pre-experimentally unfamiliar faces elicit a familiarity effect in event-related brain potentials (ERPs) following a learning task, with more negative amplitudes for learnt relative to unfamiliar faces in the N250 component. However, these studies relied on photos or videos to mimic real-life learning, creating a discrepancy between everyday face learning and how the process is studied in the laboratory. The present study used ERPs to investigate whether robust image-independent representations could be established after a brief real-life encounter. The participants interacted with the ‘to-be-learnt’ person for 30 min in a face-to-face conversation which was followed by an EEG test session in which they were shown naturally varying “ambient” images of the newly learnt person and an unfamiliar face. Familiarity effects were present, with more negative amplitudes for the newly learnt identity in the 200-300 ms time window (N250) reflecting visual recognition. At the same time, the effect was small relative to previous studies suggesting that the newly formed representations had not reached the same degree of image independence as those of highly familiar faces. This finding supports recent theoretical accounts that conceptualise familiarity as a gradual rather than a bi-valent category.

Examining the social signals hypothesis in face perception and recognition.



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Research has shown that people are more accurate at recognising faces from moving compared to static images. Three experiments were conducted to examine the validity of the social signals hypothesis, which proposes that social cues carried in movement (e.g. expression and speech) benefit face recognition by attracting attention to identity-specific facial features such as the eyes, nose and mouth. Participants (N=51) completed three tasks while their eye movements were recorded: an unfamiliar face learning task, a familiar (famous) face recognition task and a face-matching task. In the famous and learning tasks, participants were found to be more accurate when recognising faces from motion, relative to a static presentation. However, motion did not affect performance in the matching task. Across all three tasks, participants directed a significantly higher proportion of dwell time and fixations to the internal features (eyes, nose and mouth) when faces were presented in

motion, relative to static. Conversely, the proportion of time and fixations directed to the external features (cheeks, chin and hair) was significantly higher during the presentation of static faces. These results support the social signals hypothesis by demonstrating that social cues present in facial motion attract attention to identity-specific features, facilitating identity processing.

Differences in perception of emotion from dynamic and static faces – Testing a novel methodology.



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Facial expression recognition (FER) is essential for social interaction and can be impaired in a number of patient populations. Whilst significant differences in recognition of emotion have previously been found (see Young, Perrett, Calder, Sprengelmeyer, & Ekman, 2002; Matsumoto & Ekman, 1989), there is currently no widely used test for FER that uses both dynamic and static stimuli. In the reported experiment, 20 control participants were recruited and shown dynamic and static facial stimuli at gradually increasing durations and participants were asked to state what emotion was shown. Anger, disgust, fear, joy, sadness, and surprise facial stimuli were included. Both correct hit rates and eye tracking data were collected. Results showed that, for both static and dynamic stimuli, joy was recognised fastest, and anger and fear recognised the slowest. Participants were significantly more accurate with joy stimuli in both dynamic and static stimuli than other emotions. For each emotion, static stimuli were recognised faster than dynamic stimuli. These results establish baseline measures in a control population, allowing for comparison in patient populations of interest.

Young, A. W., Perrett, D. I., Calder, A. J., Sprengelmeyer, R., & Ekman, P. (2002). Facial expressions of emotion: Stimuli and Test (FEST). *Psychology (Vol. 126)*. Bury St Edmunds, Suffolk: Thames Valley Test Company.

Matsumoto, D., & Ekman, P. (1989). American-Japanese cultural differences in judgments of facial expressions of emotion. *Motivation and Emotion*, 13, 143–157.

Differences in social perception using static and dynamic faces.



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Looking younger, healthier, and more attractive is important for older adults, as reflected by increasing demand for cosmetic procedures. Moreover, studies have generally found that older faces were perceived as less healthy and less attractive. However, the main images presented for such studies tended to be static. We therefore aimed to investigate how static and dynamic faces spanning three age groups (young, middle, and old) would be perceived on three traits – age, health, and attractiveness. Supporting previous studies, we found that older faces received lower ratings of

health and attractiveness in both contexts. However, dynamic presentation did have a differential impact on trait perception; where age ratings were unaffected by motion, whereas ratings of health and attractiveness tended to be generally higher when faces were moving. Interestingly, the impact of motion also interacted with the age of the face perceived, where this positive ‘boost’ to ratings of health/attractiveness under dynamic versus static perception was greatest for the oldest faces. This implies that when faces are moving, older adults are perceived as slightly more attractive/healthier compared to a static context. This could have implications on stimuli selection for experiments of such traits in future and when perceiving results from anti-aging treatments.

Social status and reward value of socially significant stimuli.



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The influence of social status on the reward value of social stimuli was investigated using the motivated viewing paradigm. Attractive and non-attractive, male and female faces expressing happy, neutral, and angry emotions together with a label indicating an occupation with high- (e.g., ‘surgeon’) or low-status (e.g., ‘cleaner’) were presented to (N= 46) participants. We found the typical effects with effort expended to view attractive models for longer than non-attractive ones ( $F(1,45)=43.03$ ,  $p<.001$ ,  $\eta^2=.49$ ), female for longer than male faces ( $F(1,45)=11.00$ ,  $p=.002$ ,  $\eta^2=.20$ ) and differential viewing of emotion ( $F(1,46)=34.00$ ,  $p<.001$ ,  $\eta^2=.43$ ; happy most motivating and anger least). Of importance here is the interaction between attractiveness, sex of model, emotion, and status ( $F(2,90)=7.99$ ,  $p=.001$ ,  $\eta^2=.15$ ). High-status neutral expressions were preferred over low-status ones ( $F(1,45)=4.68$ ,  $p=.036$ ,  $\eta^2=.09$ ), but status did not influence angry expressions or happy attractive expressions. However, non-attractive high-status happy males (4023ms) were more rewarding than their low-status counterparts (3780ms;  $t(46) = -2.23$ ,  $p=.031$ ), whereas low-status non-attractive females (4533ms) were more motivating than high-status ones (4186ms;  $t(46)=2.29$ ,  $p=.027$ ). These findings demonstrate that the influence of social status on the reward value of social stimuli is nuanced.

Instrumental learning in social interactions: Trait learning from faces and voices.



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Recent research suggests that reinforcement learning may underlie trait formation in social interactions with faces (Hackel, Doll, & Amodio, 2015; Hackel, Mende-Siedlecki, & Amodio, 2020). The current study investigated whether the same learning mechanisms could be engaged for trait learning from voices. On each trial of a training phase, participants (N = 192) chose from pairs of human or slot machine targets that varied in the 1) reward value and 2) generosity of their payouts. Targets were either auditory (voices or tones; Experiment 1) or visual (faces or icons; Experiment 2), and were presented sequentially before payout feedback. A test phase measured participant choice

behaviour, and a post-test recorded their target preference ratings. For auditory targets, we found no effect of reward or generosity on target choices, but saw higher preference ratings for generous humans and slot machines. For visual targets, participants learned about both generosity and reward, but generosity was prioritised in the human condition. These findings demonstrate that (1) reinforcement learning of trait information with visual stimuli remains intact even when sequential presentation introduces a delay in feedback and (2) learning about traits and reward in such paradigms is weakened when auditory stimuli are used.

Hackel, L. M., Doll, B. B., & Amodio, D. M. (2015). Instrumental learning of traits versus rewards: dissociable neural correlates and effects on choice. *Nature Neuroscience*, 18(9), 1233–1235.

Hackel, L. M., Mende-Siedlecki, P., & Amodio, D. M. (2020). Reinforcement learning in social interaction: The distinguishing role of trait inference. *Journal of Experimental Social Psychology*, 88, 103948.

When honesty doesn't pay out: Social presence evokes gender differences in an ambiguous dishonesty task.



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Based on past research findings in honesty this study examined whether a realistic and dynamic cue of social presence, a video, is powerful enough in order to evoke honesty in an ambiguous task where otherwise could result in financial pay-out. Participants were asked to look at an optical illusion and answer what they have seen, following the exposure of the observational cue, a video of someone looking directly at them or not. All participants were informed that certain answers, regardless of being correct or incorrect, can reduce the amount of money they can potentially win at the end of the study. As the task provided a level ambiguity and a potential financial reward, participants experienced a level of doubt and a margin of potential honesty-dishonesty flexibility. The interaction between the inclination to lie and ambiguity effect was analysed to see whether implicit realistic observational social cues have an effect on honesty in a task that tempts dishonesty. The results showed that whilst the eye gaze had no impact on the honesty levels, an unforeseen gender effect was found to be statistically significant where both sexes were found to respond honestly following exposure to their respective sex on the screen.

Research Plan - How gaze is deployed in visual target choice and how we identify if like-wise choices are human or computer-generated when observing and interacting.



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Sense of Agency is the feeling of responsibility for actions and their effects. Most agency studies are non-social, but social agency has been shown to be a distinct construct. For example, temporal

action-effect contiguity is required for agency to arise in non-social, but not social contexts (Pfeiffer et al., 2012). Most social agency paradigms employ deception in delivering action-effects: responses are arbitrarily computer-generated. This explorative study will investigate how people deploy gaze in visual target choice and how they identify others doing the same. Participants will a) choose a target from a set, b) observe likewise responses and judge whether said responses are human- or computer-generated, and c) make the same judgements when interacting: participant target choice is followed by the other's choice. Results will show (a) to what degree our own gaze behaviour serves as expectation towards others', (b) how social interaction changes our gaze behaviour and perception of others', (c) a way towards more ecologically valid social stimuli by investigating which latencies/choices people produce in a target choice task. Analyses will focus on whether own prior gaze (a), depends on temporal contiguity or target location or (b) congruency of response to one's own, and (c) influences agency judgements.

Pfeiffer, U. J., Schilbach, L., Jording, M., Timmermans, B., Bente, G., & Vogeley, K. (2012). Eyes on the mind: Investigating the influence of gaze dynamics on the perception of others in real-time social interaction. *Frontiers in Psychology*, 3(DEC).

#### Social gaze-speech coordination in Parkinson's disease.

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Parkinson's disease (PD) can affect cognitive and social functioning as well as the control of movement. Studies have suggested that people with PD have an impaired understanding of other people's emotions and social connectedness. PD also affects the ability to generate facial expressions and this might change how others interact with them socially. We examined the influence of PD on gaze and speech coordination during social interaction in a card guessing game. Eleven participants with PD and sixteen age-matched controls took part in a study in which we recorded eye movements and timing of speech events while pairs of participants played the game. The largest difference between PD patients and controls was found in the time needed to pick up the cards (longer in PD patients), but also subtle differences in eye movement patterns were found. The results suggest that PD has its strongest influence on the control of movement, but may also affect gaze control in social interactions.

#### Development of social attention to complex social scenes.



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Even in infancy, human visual attention is captured by human information in naturalistic scenes. Recent findings suggest people also preferentially attend to and more quickly detect interacting dyads compared to non-interactors. However, little work has examined scenes containing multiple social targets. How might social attention to competing social targets change across development?

Here, we recorded eye movements in 99 adults (18-35) and 53 children (6-11) during free viewing of naturalistic scenes where dyads were either interacting or not, and were depicted with either one or two additional non-interactors. Preliminary analyses across all pictures re-confirmed a human attentional bias, in both age groups, that was not moderated by social interaction. This effect was stronger in adults, with no age group differences for non-human information. Second-level analyses for scenes containing an interacting dyad and one or two other non-interactive individuals show that interacting people both capture attention more quickly, and engage it more strongly, than non-interactors across both age groups. However, this effect is significantly stronger in adults than children. This suggests that in complex social scenes with multiple social targets, interactions take attentional priority but that this "interaction bias" increases across development, a finding with implications for both scene perception and social development.

The role of emotion and physical distance when remembering social interactions.



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Human behaviour is inherently social. Research suggests that social interactions are preferentially processed; compared to non-facing dyads, facing dyads are found more quickly during visual search, and remembered as closer together. These processing differences seem to arise through ‘chunking’ of interaction information during memory encoding. Here, we investigated how crucial information about the nature of social interactions affects how they are remembered. Across two experiments, we used a spatial memory task to explore the role of emotion and physical distance. We expected to replicate a spatial bias to remember facing dyads as closer together, but that this bias would be modified both by the dyads’ emotion (e.g. happy dyads to be remembered as closer together compared to angry dyads) and the distance between individuals in a dyad (e.g. less bias for dyads presented at their canonical distance). Results revealed the expected spatial bias for neutral facing dyads. However, this effect was reduced for emotional dyads, perhaps because emotion might encourage participants to perceive non-facing dyads as more interactive. Further, when interactants were seen at unusual distances, judgements were altered to compensate for this, regardless of dyad emotion. These findings suggest that interaction processing is affected by implicit social knowledge.

Do comprehenders predict from their own or their partner’s perspective?



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Comprehenders rapidly predict what they are going to hear [1]. But do they predict what they themselves would say if they were producing the utterance, or can they “step into the speaker’s shoes” and predict appropriately? We addressed this question in three visual-world experiments, in which participants listened to sentences (e.g., I would like to wear...) while viewing four objects on-screen. We created differences in gender identity (and thus perspective), so that male and female

participants heard male and female speakers producing sentences about stereotypical male (target: tie, distractor: drill) and female (target: dress, distractor: hairdryer) objects. Sentences began with I in Experiment 1, You in Experiment 2, and the name James or Kate in Experiment 3. In all three experiments, participants fixated targets more than distractors rapidly after verb onset, suggesting they predicted associatively. But participants also adopted the appropriate perspective, predicting from the speaker's perspective in Experiment 1, their own perspective in Experiment 2, and the character's perspective in Experiment 3. This appropriate effect occurred much later than the associative effect. Consistent with a multiple mechanisms account of prediction [2, 3], we conclude that listeners consider perspective when predicting, but not from the earliest moments of prediction.

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Effect of embodied perspective on the sensory-level processing of self-relevant information.



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It is well established that information relevant to the self is better processed than other information when people learn to associate shapes with identity labels in a perceptual matching task. Recently, it was found that this self-bias was stronger when the identity-related stimulus was presented in the first-person (embodied) perspective than in the third-person perspective (Sun et al., 2016). However, it remained unclear whether this modulation of self-bias by perspective reflected a sensory-level process. The current study addressed this question using event-related potentials (ERPs) and the perceptual matching paradigm, presenting two top-view avatars facing each other along with an identity label (“you”, “friend”, or “stranger”). The behavioural data replicated the self-bias as higher accuracies and shorter reaction times, but found no effect of perspective. This self-bias was also found in a stronger sensory-level P1 component, with the maximal effect over the midline occipital area around 100ms post-stimulus. In comparison to the third-person perspective, the first-person perspective resulted in enhancement of all ERP components before 200ms. This enhancement, however, did not significantly differ across identity conditions. These results suggest that embodied perspective enhances identity-related processing at the sensory level, and that this benefit is not specific to the self-identity.

Research Plan - Development of overimitation and its relation to theory of mind.



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Introduction: Children are savvy social learners, but across early childhood (2-to-4-years) their tendency to copy everything they see someone do—including actions that are causally unnecessary (termed ‘overimitation’)—increases. Although much effort has been put into uncovering why children overimitate, less attention has been paid to the cognitive mechanisms underpinning its development. Despite appearing irrational, copying everything makes sense if you can recognize that someone’s actions are being done for your benefit. Thus, one potentially relevant cognitive skill is the ability to reason about others’ mental states. This study will investigate whether theory-of-mind skills predict tendency to overimitate in early childhood. Methods: Two-and three-year-old children (period of rapid overimitation and theory-of-mind development; n=60) will complete:

1. Overimitation task (3 trials): child watches demonstrator perform one unnecessary and one necessary action to retrieve a sticker, before retrieving a sticker for themselves
2. Theory-of-mind scale (5 tasks)
3. Sequence-copying task: to control for child’s ability to remember and copy a 2-action sequence

Parents will complete a questionnaire to assess the child’s language skills. Analysis: Mixed-effects logistic regression. DV: whether participants overimitated (0/1); Predictors: theory-of-mind score (0-5), sequence copying score (0/1), language score (0-100); age in months; overimitation trial (1-3); Random factor: participant.

Frith-Happé animations: Stimulus kinematic jerkiness predicts ease with which neurotypical participants can correctly interpret mental states.



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Autism spectrum disorders have long been associated with mentalising atypicalities. However, recent work has challenged this hypothesis, suggesting that mentalising constitutes a two-way process. Edey and colleagues (2016) demonstrated that neurotypical individuals perform worse in the Frith-Happé animations task when interpreting animations created by autistic participants, relative to their own group’s animations. Although it has been suggested that increased kinematic jerkiness is a key factor that makes autistic animations difficult to interpret, studies have not directly tested whether animation jerkiness predicts mentalising performance. Here we asked 52 neurotypical participants to animate two triangles on a touch-screen device in order to depict three mental-state and two non-mental state words. 37 naïve neurotypical observers were then asked to rate the extent to which each animation depicted the five words. We calculated mean jerk and indices of contact, contingent motion and curved movements of these videos. A linear mixed effects model revealed that jerk and the proportion of simultaneous movement of both triangles predicted accuracy. Though there was

variation between words, in general less jerky animations were easier for neurotypical individuals to interpret. These results indirectly support the hypothesis that neurotypical individuals may struggle to read autistic animations due to increased movement jerkiness.

Gaze cueing, mental states and the effect of autistic traits.

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The ability to interpret and follow the gaze of our social partners is an integral skill in human communication. Recent research has demonstrated that gaze following behaviour is underpinned by theory of mind (ToM) processes. However, it is yet to be determined whether the modulation of gaze cueing by ToM is affected by individual differences, such as autistic traits. The aim of this experiment was to establish whether autistic traits in neurotypical populations affects the mediation of gaze cueing by ToM processes. This study used a gaze cueing paradigm within a change detection task. Participants' perception of a gaze cue was manipulated such that they only believed the cue to be able to 'see' in one condition. The results revealed that participants in the low autistic traits group were significantly influenced by the mental state of the gaze cue and were more accurate on valid trials when they believed the cue could 'see'. By contrast, participants in the high autistic traits group were more accurate on valid trials but this was not influenced by the mental state of the gaze cue. This study therefore provides evidence that autistic traits influence the extent to which mental state attributions modulate social attention in neurotypical adults.

Perceptual bias and AQ traits: An eye-tracking study.



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The Navon task (Navon, 1977) has long been used to demonstrate visuo-spatial hierarchical differences in autistic individuals (e.g. Plaisted et al, 1999; Wang et al., 2007). More specifically, enhanced processing of local compared to global items has provided supporting evidence for theories such as Enhanced Perceptual Functioning (EPF; Mottron et al. 2006) and Weak Central Coherence (WCC; Frith & Happé, 1994). Indeed, Reed et al. (2011) amongst others found enhanced processing of local items in individuals who do not have a clinical diagnosis of autism, but score highly in autistic traits using the Autism Quotient questionnaire (AQ; Baron-Cohen et al., 2006). The current study uses the AQ to predict performance on two Navon tasks. Using a Tobii eye tracker, 55 adults who ranged in AQ scores between 4-42, took part in selective and divided attention Navon tasks. Accuracy, fixation duration and fixation count were measured to test implicit and explicit task performance. Multiple linear regressions found no significant results in any of the Navon task measures. Results do not support the previous literature in that those who scored higher on the AQ

questionnaire performed in a similar way to individuals with ASD on tasks with a perceptual component.

Emoji identification and emoji effects on sentence emotionality in ASD and neurotypical controls.



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Autism spectrum disorder (ASD) participants report difficulty making optimal decisions in ambiguous situations. Research suggests emotion recognition as a primary deficit within ASD, particularly when recognising the “six basic emotions”. Research has examined emoji effects on sentence emotionality, with inconsistent findings. We conducted two studies, comparing adult ASD and neurotypical (NT) participants. The first study presented participants (nASD=31; nNT=57) with 12 emoji (two per the “six basic emotions”). Participants chose from a list of emotions to identify each emoji. Results showed a Group × Emoji Type interaction – ASD and NT participants were equivalent in identifying ‘happy’ and ‘disgusted’ emoji; ASD participants were poorer at correctly identifying ‘fear’, ‘sad’, ‘surprise’, and ‘angry’ emoji. The second study presented participants (nASD=37; nNT=24) with 36 emotionally-neutral sentences. Half of the stimuli were paired with sentence-final ‘happy’ emoji, half with ‘sad’ emoji. Participants rated each sentence+emoji stimulus for emotional valence (-3 very negative to +3 very positive). Results showed a Group × Emoji Type interaction – ASD and NT participants rated sentences with ‘happy’ emoji equally positively; ASD participants rated sentences with ‘sad’ emoji more negatively than NT participants. Results are discussed in the context of Theory of Mind, and applications of the findings are considered.

Research Plan - Social reasoning and autism spectrum traits.



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A key diagnostic feature of autism relates to difficulties with social relationships. Reasoning is a core ability that helps us understand, develop, and maintain these relationships. There is evidence that autistic people tend to rely more on deliberative reasoning, with less focus on heuristics and intuitive reasoning than their neurotypical peers. However, there is little research on whether this difference varies between social and non-social domains and on the impact of individual differences. We will examine how autistic traits relate to performance on a causal reasoning task and whether this is impacted by reasoning about social vs. non-social domains. Participants will learn about cause and effect relationships in domains of social (e.g. interpersonal relationships) and non-social (e.g. economics, meteorology). They will then complete multiple trials of a forced-choice paradigm about each domain. Responses will quantify participants’ intuitive bias to assume interdependence between

causal factors in their reasoning, as opposed to reasoning in a purely logical manner. We will examine the correlation between this bias and participants' scores on the Autism-Spectrum Quotient (AQ). We predict that reasoning bias will be negatively correlated to the AQ score and this effect will be strongest for reasoning in the social domain.

Autistic adults show a typical response to surprising events during motor sequence learning.



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A burgeoning field reports motor atypicalities in autism 1,2, which may be underpinned by differences in the process of motor learning 3,4. Parallel work, proposes that in general autism may be characterised by an underweighting of prior beliefs and an overweighting of incoming sensory information 5,6. Indeed, with respect to visual perception, non-autistic participants show increased reaction times (known as surprise-related slowing) when prior beliefs are violated, whereas autistic participants exhibit an efficient response to surprising incoming visual information 7. Here we investigate whether autistic adults exhibit reduced surprise-related slowing in the context of a motor learning task 8. Participants learned unique actions responses to visual cues. In the critical predictable conditional actions followed a simple sequence with occasional surprising trials whereby an expected action had to be replaced with an unexpected action. Comparing 28 autistic and 35 non-autistic controls revealed no differences between groups. Both groups exhibited surprise-related slowing. Bayesian statistics revealed that the surprise-related slowing effect was comparable between the two groups ( $BF_{01}=3.78$ ). We conclude that autistic adults showed a typical response to surprising events. These data do not support the claim that autistic individuals show atypicalities in response to surprising events in the context of motor sequence-learning.

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Global motion evoked potentials in autistic and dyslexic children: a cross-syndrome comparison.



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Atypicalities in global motion processing have been reported in many neurodevelopmental conditions, including autism and dyslexia. Cross-syndrome comparisons of neural correlates may help determine whether altered motion processing is a general marker of atypical development or condition-specific. Here, we assessed group differences in N2 peak amplitude (previously proposed as a marker of motion-specific processing) in typically developing (n = 57), autistic (n = 29) and dyslexic children (n = 44) aged 6 to 14 years, in two global motion tasks. High-density EEG data were collected while children judged the direction of global motion stimuli as quickly and accurately as possible. Using a data-driven component decomposition technique, we identified a reliable component that was maximal over occipital electrodes and had an N2-like peak at ~160 ms. We found no group differences in N2 peak amplitude, in either task. However, there was some evidence of atypicalities in later stages of processing for both autistic and dyslexic children that will need to be followed up in future research. Our results suggest that early sensory encoding of motion information is unimpaired in dyslexic and autistic children. Yet, group differences could arise in later processing stages linked to decision-making and response generation.

What affects performance during an online WM task? Visual load, maintenance, distractor processing, emotion identification, and ADHD-like traits.



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Previous studies in people with Attention- Deficit Hyperactivity Disorder (ADHD) report working memory (WM) and emotion identification impairments. As it has been suggested that this disorder can be measured as a discrete diagnostic entity but also as a continuous trait within the general population (i.e. Panagiotidi, Overton, & Stafford, 2018). We investigated three components of working memory (load, maintenance, and distractor processing), their involvement in an emotional identification task, and their relationship with ADHD-like traits within the general population. We administered a behavioural online study measuring accuracy and reaction times, and a questionnaire

measuring ADHD traits to 250 participants. Our WM task was a full design paradigm with 2 levels of (1) visual load (one or two faces), (2) maintenance (1 and 9 sec), and (3) distractor processing (presence or absence). We tested the hypothesis that the difference between components of WM would be related to ADHD traits. Our results demonstrated quicker responses in the short-delay than in the long-delay condition. However, the difference of each component does not seem to be related to ADHD traits.

Research Plan - Testing the effect of criticism on self-compassion and self-criticism between adults with and without ADHD traits using an implicit experimental design.

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Self-compassion is a positive way of relating towards the self during times of suffering or when facing challenges. It is beneficial to a person's mental health and enables resilience to criticism. People with ADHD face more frequent challenges compared to people without ADHD, yet they also have lower levels of self-compassion. People with ADHD also receive more criticism from others, which contributes towards the low levels of self-compassion. Previous research typically used self-report measures, which limits the findings methodologically and theoretically. An implicit measure of one individual component of self-compassion has been found, but this has not been used for a global measure of self-compassion or to investigate between group differences. A Propositional Evaluation Paradigm will measure self-compassion and self-criticism by recording reaction times (RT) to TRUE/FALSE signals that follow self-compassionate, self-critical, and neutral statements. This study will measure all self-compassion components using an implicit task, which will be assessed by comparing RT between self-compassion/self-criticism and neutral statements using a within-subject ANOVA. The study will investigate differences in self-compassion between people with/without ADHD by comparing RT's between the groups using a between-group ANOVA. Finally changes in self-compassion following criticism will be captured by evaluating differences in RT's using a mixed-ANOVA.

Your guess is as good as mine: Assessing physiological markers of fear and anxiety to the unknown in individuals with varying levels of intolerance of uncertainty.



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Fear of the unknown is thought to underpin individual differences in self-reported intolerance of uncertainty (IU). Over the last decade, IU has gained substantial interest and now sits at the forefront of anxiety and stress research. Despite the emergence of IU as a construct, there is a dearth of literature on the extent to which the known vs. the unknown during threatening contexts induces fear and anxiety in individuals with high IU. To address this question, we manipulated the known and

unknown during a classic anxiety task (n = 93). Throughout the task, we measured a variety of physiological indices (i.e. sweating, pupil dilation, startle blink, and facial frowning). Higher IU, relative to lower IU, was associated with physiological markers of fear and anxiety (i.e. startle blink and facial frowning) during conditions with known, compared to unknown threat. These findings provide evidence that IU-related fear and anxiety during threatening contexts are driven by the perception that something known isn't correct or complete, rather than when something is entirely unknown. Ultimately, this research will inform future models of IU in relation to anxiety and stress disorders.

When obsessive compulsive checking symptoms make you better: Reward-based learning of hidden pattern sequences in positive vs. negative feedback conditions.



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Decision making deficits in ambiguous situations have been previously reported in people with OCD, especially when they perform in probabilistic reward-based learning (RBL) tasks. The aim of the study was to investigate RBL in people with non-clinical checking compared to non-checking tendencies while (1) disentangling positive and negative feedback into two distinct tasks, (2) adding analysis methods that consider previous trial outcomes for the current decision making in sequences of events that were either random or contained a response pattern. In this study, participants (N = 72) were divided into subclinical checkers and non-checkers who were performing either an RBL task with positive feedback (winning vs. no reward/punishment) or negative feedback (losing vs. no reward/punishment). Findings showed that checkers and non-checkers presented a similar performance in the two tasks when random trial RBL blocks independent of feedback type. However, checkers performed better in blocks where response patterns were overlaid with random noise, but only in the negative feedback condition. These findings suggest that negative environments bias checkers to enhance the search for specific patterns in uncertain environments, maybe to reduce the uncertainty of the situation.

Reduced subjective and objective arousal responses as an index of alexithymic traits in the general population.



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Alexithymia concerns a difficulty identifying and communicating one's own emotions. Recent work

argues that difficulties identifying emotions in alexithymia are due to poor subjective awareness of 'objective' arousal responses such as the skin conductance response. Although there are individual differences, within the general population, in identifying one's own emotions, extant research has focused on highly alexithymic individuals. Here we investigated whether poor subjective awareness of objective arousal responses underpins individual differences in alexithymic traits in a general population sample. Forty-three participants rated subjective arousal responses to 20 high, 20 moderate and 20 low arousal images from the International Affective Picture System. Concurrently, objective arousal was measured in terms of skin conductance response. Alexithymic traits were indexed with the Toronto Alexithymia Scale. Individuals with higher alexithymic traits exhibited a trend towards reduced objective and subjective arousal responses to high versus low arousal images. Consequently, in this general population sample, individual differences in identifying one's own emotions were associated with reduced objective arousal responses to high versus low arousal images. However, since this reduced response was reflected in subjective ratings, alexithymic traits were not linked with poor subjective awareness of objective arousal responses.

Alexithymia in stroke survivors: associations with self-reported and behavioural communication impairments.



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The factors that underlie the development of alexithymia, an inability to identify and communicate one's emotions, remain unclear. Studies of patients with traumatic brain injury have suggested a role for language processes (Hobson et al., 2018). The present study examined this link in a population with differently acquired brain injuries: stroke survivors. We examined data from a large group of chronic stroke patients (N =118) to test whether self-reported or behavioural measures of language and communication problems were associated with alexithymia. We also examined the impact of hemisphere of damage on alexithymia. We found no differences in alexithymia levels for patients with observed language impairments on brief tests of picture naming, comprehension and reading vs unimpaired patients. However, self-reported communication difficulties were found to be associated with higher scores of alexithymia, even after controlling for depression and anxiety. Patients with left versus right hemisphere damage did not differ in their alexithymia scores. This provides partial support for the language hypothesis of alexithymia. Potential reasons for the discrepant findings between the self-report and objective language measures include the possibility that self-report measures may be more sensitive to milder impairment, or impairments in pragmatic rather than structural language skills.

Hobson, H., Hogeveen, J., Brewer, R., Catmur, C., Gordon, B., Krueger, F. & Grafman, J. (2018). Language and alexithymia: Evidence for the role of the inferior frontal gyrus in acquired alexithymia. *Neuropsychologia*, 111, 229-240.

Down-regulation of emotion using self-focused reappraisal is a cognitively-costly strategy.

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Many believe that once the emotion regulation technique of reappraisal is deployed, it does not rely on limited-capacity cognitive resources. Our aim was to investigate whether this is true for the self-focused subtype of emotion regulation, by using a divided-attention task (Experiment 1) and EEG measures of attention (Experiment 2). Self-focused reappraisal in these experiments was shown to be an effective strategy, as it resulted in lower ratings of the negative emotions experienced, lower self-reported arousal, as well as decreased corrugator supercilii activity (as compared to simply watching unpleasant pictures). In Experiment 1 participants were asked to regulate their emotions while performing an auditory discrimination task (ADT). ADT impairment was observed, indicating cognitive costs of regulation strategies. While we failed to find any differences in forced-choice recognition memory, source memory for the instructions (Watch or Decrease) in the reappraisal condition, supporting the same conclusion. In Experiment 2 reappraisal increased sustained centro-parietal evoked amplitude and decreased oscillatory power in the gamma band. The increase in evoked responses as a result of reappraisal, despite reduced emotional experience in this condition, suggests that this strategy may be associated with cognitive effort. Overall, these results support the hypothesis that down-regulation of emotion using reappraisal engages effortful stimulus elaboration. These results are important for the design and interpretation of emotional memory studies, where there are reported discrepancies in the directional influence of emotional reappraisal.

Neural evidence of a deficit in reappraisal in people with sub-threshold eating disorders.



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While difficulties with emotion regulation have been shown to contribute to eating disorders (ED), most studies have used self-reports. This is problematic because people with EDs have difficulties identifying and describing their emotions. In this study we used an objective way to measure emotion regulation processes by looking at the Late Positive Potential (LPP). We recruited 12 females with sub-threshold ED and 13 controls. They performed a task in which they were shown emotional pictures and asked to attend or reappraise their emotions following a prompt that described the pictures (attend condition) or offered an alternative explanation (reappraisal). We analysed their brain activity at the CPz electrode in three conditions: first presentation, attend and reappraisal. We found that the ED group showed larger LPP amplitudes compared to controls in the reappraisal condition, suggesting that they had not reappraised their emotions. Our data also suggested that reappraising emotion may actually increase the intensity of negative emotions in our ED group. This is the first time that the neural basis of a deficit in reappraisal is shown in people

with sub-threshold EDs. We are currently replicating these findings in females with diagnosed bulimia nervosa in order to inform possible treatment alternatives.

Research Plan – “Filling out” and “Emptying in” of skin sensations.



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Our visual world does not contain holes, despite absence of receptors in the blind spot. Processes of “filling-in” maintain our continuous visual field. In somatosensation, thermal receptors are sparsely distributed, forming sensitive ‘thermal spots’ in human skin. Although these spots are readily identified in the lab, thermal perceptions in daily life is rarely well-localised. Whether thermal perception involves similar extrapolation beyond sparse sensory information remains unclear. To study thermo-tactile object constancy, we will study how the brain constructs thermal percepts when objects move between more and less thermosensitive skin regions. Each stimulation involves either two successive touches from a thermal stimulator at locations 5 cm apart, or a continuous sliding motion across the skin between those locations. Participants detect whether the temperature changes during the course of each stimulation, or does not change. Bias and sensitivity are computed using signal detection theory for each cell of a 2x3 factorial design, with factors of stimulus motion (successive touches, continuous sliding) and skin region stimulated (spot-then-nonspot, nonspot-then-spot, nonspot-then-nonspot). Higher sensitivity is expected if the stimulation includes a thermosensitive spot than otherwise. However, continuous motion may reduce this sensitivity or introduce bias, shedding light on perceptual mechanisms of thermo-tactile object constancy.

Research Plan - Stereotype threat and pregnant women's cognitive functioning.



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Throughout pregnancy and into motherhood, women are perceived to be incompetent and forgetful. In this poster, we provide the first social experimental work testing whether “baby brain” in pregnancy can be explained by stereotype threat theory (Steele, 1997), which proposes that awareness of negative stereotypes about one’s ingroup can harm performance. In Study 1 (N = 364), we tested stereotype threat effects in a 2 (stereotype threat vs no threat) x 3 (pregnant women, new mother, never-pregnant female control) design. We observed a main effect of group on memory performance, such that pregnant women and new mothers performed worse, but no other main or interactive effects. Study 2 (N = 409) aimed to replicate this with mathematics ability, memory, and attention as the dependent variables. This *Research Plan* poster will share our planned work which will test whether participant’s motivation is a crucial factor in the relationship between partum status and cognitive functioning. In this study, we plan to manipulate participant’s motivation via manipulation of monetary compensation, using a 2 (stereotype threat vs no threat) x 3 (pregnant

women vs new mother's vs never-pregnant women) x2 (low vs high motivation) design. We will conduct 2x3x2 ANOVAs to test these hypotheses.

Research Plan - What makes children feel curious? Investigating the 'Goldilocks effect' in children's viewing preferences.



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It is important to understand what makes children feel curious so we can provide environments that support their intrinsic motivation to learn. Curiosity is thought to be greatest when predictability is intermediate - a stimulus is neither too predictable (boring) nor unpredictable (overwhelming; Berlyne, 1960). Indeed, this inverted U pattern has been observed in infants' looking behaviour (Kidd, Piantadosi, & Aslin, 2012). In the proposed study, we will investigate the relationship between curiosity and predictability in older children using a new information-seeking paradigm. Children aged between 6 and 10 years will be presented with visual sequences of events (monsters performing dance moves) that have varying predictability. In the familiarisation phase, children will be able to watch five monsters performing sequences of dance moves simultaneously. Each monster's dance will be more or less predictable. In the information seeking phase, children will be able to continue viewing the monsters by moving the mouse cursor to different parts of the screen. We predict that children will choose to observe monsters with dances of intermediate predictability (a) more often and (b) for longer than those with low or high predictability dances. We will also calculate the predictability of the sequence at the point when participants disengage from a sequence - our prediction is that the probability of disengagement will have a U-shaped relationship with predictability.

Stopping at nothing: Can 2-year-olds differentiate between interrupted and abandoned goals?



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Goal attribution emerges early in the first year of life (Csibra, 2008; Liu & Spelke, 2017; Southgate & Vernetti, 2014). Most research on goal attribution implements experimental scenarios in which the target agent's goals remain constant. Little is therefore known about whether children update their representations of others' goals, and specifically, whether children distinguish between goal-directed actions that were halted due to goal interruption and goal abandonment. We tested this using an instrumental helping paradigm. In test trials the experimenter begins to place a toy into a box (initial location). In the interrupted goal-condition, the experimenter encounters an obstacle which interrupts this action. In the abandoned goal-condition, the experimenter states that he would rather place the

toy in another box (alternative location). We measure where children help place the toy (initial vs alternative location). Twenty-four children (24-30 months old) were tested using a within-subjects design. Using GLMMs, we found that the odds of helping place the toy in the initial location were over 4 times larger in the interrupted goal-condition compared to the abandoned goal-condition ( $OR = 4.63, p = .003$ ). This indicates that children differentiate between interrupted and abandoned goals, and this guides their helping in dynamic social contexts.

Csibra, G. (2008). Goal attribution to inanimate agents by 6.5-month-old infants. *Cognition*, 107(2), 705–717.

Liu, S., & Spelke, E. S. (2017). Six-month-old infants expect agents to minimize the cost of their actions. *Cognition*, 160, 35–42.

Southgate, V., & Vernetti, A. (2014). Belief-based action prediction in preverbal infants. *Cognition*, 130(1), 1–10.

Research Plan - Do spontaneous thoughts about an academic goal mediate the benefits of mental contrasting? A prospective experimental study.



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Many factors besides raw ability impact attainment in exam-based assessments (e.g. performance expectations, self-efficacy; Schunk & Di Benedetto, 2018). Intersecting with these is the way in which the student views an exam while it is still a future possibility. Students may view an assessment primarily in terms of a desired outcome (e.g. performing well); or in terms of the necessary process for achieving it (e.g. studying hard). Studies experimentally manipulating these possibilities have shown that ‘process’ simulation, compared to ‘outcome’ simulation, improves attainment in university assessments (Taylor et al., 1998). More recent research has shown that ‘mental contrasting’ of a desired outcome with potential obstacles to success further enhances goal attainment (see Oettingen, 2012 for a review). A separate vein of research has revealed that spontaneous thoughts often reflect uncompleted personal goals (Baird, Smallwood, & Schooler, 2011; Morsella et al., 2010) – suggesting that such ‘mind-wandering’ may serve an adaptive function through mental preparation and planning (Smallwood & Schooler, 2015; Baars, 2010). The proposed study draws on both literatures, testing mind-wandering as a possible mechanism underlying the benefit of mental contrasting on attainment. It uses a prospective design, manipulating goal processing and measuring mind-wandering several days before an exam, with resulting scores taken as the outcome measure. The project represents a synthesis of experimental and naturalistic methods in the service of applied cognitive psychology.

The relation between linguistic factors and simple multiplication problem-solving.



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The acquisition of arithmetic skills is quintessential for academic achievement. Numerous studies have found that difficulties to solve single-digit multiplications is prevalent among individuals with dyscalculia. Thus, this study investigated the relationship between simple multiplication performance and education-related factors in Malaysia. In this exploratory study, adults (n=253) were asked to complete 60 multiplication questions in a minute and a demographic and educational questionnaire. Despite the simplicity of the task, approximately 35% of adults performed below 50% accuracy. The number of second languages known positively correlated to the proficiency of multiplication solving. Education attainment also positively associated with the number of second languages known. Generally, students who had attended Vernacular schools (i.e., using three languages as medium of instruction) performed better than those students who had graduated from National schools (i.e., using either one or two languages for instruction). Our findings support the view that language acquisition is crucial for arithmetic performance, specifically for multiplications. Further studies should look into the cognitive and neural mechanisms behind low arithmetic performances for effective and efficient planning of educational programs.

The origins of the concept of fractions.



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Two abilities, quantitative reasoning and arithmetical skills, play an important role in mathematics learning. Quantitative reasoning is the ability to draw new conclusions from knowledge of relations between quantities. Arithmetic skill involve knowledge of relations between numbers and how they behave in the four operations. This intervention study aimed to assess how promoting either of these abilities affects children's performance in a fractions assessment at post-test. Children (108, age range 8-9 years) were randomly assigned to one of two intervention programmes or to a control group. One intervention aimed to improve their reasoning about quantities in division situations and the second to improve their arithmetic skills in operations with fractions. Children were pre-tested in a fractions assessment and the Raven's matrices. After an 8-week intervention with half-hour sessions in small groups, they answered an immediate and a delayed post-test about fractions. Analyses of covariance, controlling for non-verbal ability and pre-test, showed that the quantitative reasoning group significantly outperformed the control group on both post-tests; the arithmetic group outperformed the control group only at delayed post-test. Thus quantitative reasoning plays a clear causal role in children's learning about fractions whereas the role of arithmetic skills is less well defined.

Research Plan - Multiplication and sleep: Does learning before sleep improve recall?

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Declarative learning is optimised when it occurs prior to sleep as opposed to a period of daytime waking evidenced using cued recall of word pairs in both children and adults (Backhaus, Hoeckesfeld, Born, Hohagen & Junhanns, 2008; Wilhem, Diekelmann & Born, 2008). There is no research into the generalisation to mathematical stimuli. It is hypothesised that the practice of multiplication before bed as opposed to in the morning will improve the accuracy and speed in the recall of the products. A repeated-measures design will be used with undergraduate students (N=50). Sleep-learning and wake-learning conditions will be counterbalanced and separated by one week. Forty complex multiplications will be presented in each condition. Firstly, participants will practice problems through one untimed trial with immediate feedback. Secondly, participants will complete 3 second timed trials with immediate feedback with the correct answer displayed for 2 seconds on all trials. Incorrect problems will be repeated until 70% criterion is reached. Recall will be tested 10 hours after learning. Approach for statistical analysis: Number of correct responses within 3 seconds (recall minus learning) is the primary outcome. A paired-samples t-test will be used to compare this outcome between conditions.

The effect of targeted memory reactivation on generalisation in language learning.

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Targeted memory reactivation (TMR) during sleep strengthens episodic memory, but its role beyond this is less understood. We tested the impact of TMR on learning and generalisation of artificial orthography. Adults (N=24) learned to read pseudowords containing a novel letter that mapped onto two vowel sounds (e.g., b#v pronounced /bev/, n#d pronounced /nid/). Each word was paired with an image of a familiar object. Half of the trained words were cued during non-REM sleep by playing the spoken form. The cued words were selected such that only one of the two letter-to-vowel mappings was cued (e.g., b#v but not n#d). Tests took place immediately and one week later. We predicted that cueing would benefit episodic memory such that cued words would be recalled more accurately than uncued words, and recognition memory would be better for images paired with cued words. We also predicted that TMR would promote generalisation of letter-to-vowel mappings such that untrained words would be pronounced with the cued vowel (read d#f as /def/ rather than /dif/). However, no cueing benefits were found. We suggest that TMR effects are more limited than previously thought. Cueing one memory element (spoken form) may not cue associated elements (spelling or meaning).

The effect of sleep deprivation before and after encoding on memory: A meta-analysis.



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A substantial number of studies suggest that sleep deprivation, both before and after encoding, has a detrimental effect on memory for newly learned material. However, there is no quantitative analysis of the size of these effects. We conducted two meta-analyses of studies published between 1970 and 2020 that investigated effects of sleep deprivation on memory, one for deprivation occurring before encoding and one for deprivation occurring after encoding. We found 43 effect sizes investigating sleep deprivation before encoding, which showed that sleep deprivation impairs encoding with a medium effect size ( $g = 0.63$ ). However, there was evidence of publication bias, with a trim-and-fill procedure yielding an estimated  $g = 0.45$ . A post-hoc power analysis of each study found a mean power of 58% to detect the meta-analytic effect size. We found 85 studies showing a small effect ( $g = 0.29$ ) of sleep deprivation after encoding impairing memory. No statistically significant evidence of publication bias was found. The mean power to detect the meta-analytic effect was 16%. Our analyses suggest that sleep deprivation impacts memory, but direct replications and better powered conceptual replications are both needed to enhance our ability to estimate the true effect size.

Nasal respiration does not influence declarative memory consolidation during waking rest.



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A recent finding (Arshamian et al., 2018) found that nasal breathing enhanced memory consolidation over a resting period of an hour compared to oral breathing. However, this memory benefit has so far been shown on odour memory in a paradigm manipulating oral and nasal breathing, leaving the possibility that this effect was due to nasal breathing only having an influence on olfactory processing. To establish the generality of the nasal enhancement effect there would need to be evidence that these effect transfers to other kinds of memory systems and stimuli. We conducted a pre-registered conceptual replication extending this finding to the memory of words, using a within-participants design with sessions separated by a week. Following an encoding and a consolidation period, participants who breathed through their noses during wakeful rest showed no significant benefit on memory compared to those who breathed through their mouths. We discuss these findings and the need for further work to establish the generality and reliability of the nasal respiration memory enhancement effect.

Arshamian, A., Iravani, B., Majid, A., & Lundström, J. N. (2018). Respiration modulates olfactory memory consolidation in humans. *Journal of Neuroscience*, 38(48), 10286-10294.

No correspondence between breathing phase and memory encoding or performance in a self-paced memory task.



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There is a growing body of research showing that breathing can influence cognitive processing. In particular, it has been shown that inspiration may be beneficial for some cognitive processing tasks, with participants choosing to initiate cognitive tasks with the onset of inhalation (Perl et al., 2019), and that pictures encoded during inspiration led to improved recognition memory (Zelano et al., 2016). We investigated the idea that inspiration may be an optimal state for encoding new information in a self-paced memory task. Participants were able to self-initiate the presentation of concrete words to be encoded to memory while breathing physiology was recorded. A subsequent recognition memory test found no systematic correspondence with breathing phase and participant presentation decisions. Furthermore, recognition memory analysis found no relationship between memory performance and respiratory phase during encoding. We discuss these findings and plans to extend this paradigm to visual memory of objects.

Perl, O., Ravia, A., Robinson, M., Eisen, A., Soroka, T., Mor, N., Sobel, N. (2019). Human non-olfactory cognition phase-locked with inhalation. *Nature Human Behaviour*, 3(5), 501-512.

Zelano, C., Jiang, H., Zhou, G., Arora, N., Schuele, S., Rosenow, J., & Gottfried, J. A. (2016). Nasal respiration entrains human limbic oscillations and modulates cognitive function. *Journal of Neuroscience*, 36(49), 12448-12467.

Right, but not the left prefrontal cortex is necessary for the suppression of unwanted memories.



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When people are confronted with reminders to an experience they would rather choose to forget, they often try to engage in the process to prevent that unwanted memory from entering into one's awareness. This process is known as retrieval suppression, is known to engage the right prefrontal cortex (PFC) and the hippocampus. However, whether the right PFC is causally necessary for retrieval stopping is a question that is still being explored in research. In this study, we adapted the Think/No-Think task for patients with brain lesions (i.e. patient-friendly- TNT). 50 patients with unilateral frontal lesions (25 left and 25 right-sided lesions) completed the task. All patients engaged in these cognitive tasks and patients with left PFC damage had little effect on suppression induced forgetting, while, damage to the right PFC fully abolished it. These findings support the suppression-induced forgetting requires the right PFC, which may be causally necessary for motivated forgetting.

Patients with left frontal lesions suppressed unwanted memories ( $p < .001$ ) compared to those with right lesions who were not able to suppress ( $p = .408$ ). These results support clinical rehabilitation and will inform strategies to cope with unwanted memories post stroke, especially to networks supporting inhibition.

Moving On or Deciding to Let Go? A pathway exploring the effects of emotional and decisional forgiveness on intentional forgetting.

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We report three empirical studies that represent the first systematic attempt to explore the relationship between emotional and decisional forgiveness, and intentional forgetting. On this basis, we propose a model that provides a credible explanation for the relationship between forgiveness and forgetting. Specifically, we propose that engaging in emotional forgiveness promotes the psychological distancing of an offence - such that victims construe the offence at a higher and more abstract level. This high-level construal, in turn, promotes larger intentional forgetting effects which, in turn, promote increased emotional forgiveness. Our studies found that participants in an emotional forgiveness manipulation reported increased psychological distance and recalled more high-level construals than did participants in either a decisional or no-forgiveness manipulation (Study 1). Using the list-method directed forgetting (LMDF) paradigm, we found that participants in an emotional forgiveness manipulation showed larger forgetting effects for both offence-relevant and -irrelevant information using both hypothetical (Study 2) and real-life (Study 3) moral transgressions, compared to participants in either decisional or no-forgiveness manipulations. The potential implications of these findings for coping with unpleasant episodes in our lives are considered.

Does forgetting in working memory depend on the type of representation?



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A persistent debate concerns whether decay or interference causes forgetting from working memory (WM). Two experiments explored whether forgetting depends on the nature of the representation (Sadeh et al., 2016). Five unrelated word pairs (e.g., lily – coffee, ballot – dress) were followed by retrieval of each pairing, wherein one of the words (e.g., lily) was presented with three options: the correct target (e.g., coffee), a never-presented lure (e.g., rabbit), and a lure from a different pair (e.g., dress). In-between each retrieval attempt, participants responded aloud to 1, 2 or 4 distractors. In Experiment 1, the pairs were presented for either a short or long duration and the distractors at a fixed rate. In Experiment 2, the pairs were presented for 1s and the distractors at either a fast or slow pace. Recollection and familiarity were estimated using hierarchical Bayesian multinomial processing tree modelling. I predicted that presentation rate and pace should exclusively affect

recollection, whereas the number of distractors should exclusively affect familiarity. The results revealed a credible effect of presentation rate on recollection, but no impact of pace or distractors on recollection or familiarity, thus conflicting with the notion that the nature of forgetting depends on the type of representation.

A single, domain-general resource explains temporary storage in working memory.



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Multi-tasking, or performing several mental tasks at once, has long intrigued psychologists, and an ongoing major debate centres around whether mental activities are supported by multiple specialized systems or by a single-purpose system. In particular, psychologists disagree about whether multi-tasking is supported by domain-specific or by domain-general cognitive resources. The predictions of domain-specific and domain-general views are in conflict with one another when it comes to the cognitive cost associated with concurrent verbal and visuo-spatial working memory tasks, but previous tests of these predictions have not led to straightforward conclusions. To make critical progress in this theoretical debate, we used a novel approach combining Bayesian state-trace analysis with an experimental design fully crossing processing and storage tasks which differed only in the domain of the memory items (verbal vs. visuo-spatial). Across two experiments, we show unambiguously that a single, domain-general factor can account for briefly maintaining verbal and visuo-spatial information in a multi-tasking scenario. We conclude that the evident domain-specialization observed in working memory tasks must arise from functions other than short-term storage.

The impact of test format on change detection performance in imagery, VWM and VSTM.



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Visual imagery (VI) and visual memory (VM) have been proposed to be similar. However, recent research indicates they differ in capacity, with visual working memory (VWM) capacity higher than that of visual short-term memory (VSTM), and both higher than imagination (Atkin et al., in preparation). Another way of assessing the commonality of the underlying processes is to examine how the test format influences task performance. In the current study participants completed change detection on a checkerboard grid where the location of the black squares were built-up sequentially in the mind's eye (Imagination), shown sequentially (VWM) or shown simultaneously (VSTM). The task was to judge whether a subsequent test display (with one item location changed) was the same or different from this. At test, either a single item was presented, the whole display was presented with the decision being about a single cued item, or a whole display was presented with the decision

based on this whole array. Performance was better for VWM in the single-cue condition, whereas VSTM performance was better when global information (post-cue and whole display) was presented at test. Imagination performance was similar for all test displays. Our results suggest that VI, VWM and VSTM rely on different underlying processes (e.g. reliance upon independent item representations versus global configurations). These results are discussed alongside theoretical implications about the mechanisms underpinning imagination and VM.

Multidimensional change detection: An initial investigation of resource allocation in visual short-term memory.



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The underlying nature of capacity limitations in visual short-term memory (vSTM) have been extensively debated, with two accounts coming to the fore. One suggests that a limited number of fixed-resolution object representations can be held in vSTM (~4). Another posits that a continuous resource is deployed across all items in a visual scene, with no upper limit to the number of representations that can be held in memory. Rather, the resolution of each representation is a function of the total number of objects in the scene. The present experiment embeds a change detection task within a task switching paradigm and is one in a series of experiments that aim to determine how this memory resource is allocated to relevant visual information. Stimuli consisted of coloured, oriented circular shapes, with participants making change/no change judgements in pure blocks (e.g., all colour trials) and mixed blocks (colour and orientation trials). Results show no switch costs for change detection accuracy, suggesting that switching attention to a new dimension did not impair vSTM in comparison to maintaining attention on a previously attended dimension. Although methodological refinements are called for, this paradigm provides a basis for improving understanding of vSTM resource allocation in multidimensional displays.

Research Plan - Effects of tDCS over DLPFC and PPC on visual working memory.



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Transcranial direct current stimulation (tDCS) has gained growing research interest as a promising intervention tool to enhance visual working memory (VWM) performance. Previous evidence indicates a correlation between VWM performance and neural activities in the dorsolateral prefrontal cortex (DLPFC) and posterior parietal cortex (PPC). Recently, Wang et al. (2019) found that anodal tDCS over PPC, but not over DLPFC, selectively improved VWM capacity but not VWM precision. However, the original study has some potential limitations, such as a small number of participants and trials, and incomplete counterbalancing, which could have led to overestimated effect sizes, unreliable estimation of VWM performance, and “carryover” effects. In the present pre-registered study, we aim to conceptually replicate these findings using a continuous reproduction task and study design that account for these weaknesses identified in Wang et al.’s (2019) study. Normalised

Fcapacity and precision estimates relative to sham will separately be analysed by running omnibus ANOVAs with two within-subjects' factors stimulated region (DLPFC/PPC) and set size (2, 4, 6). If our replication attempt succeeds, it would suggest that PPC-tDCS is an effective paradigm to enhance VWM. Moreover, these findings would provide an insight into the distinct roles of the DLPFC and PPC in WM performance.

Examination of the representation of spatial locations in visuospatial working memory.



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There is considerable debate surrounding the nature of spatial representations within visuospatial working memory (VSWM), with some arguing for slot-based representation and others, such as Schneegans and Bays (2016), arguing for a resource model of VSWM. We aimed to replicate and extend the work of Schneegans and Bays (2016) by testing a larger range of set sizes and controlling for any eye movements that were made during encoding and rehearsal, as activation of the eye movement system may play an important role in spatial working memory (Ball et al., 2013; Pearson et al., 2014). We used a continuous response task, where participants were required to localise a probe stimulus from an initially presented array. Consistent with Schneegans and Bays (2016), we found a decrease in precision, and a corresponding increase in swap errors, with increasing set sizes. However, we also found an exponential increase in localisation error as set size increased from one to eight items. We speculate that the increases in localisation error and swap errors may be best accounted for by an oculomotor rehearsal system, which gets overloaded at larger set sizes. That is, the ability to plan and execute saccades during encoding and rehearsal improves the representation of spatial locations in VSWM.

How holding an item in visual working memory affects pre-saccadic shift of attention.



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The maintenance of an object in visual working memory (VWM) automatically biases spatial attention toward the location of an object with matching features. This has been accounted for by a competition between the motor plan for the eye-movement endpoint and the location of the object in VWM. Here, we investigated the interaction between VWM and motor control by measuring attention when the goal of an eye-movement is congruent or incongruent with the location of an object matching the VWM content. Participants had to retain a colour in VWM (Memory Target; MT), performed a saccadic eye-movement towards a specified location (Saccade Target, ST) and made a discrimination decision (Discrimination Target, DT). Different conditions were used so that the different locations of ST, DT and MT can be congruent or incongruent. Results showed that

pre-saccadic attentional facilitation was greater when MT, ST and DT were all congruent, and abolished when they were incongruent. Critically, when the ST and DT were in the same location but not the MT pre-saccadic attentional facilitation was reduced, suggesting competition between the eye-movement goal and the MT. This suggests that automatic guidance of attention by the content of VWM can be operationalized as a competition between different saccade goals in the oculomotor system.

Hebbian learning of language structure in adults: Evidence from a speech production task.



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Growing evidence suggests a Hebb-style learning mechanism (Hebb, 1961) may contribute to vocabulary learning. Yet, while Hebb repetition effects are well documented for serially-ordered syllable sequences, relatively little is known about humans' capacity for Hebb-style learning of sequences containing structure. We test this here using sequences containing non-adjacent dependencies. Forty-eight Native Dutch-speaking adults completed a speech repetition task modelled on studies of Hebbian Learning (e.g., Szmalec, Page, & Duyck, 2012). Participants heard 9-syllable sequences which they repeated aloud. Sequences were either targets, comprising three tri-syllable chunks, with each chunk containing a distinct nonadjacent dependency (e.g., belapogimitudiwuko), or scrambled foils (e.g., bekotupolagidiwumi). These were interleaved, with a target sequence occurring on every third trial. Participants then received generalization sequences, containing trained dependencies with new medial syllables. Repetition accuracy of targets and foils was compared using LME analysis. Repetition accuracy improved over the task, and was higher for targets than foils. Recall for pairs of syllables in rule-carrying positions (i.e., syllables 1&3, 4&6, 7&9) was greater for target sequences than foils, and this was replicated for the generalization sequences. The data provide further evidence that adults can acquire phonological word forms through Hebbian learning, and extend this to learning of within-word structure.

Every letter counts in the new interpretative spelling test.



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Spelling is an essential foundation for reading and writing. Children typically use two different processes, a phonological and a lexical-semantic one when they spell (Martin and Barry 2012). Therefore, it is important to know the processes they use when they spell different types of words (regular, irregular and pseudowords) as in that way we can intervene and help those children who struggle. The aim of the study was to identify key processes children use when they spell different types of words using a spelling test that distinguishes among different word types (regular, irregular and pseudowords) and to explore the psycholinguistic characteristics of the misspellings.

Misspellings from 369 pupils from Reception Year to Year 3 were scored using sensitive scoring systems tapping phonological and lexical-semantic knowledge in a cross-sectional correlational design. In line with past research, these measures were able to capture increase in linguistic knowledge in all types of words in young children. Findings suggested that children in primary school rely on both orthographic and phonological processes to spell all types of words (regular, irregular and pseudowords).

Does orthographic processing emerge rapidly after learning a new script?



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Letters are unique objects. How we process these objects in a string differs qualitatively from how we process symbols in terms of location-invariant processing (Grainger, 2018): strings of letters are more vulnerable to transposition effects than the strings of symbols in same-different tasks. This dissociation is posited to occur because of the developing of letter-specialized processing—orthographic processing—when learning to read. To examine the emergence of this marker of orthographic processing, we conducted a same-different task with two unfamiliar scripts (pre-training experiment). Across six training sessions, participants learned to fluently read and write one of these scripts. The post-training experiment was parallel to the pre-training experiment. Results showed a training benefit in the trained script for “same” responses, thus suggesting the emergence of an early visual specialization for letter strings in the trained script. However, the magnitude of the transposed-letter effect was very similar in the trained and untrained scripts, as confirmed by Bayesian analyses. Thus, location-invariant processing does not emerge rapidly after learning a new script; instead, it may require thorough experience with specific orthographic structures.

Learning words with unfamiliar orthography: the role of cognitive abilities.



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This study investigated the mechanisms supporting the learning of foreign language (FL) words with both familiar and unfamiliar orthographies. Participants (N=132) with no prior knowledge of the FL, took part in a series of incidental and explicit learning tasks where FL words were presented orally and in writing along with a picture depicting the meaning of the words. Word learning was measured the next day through meaning recall. Participants also completed a series of memory tasks (short-term and working memory), tasks assessing their phonological and acoustic perceptual abilities, as well as a native language vocabulary test. Orthographic familiarity ratings of the FL words were collected using another sample of participants. Using a mixed-effect model, we found that orthographic familiarity interacted with both perceptual and memory abilities. Participants with better perceptual/memory abilities performed better on words with unfamiliar orthographies. In

participants with weaker working memory there was an interaction between orthographic familiarity and native language knowledge, suggesting that the learning of words with familiar orthographies is supported by long-term language knowledge. We conclude that mechanisms supporting learning are recruited differently depending on the (un)familiarity of the items; this must be accounted for in a FL word learning model.

Seeing iconic gestures with unlabelled action exemplars facilitates children's verb learning.



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This study investigated what type of prior experience with unlabelled actions facilitates subsequent verb learning in 3-year-old children. We provide the first empirical evidence for an important novel step in the verb learning process: prior experience with actions. Experiment 1 showed that 3-year-old children (N = 96, Mean age: 41.14, SD = 3.71) learned novel verbs better when pre-exposed to unlabelled exemplars of the referent actions (“relevant exemplars”), but only if the referent actions were highlighted with iconic gestures during the pre-exposure phase. Experiment 2 showed that 3-year-old children (N = 48, Mean age = 39.85, SD = 3.33) learned novel verbs better when pre-exposed to relevant exemplars with iconic gestures than when pre-exposed to two relevant exemplars (i.e., the same referent action performed by different actors) presented simultaneously side-by-side and without gesture. Taken together, these results suggest that iconic gestures do not merely serve as extra exemplars but help children to extract information from multiple exemplars which they can use for subsequent verb learning. To conclude, prior experience with unlabelled actions is an important first step of the verb learning process and the top-down guidance that adults provide by producing iconic gestures plays a crucial role in this.

How word recognition abilities develop across our life span: Insights from a crowdsourcing megastudy.



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Research looking at age effects on word recognition has typically used small-scale studies focused on comparisons of the mean performance of different age-groups, treating age as a categorical variable (e.g., college-aged vs. older individuals). This makes it difficult the generalization of results. Here we used a large database obtained through a crowdsourced lexical decision megastudy in Spanish (SPALEX, Aguavivas et al., 2018) to examine how our ability to recognize words changes

from childhood (the moment we become independent readers) to the elderly years. Results showed shorter word identification times from the early 10s to the 30s, reaching stability until the 60s, when they start to increase. Importantly, accuracy shows a positive monotonic trend across age. To better capture and explain the way reading evolves over time, we fitted the ex-Gaussian distribution to the observed identification times. Thus, the current study offers a “big picture” of the progression of our reading abilities, tackling at the specific aspects of reading that change at different age periods. These findings will help achieve a general theory of how reading abilities change over time.

Further support for enhanced lexical competition in the left hemisphere: Evidence from an online visual-half field technique.

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There are hemispheric asymmetries in the representation and processing of phonological, orthographic, and semantic features. With regards to the processing of orthography, evidence suggests that orthographic neighbourhood size (N) has a facilitatory effect in the right hemisphere. The role of N in the left hemisphere remains somewhat controversial: it may have a weaker facilitative role than in the right hemisphere, or it may even be inhibitory. The current pre-registered online experiment aimed to replicate the finding of Perea, Acha, and Fraga (2008), who found a facilitative effect of N in the left visual field (i.e., right hemisphere) and an inhibitory effect of N in the right visual field (left hemisphere). Thirty participants were tested and the results indeed revealed a facilitative effect of N in the right hemisphere and an inhibitory effect in the left hemisphere, adding further support for the claim that lexical competition is enhanced in the left hemisphere. Additional exploratory divergence point analysis indicated that effects of N emerged later in the right hemisphere. Together, these results confirm hemispheric differences for the processing of orthography and have important implications for models of visual word recognition.

Perea, M., Acha, J., & Fraga, I. (2008). Lexical competition is enhanced in the left hemisphere: Evidence from different types of orthographic neighbours. *Brain and Language*, 105(3), 199-210.

What is semantic diversity and why does it facilitate visual word recognition?



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Previous research has speculated that semantic diversity and lexical ambiguity may be closely related constructs. Our research sought to test this claim in respect of the semantic diversity measure proposed by Hoffman et al. (2013). To this aim, we replicated the procedure described by Hoffman et al. (2013) for computing multidimensional representations of contextual information using Latent Semantic Analysis, and from these we derived semantic diversity values for 28,555 words. We then

replicated the facilitatory effect of semantic diversity on word recognition using existing data resources and observed this effect to be greater for low frequency words. Yet, we found no relationship between this measure and lexical ambiguity effects in word recognition. Further analysis of the LSA-based contextual representations used to compute Hoffman et al.'s (2013) measure of semantic diversity revealed that they do not capture the distinct meanings of ambiguous words. Instead, these contextual representations appear to capture general information about the topics and types of written material in which words occur. These analyses suggest that the semantic diversity metric previously proposed by Hoffman et al. (2013) facilitates word recognition because high diversity words are likely to have been encountered no matter what one has read, whereas many participants may not have encountered lower diversity words simply because the topics and types of written material in which they occur are more restricted.

Distinct components of Stroop interference in Chinese.

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Stroop interference refers to the finding that responding to the ink colour of a colour word written in a different colour is slower than responding to a neutral word written in the same ink colour (e.g., BLUE vs. XXXX written with green ink). Augustinova et al. (2018; 2019) focused on different underlying components of Stroop interference in French (e.g., task, semantic, and response conflicts). Because it is hard to find colour word homophones in alphabetic languages, these studies did not investigate phonological conflicts. In Chinese, however, it is easy to find homophones of colour words to investigate phonological conflicts. Thus, the present study added homophone conditions to a design similar to Augustinova et al.'s (2019) in both vocal and manual Stroop tasks. The results revealed that phonological conflicts were present in both vocal and manual Stroop tasks. Furthermore, phonological and response conflicts were stronger in the vocal than in the manual Stroop task. Interestingly, no task conflicts were observed in the current study, whereas Augustinova et al. (2019) found task conflicts in the vocal Stroop task. Possible explanations of the differences between the current findings and those reported by Augustinova et al. (2019) will be discussed.

Augustinova, M., Parris, B. A., & Ferrand, L. (2019). The Loci of Stroop Interference and Facilitation Effects with Manual and Vocal Responses. *Frontiers in Psychology*, 10(1786).

Augustinova, M., Silvert, L., Spatola, N., & Ferrand, L. (2018). Further investigation of distinct components of Stroop interference and of their reduction by short response-stimulus intervals. *Acta Psychologica*, 189, 54-62.

Effects of bilingualism and lifestyle choices on the neural indices of cognitive control in older adults.



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Older adult bilinguals often outperform monolinguals on non-verbal tasks of executive function. It is argued that the use of domain-general executive functions to manage two languages is the source of this advantage. However, a bilingual advantage is not consistently observed and the factors associated with its presence or absence are not well understood. The present study employed a visual Go/NoGo paradigm whilst collecting EEG from monolingual and Welsh-English bilingual adults, aged 61-87 years. Monolinguals and bilinguals achieved comparable behavioural performance. However, for bilinguals, NoGo trials were associated with significantly larger mean amplitudes for the N2 relative to Go trials. Monolinguals older adults did not show larger N2 amplitudes to the NoGo than Go trials. The size of the N2 amplitude effect was correlated with exposure and use of two languages. Analysis of questionnaire responses revealed an association between Go-N2 peak latencies with increasing age and poorer lifestyle. These findings suggest that bilinguals show patterns of brain activity associated with conflict resolution similar to younger adults. However, lifestyle factors may interact with the amelioration of age-related cognitive decline provided by bilingualism. The results have implications for targeted interventions to stimulate second language use in older adults.

Interhemispheric transfer times in bilinguals and monolinguals.



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The corpus callosum (CC) is the largest white matter structure in the human brain, representing the major commissure linking both cerebral hemispheres. Bilingual experience is associated with a relatively larger midbody of the CC and a larger CC in general, suggesting that interhemispheric communication may be faster in bilinguals. Using the Poffenberger paradigm, the current study compared interhemispheric transfer times (IHTT) of bilinguals and monolinguals in an auditory and visual version. IHTT was measured by comparing reaction times for crossed conditions (stimulus presentation and contralateral hand response) and uncrossed (stimulus presentation and ipsilateral hand response) conditions. We expected to see smaller IHTT for bilingual participants, especially in the auditory task, due to higher auditory processing abilities through extensive language learning. No differences between bilinguals' and monolinguals' IHTT in the visual and auditory experiment were found, but the latter showed a significant crossed-uncrossed difference in monolinguals and not in bilinguals. Therefore, bilinguals seem to experience relatively faster interhemispheric communication in the auditory condition, potentially because of enhanced interhemispheric transfer through a larger corpus callosum.

Foveal and Parafoveal Processing of Letter Information in Arabic Reading.



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Research with scripts like English read from left-to-right shows that readers acquire parafoveal orthographic information that can facilitate the pre-processing of the next word in a sentence. However, the extent to which parafoveal orthographic information is used when reading right-to-left scripts like Arabic is unclear, as the majority of Arabic letters are discriminable based only on small features (i.e., dots) and this information projects initially to the right cerebral hemisphere which for most readers, has poorer orthographic processing capabilities. Accordingly, we conducted two eye movement experiments to investigate foveal and parafoveal processing of letter information in Arabic reading. In both, participants read sentences containing words spelled correctly (e.g., حفظ) or misspelled by replacing one letter with a visually-similar (e.g., حَقَط) or visually-dissimilar (e.g., حَكَط) letter. In Experiment 1, these were encountered normally during reading; in Experiment 2, they were presented as parafoveal previews using the boundary paradigm. Words spelled correctly yielded shorter fixations than misspelled words in both experiments. However, while fixation times were shorter for visually-similar than visually-dissimilar misspelled words read normally, no such difference was observed when these were presented as parafoveal previews. We take this to show insensitivity to letter-shape information during parafoveal processing of Arabic words.

Predicting the unpredicted: No relationship between "the"-skipping and response inhibition.



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Skilled readers are likely to skip short, high-frequency words such as “the” in English. When deciding to skip such words, readers fail to take into account the preceding sentence context and will frequently skip an upcoming word that looks like “the” even if it is incompatible with the context, i.e. infelicitous (Angele & Rayner, 2013). It is not clear if (1) this failure to identify a potential problem with a sentence stems from an inability to access the information about the sentence context at the point of making the skipping decision or (2) a problem in selecting the appropriate information in order to make the decision. The latter case resembles response inhibition tests where participants need to make a decision in the presence of incongruent stimuli. If skipping and response inhibition depend on the same cognitive processes, we should find a relationship between a participant’s performance on response inhibition tests and the rate at which they skip words with an infelicitous gaze-contingent preview. We report an experiment testing this hypothesis in which there was no evidence for a relationship between the congruency effect in response inhibition tests and the rate of skipping infelicitous previews in a sentence reading task.

Is this a ‘hit’? How the lay person codes subjective mobile eye-tracking data.



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Mobile eye-tracking (MET) can provide us with extensive and rich data from a natural setting, something which is invaluable in social attention research. However, analysing the data often requires extensive manual coding which can be subjective. This study was designed to establish which aspects of an image affect how a novice person codes a ‘hit’ (on target) in eye-tracking data. By showing (N=426) lay participants static images of MET data, we asked ‘is this a hit’? The study explored the fixation distance away from the target in question, the target type (whether the ‘hit’ is on a person or object) and cursor size and shape. As expected, as distance away from the target increased, the frequency in which participants coded the fixation as a ‘hit’ decreased. Interestingly, participants coded fixations to faces as ‘hit’s significantly more than objects at all distances, consistent with the idea of special processing of faces. Cursor size and shape did not affect the ‘hit’ rate. The results indicate which aspects of a MET image need to be considered when training a researcher in coding MET data. Overall this research should provide awareness and inform considerations for future MET studies which involve subjective manual coding.

Eye movements during unequal attention splitting in a multiple object tracking task.



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Multiple Object Tracking (MOT) tasks are used to investigate the process of attention allocation. Typically, participants in these tasks must pay equal attention (e.g. track 4/8 objects) to each object. Recently evidence for unequal attention allocation has been shown in a task in which participants are told the probability of each object being probed (Crowe, Howard, Attwood, & Kent, 2019). However, it could be the case that these findings were the result of identity-location bindings (participant needed to maintain the probability associated with each object during the task) creating additional attentional demands for objects in the unequal attention conditions rather than of unequal attention allocation per se (participant might, for example, only track one of the objects on a subset of trials). In order to control for this possibility, the present experiment used two distinct tracking areas associated with different probabilities of being probed, thus negating the need to maintain probability-identity bindings. Eye-movements of participants were also recorded, to more directly measure attention allocation. As predicted, participants’ tracking performance was better (i.e. lower average error) in high- versus low-probability areas, although the ability to which participants can do this in a more fine grained way is still unclear.

Crowe, E. M., Howard, C. J., Attwood, A. S., & Kent, C. (2019). Goal-directed unequal attention allocation during multiple object tracking. *Attention, Perception, & Psychophysics*, 81(5), 1312-1326.

The temporal profile of covert, exogenous attention.



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Exogenous orienting of attention refers to rapid, involuntary shifts of attention that occur in response to salient events such as peripheral cues. Seminal work by Cheal and Lyon (1991) indicated that exogenous attention gradually accumulated at a cued location, peaked around 120ms after cue onset. Although widely cited, this temporal profile for exogenous attention is problematic because Cheal and Lyon used only Valid trials (i.e the target always appeared at the cued location), leaving open two alternative possibilities: (a) the effects were due to the gradual engagement of endogenous attention or (b) the effects were due to alerting. The current study addressed these issues by examining the profile of exogenous attention using nonpredictive cues, which do not engage endogenous attention and permit the comparison of performance at attended and unattended locations. As with Cheal and Lyon, we saw a gradual improvement in performance which peaked ~120ms after cue onset. However, this pattern manifested at attended and unattended locations, which is consistent with an arousal effect. Furthermore, a significant spatial cueing effect emerged at 30ms and was stable in magnitude up to ~150ms. Contrary to Cheal and Lyon, we conclude that the effects of exogenous, attention do not accumulate over time.

Quantifying the functional significance of reduced eyesight.



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Visual impairment can reduce an individual's ability to complete activities of daily living. However, the relationship between measured visual status and task performance remains unclear and poorly quantified. We, therefore, measured the relationship between degraded vision and functional sensorimotor performance. Experiment 1 explored whether monocular viewing (vs binocular) resulted in impaired sensorimotor interactions with planar targets. Notably, we were able to quantify decrements in performance despite the task having no stereoacuity requirements. Experiment 2 used Bangerter foils to mimic the type of visual deficit typically associated with cataracts. Functional task performance (peg placing and water pouring) was reduced and, in general, the effect was greater when vision was degraded in both eyes. While some adaptation to vision loss may occur over time, these results suggest that binocular vision may confer major quality of life benefits; even where eyesight is well preserved in one eye. These functional benefits are likely to be particularly important

for groups at risk when performing manual tasks (e.g. cooking), such as older adults, where the ability to complete such tasks may be the difference between independent or assisted living.

Illusion of visual stability through active perceptual serial dependence.

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Perception can be strongly biased toward previously seen stimuli. Such serial dependencies may enhance the apparent stability of objects by smoothing visual representations over time. Here, we introduce a new visual illusion, which shows direct evidence of how serial dependence promotes the stable appearance of ever-changing objects. In a single-trial, single-shot experiment, 300 observers attended to a 30 second video with a face ageing from young to old (or vice versa). At the end of the video, after a gap, observers reported the age of a visible test face that was identical to the last face in the video. The rated age of the test face was strongly biased towards the earlier faces seen in the video. Because of serial dependence, the identity of the face is continuously merged over time and, as a result, observers perceive a slower age change. Our illusion provides the first direct demonstration of the causal link between serial dependence and perceptual stability.

Top-down expectations facilitate rapid scene processing: a behavioural and ERP study.



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We can rapidly process a scene's meaning, leading many to suggest a primacy of bottom-up information. However, while scene research often relies on showing a succession of unrelated target images, our everyday experience is of a predictably unfolding world. Thus, we investigated whether top-down information – in the form of observers' expectations – facilitates 'gist' processing. If so, predictable scenes should be categorised more readily. Participants (N=129) were provided with five sequential leading images, organised to represent a progression through an environment. A final target scene was then presented, either congruent or incongruent with the journey, requiring a 6AFC response. Additionally, to delineate the influence of predictions on scene processing over time, we manipulated the presentation duration of target scenes (35-250ms). As hypothesised, congruent trials exhibited significantly higher performance, especially at shorter durations. We next investigated the neural signature of expectations on scene processing using ERP (N=26). Significant differences were found in the scene-selective ERP marker related to integrating visual properties (P2 component), and in components related to contextual regularities including semantic and syntactic meaning (N400 and P600, respectively). Our results strongly suggest that, in real-world situations, top-down predictions of an upcoming scene influence even the earliest stages of its processing.

Cognitive determinants of individual differences in spatial navigation.



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There is great variability in spatial navigational abilities across the general population, and impairments can adversely affect quality of life. Previous research has sought to identify the cognitive underpinnings of variance, implicating factors that include spatial working memory and mental imagery manipulation. Assays of concomitant navigational difference have, however, tended to be relatively limited. Here, we present findings from a large-scale project that seeks to examine differences across a wide range of behaviours in typical adults. Participants completed a comprehensive battery of measures that included real-world navigation (e.g. route learning, computing shortcuts), laboratory tasks (e.g. place learning, path integration), and standardised cognitive assessments (e.g. attention to detail, executive function). Analyses revealed several links between navigational behaviours and cognitive performance. In the real world, route learning from a map was associated with working memory, whilst combining two learned routes was related to mental rotation ability. In the laboratory, allocentric place learning shared variance with spatial working memory, path integration, and spatial anxiety. Future testing will further enable us to characterise navigational impairment with inclusion of neuropsychological data from people with hydrocephalus, a common neurological condition associated with everyday wayfinding difficulty.

Probability cueing in large scale immersive virtual environments.



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Efficient search and foraging behaviour is informed by environmental cues, including the probabilistic distribution of targets in space. Sensitivity to spatial statistics is commonly examined using 2D visual search tasks, displayed on a desktop monitor. This is, however, unlike real-world search, which unfolds in 3D space and requires full physical exploration. Extant research conducted in large-scale environments presents a more equivocal account of the conditions under which probabilistic cueing can be observed, and this may be due to environmental differences. The present study replicates two experiments conducted by Smith et al. (2010), using immersive virtual reality to fully control available cues. Participants physically inspected an array of columns in search of a hidden target, whose location was probabilistically defined so that it appeared in one side of the array on 80% of trials. In Experiment 1, participants learned this statistical contingency, and searched efficiently. In Experiment 2, allocentric spatial cueing was investigated by manipulating participants starting position across trials. Under these conditions, participants did not search efficiently, although evidence suggests differential search strategies across participants. These findings provide insight

into the underpinnings of probabilistic cueing in 3D space, and further demonstrate the utility of immersive VR as an experimental tool.

Research Plan - Time distortion, flow, and problem video-game play.



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Gaming to escape is a leading risk factor in the development of problem video-game play. During game play, 'escape players' experience deeper and more profound flow; an enjoyable state of absorption and effortless concentration. A key component of flow is the distortion of time perception; however, this is predominately probed via self-report questions rather than by arguably more objective duration estimates. In addition, if players are repeatedly asked how long it has been since the start of the game play session, they may use the previous questions and answers as anchors for their duration estimates. This study will be the first to apply 'post-event timing' to the game play paradigm. Participants will play a quest in the role-playing video game Skyrim and following three selected events, be asked to estimate how much time has passed since the given event, in addition to reporting their experiences of flow. We hypothesise that there will be a positive relationship between the experience of flow and the degree of time distortion, and we will be constructing a multi-level model to nest events within participants. We also hypothesise that escape players will have significantly higher time distortion than non-escape players, analysed with a similar approach.

The influence of martial arts experience on task switching.



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Martial arts can be considered both a sport and a therapy, combining physical exercise with intense periods of concentration (similar to meditation). Previous research suggests that both exercise and meditation can lead to improvements in executive functions (i.e., cognitive flexibility) in adult participants. Results from our lab have previously suggested that martial artists show improvements in the alerting attentional network - a measure of vigilance. The current research aims to investigate the impact of martial arts training on a task-switching protocol to measure both vigilance and cognitive flexibility in typical adults. Here we recruited adult martial artists with at least two years of experience, and control participants with no experience. Participants had to respond to either the shape or the colour of a figure in pure and mixed blocks to provide measures of mixing costs (sustained vigilance) and switching costs (cognitive flexibility). Results demonstrated martial artists did not differ from controls in the pure block, but displayed improved performance in the mixed block, revealing improvement in mixing costs (vigilance). These benefits in vigilance mirror those previously found in attentional tasks, providing convergent evidence on the impact of martial arts training on vigilance.

Action slips in a procedural task: The effect of interruption complexity and modality.

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Interruptions to even simple procedural tasks can have serious consequences; such as lapses in security. We explored the role played by interruptions in a computer-based procedural task with a view to understanding how the modality (visual or auditory) and the complexity of the interrupting task determined the speed of focal task resumption and errors. The focal task required participants to undertake a series of operations in response to multi-attribute stimuli in accordance with the acronym UNRAVEL (Altmann, Trafton, & Hambrick, 2014). Interruptions required participants to enter a code whose transcription required one of three levels of complexity (Low: transcribe letters as presented; Moderate: enter code letters two places forward in the alphabet; Difficult: enter letters two places backwards in the alphabet). Sequence errors were more likely in the focal task when interrupted and particularly so when interruption occurred in the visual modality. Increasing complexity of the interruption increased the resumption time of the focal task. Sequence errors were fewest on uninterrupted trials that comprised a separate block rather than those interspersed with interruptions, suggesting that the effects of interruption may persist beyond initial resumption. Results are discussed in terms of the activation-based Memory for Goals model (Altmann & Trafton, 2002).

Threshold versus accumulator frameworks of steering action initiation.



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Vehicle control requires complex sensorimotor actions. To safely keep in lane, drivers must monitor error development and initiate steering corrections that are appropriately timed. However, the perceptual mechanism determining how a driver processes visual information and initiates a correction is currently unclear. The literature on perceptual-motor action suggests two potential alternative mechanisms: (i) perceptual evidence (error) satisficing fixed constant thresholds (Threshold), or (ii) the integration of perceptual evidence over time (Accumulator). Using computer generated virtual environments, a steering correction task was designed to distinguish between these mechanisms. Drivers steered towards an intermittently appearing 'road-line' across brief, randomised trials. During each trial, the driver's starting position was manipulated and the road-line was offset relative to the driver's trajectory, generating errors that required correction. Threshold and Accumulator accounts predict different steering response patterns for these conditions: a Threshold account predicts a fixed absolute error response across conditions regardless of the rate of error development, whereas an Accumulator account predicts drivers respond to larger absolute errors when error signal develops at a faster rate. Results suggest that steering corrections are in line with

an Accumulator account, thus we propose that steering models should integrate perceptual error over time to capture human perceptual performance.

Does device matter? Impacts of food-specific inhibition training on food choice, liking and approach bias when delivered by smartphone or computer.



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Food-specific inhibition training (FSIT) requires users to inhibit responses to energy-dense (ED) food stimuli within a reaction time game. FSIT reduces choice and liking of ED foods. Research with the public shows larger effects when FSIT is delivered by computer versus smartphone. This pre-registered study is the first to compare computer-FSIT versus smartphone-FSIT in a controlled setting. Three-hundred-and-thirty-one adults were randomised to computer-FSIT, smartphone-FSIT or non-food control training (computer-delivered). In session 1, participants completed baseline measures of impulsive food choice, food approach bias (approach/avoid implicit association test), and food liking ratings, before completing eight minutes of FSIT/control training. In session 2, participants repeated the same training task, followed by the same measures of food choice, approach bias and liking. We hypothesised that FSIT groups would show healthier food choices, lower ED food liking, and reduced ED food approach bias at post-training compared to control. We expected no statistically significant differences between the two FSIT groups. Post-exclusions, data for 259 participants was analysed. Contrary to predictions, there was no evidence of significant group differences on any of the outcome measures. Baseline measures suggest participants already showed high approach to healthy foods, which may explain these null results.

Too old for the job? Isolated choice effect and its implications for age diversity hiring for organisations.



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Many organisations aim to increase diversity and inclusiveness, yet, older age can have a significant, negative impact on hiring outcomes. Previous research by Chang, Kirgios, Rai, and Milkman (2020) shows that people make more gender diverse hiring decisions when selecting for multiple roles simultaneously, rather than in isolation. We extend this finding of an isolated choice effect to older

worker selection in a pre-registered, conceptual replication of Chang et al. (2020). Participants in an isolated choice condition ( $n = 406$ ) were assigned one of four job roles and asked to make a hypothetical hiring choice from three candidates with relevant experience, two younger (age 21-32) and one older (age 61-67). Participants in a set choice condition ( $n = 96$ ) were presented candidates for the same four roles simultaneously. Consistent with the isolated choice effect, we found that participants in the set choice condition selected significantly older candidates than those in the isolated choice condition ( $\chi^2(1) = 4.58, p = .032$ ). To better understand reasons for this effect, we will conduct follow-up studies examining differences between isolated, sequential and set decisions, and test the effect in different hiring scenarios.

Chang, E. H., Kirgios, E. L., Rai, A., & Milkman, K. L. (in press). The Isolated Choice Effect and Its Implications for Gender Diversity in Organizations. *Management Science*.

Promoting self-disclosure with non-conscious priming: Does it and is it?



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Implicit cognitions are those thoughts and beliefs in our mental lives that pass automatically, without effort, and characteristically without conscious awareness. To give explanation for these cognitions, popular psychological theory questions how well we can know ourselves and the many influences on our behaviour by postulating separate cognitive systems, one conscious and the other non-conscious. This experiment replicated and further explored the recent finding, useful for therapeutic settings, that verbal repetition priming promotes self-disclosure outside of awareness. The claim that individuals enhanced self-disclosure took place outside of awareness was questioned on its post-experimental questionnaire basis. Using an analytic approach to the assessment and validation of contents in awareness, a sample of 112 volunteers (ages 18 to 34 years) participated in a sentence scramble game in which priming words were among the targets, either toward self-disclosure, toward non-disclosure, or neutral (no prime). All participants then briefly responded to self-report items and provided two self-descriptive essays as dependent measures. The experimental effect was replicated and extended by showing primed inhibition; however, contrary to the non-conscious claim, the analysis of self-disclosure awareness confirmed that participants were well-aware of the priming and this awareness significantly predicted the strength of their individual priming effect.

**APPLYING TO JOIN THE  
EXPERIMENTAL PSYCHOLOGY SOCIETY**

To apply for membership to the Experimental Psychology Society please go to the EPS website:  
<https://eps.ac.uk/applying-for-membership/> and fill in the form, ensuring all boxes are completed (Entries should be made in clear black type) before signing and returning to the EPS Administrator:  
[expsychsoc@kent.ac.uk](mailto:expsychsoc@kent.ac.uk) or sending to:

Sam Hurn  
EPS Administrator  
School of Psychology  
Keynes College  
University of Kent  
Canterbury  
CT2 7NP

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; 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 1<sup>st</sup> September 2020 or 1<sup>st</sup> March 2021.

See Criteria and Procedures on following page.

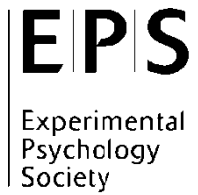
## **CRITERIA AND PROCEDURES TO JOIN**

Soon after the closing date of 1<sup>st</sup> September or 1<sup>st</sup> March, 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 at their Autumn meeting after the September deadline, or at their July meeting after the March deadline. 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 at least two independent accounts of their work in reputable, peer-reviewed psychological journals
- c) personally delivered an oral paper to the Society at one of the three EPS meetings held each year (due to the exceptional circumstances surrounding the Covid-19 pandemic, a poster presentation at EPS Online is sufficient to satisfy this criteria.)

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 eligible applicants will be put to the July Business Meeting, following the March deadline, and the Annual General Meeting in January, following the September deadline, for approval.



**Next Meeting: University College London. 6-8 January 2021**

This meeting will include the 49th Bartlett Lecture by Chris Frith (with an accompanying symposium organised by Steve Fleming), the 19th Mid-Career Prize Lecture by Michael Anderson (with an accompanying symposium organised by Pierre Gagnepain) and the 9th EPS Frith Prize Lecture by Emma James.

Local organiser: Jo Taylor

The submission portals will open at 10am on Monday 7<sup>th</sup> September 2020.

