

**EPS**

Experimental  
Psychology  
Society

**LONDON  
MEETING**

**5-6 JANUARY 2009**

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A scientific meeting will be held at the Department of Psychology, University College London on 5/6 January, 2009. The local organiser is Shelley Channon.

### **Thirty- seventh Bartlett Lecture**

Monday 5 January 6.00pm

Collaboration and communication in children and chimpanzees

Professor Michael Tomasello (Department of Developmental and Comparative Psychology, Max Planck Institute for Evolutionary Anthropology)

### **Symposium - to accompany the Bartlett Lecture**

Monday 5 January 1.30pm – 5pm

Cooperation and communication in young children

Organiser: Professor Gergely Csibra

### **Symposium**

Tuesday 6 January 1.30pm – 5.30pm

Deafness, cognition and language

Organiser: Dr Chloe Marshall

### **Poster Session and Drinks Reception**

The main poster session will be held in conjunction with the drinks reception on Monday evening at 7pm in Room 305 (Third Floor Seminar Room) and Room 308 (Third Floor Common Room). First authors of posters should be at their posters from 7.00-8.15pm. In addition, posters 1-14 will be displayed throughout Monday in Room 305 whilst posters 15-29 will be displayed throughout Tuesday in Room 305. Authors of posters 1-14 may put up posters from 9am on Monday in Room 305 and should ensure that their posters are displayed by 11am; these posters should be removed at the end of the poster session at 8.15pm on Monday. Authors of posters 15-29 may put up posters from 5pm in room 308. These posters should then be moved into Room 305 at the end of the poster session at 8.15pm on Monday and can be removed after tea at 3.30 on Tuesday. Posters should be maximum size A0 portrait.

### **Oral Presentations**

Oral sessions will be held in the Ground Floor and Lower Ground Floor Lecture Theatres of the Psychology Department (26 Bedford Way, WC1). Both theatres have data projectors available for PowerPoint presentations. Presenters may provide their own laptops and connector leads, or bring USB keys for the on-site computers which run Office XP under Windows NT/2000. Any queries about facilities in the theatres should be sent to the local organiser, Shelley Channon (s.channon@ucl.ac.uk).

Coffee will be served in Room 308 (Third Floor Common Room)

The conference dinner will be at 8.30pm at Pescatori, 57 Charlotte Street, London. W1T 4PD – (020-7580 3289). A booking form is enclosed.

## START OF PARALLEL SESSIONS

Session A**Ground Floor Lecture Theatre**

- 9.30            **Marco Tamburelli\*, Gary Jones, Sarah E. Watson\*** (Nottingham Trent University)  
Modelling phonological acquisition: Towards an explanation of children's error performance in nonword repetition tasks.
- 10.00           **Alexis Hervais-Adelman\*, Ingrid Johnsrude\*, Robert Carlyon and Matt Davis** (University of Cambridge, Queen's University Canada, MRC Cognition and Brain Sciences Unit)  
Effortful comprehension of noise vocoded speech recruits a fronto-temporal network.
- 10.30           **Katrin Schulze\*, Faraneh Vargha-Khadem, Mortimer Mishkin\*** (University College London, National Institute of Mental Health)  
Long term memory for sounds in humans: The influence of speech and language.
- 11.00           COFFEE
- 11.30           **Ryan Scott\* and Zoltan Dienes** (University of Sussex)  
No role for perceptual fluency in the implicit learning of artificial grammars.
- 12.00           **Mark Hurlstone\*, Graham Hitch, and Alan Baddeley** (University of York)  
How is the serial order of a visuo-spatial sequence coded? Insights from transposition latencies.
- 12.30–1.30    LUNCH

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START OF PARALLEL SESSIONS

*Session B*

**Lower Ground Floor Lecture Theatre**

- 9.30            **Roberto Caldara\***, **Sebastien Millet\*** and **Xinyue Zhou\*** (University of Glasgow, Sun Yat-Sen University) (Sponsor Mike Burton)  
Putting culture under the 'spotlight' reveals that face recognition subserves nature not nurture.
- 10.00           **Markus Bindemann**, **Mike Burton** and **Christoph Scheepers\*** (University of Glasgow)  
Human face detection: Progress with scenes and eye movements.
- 10.30           **Chang Hong Liu\***, **Al-Amin Bhuiyan\***, **James Ward\***, **Wenfeng Chen\***, and **Jie Sui\*** (University of Hull) (Sponsor Alan Michael Slater)  
Transfer among pose, illumination, and expression training in face recognition.
- 11.00           COFFEE
- 11.30           **Kimberly Quinn\***, **Neil Macrae\*** and **Malia Mason\*** (University of Birmingham, University of Aberdeen, Columbia University) (Sponsor Sarah Beck)  
When Arnold is 'The Terminator', we no longer see him as a man: The temporal determinants of person perception.
- 12.00           **Rachel Rogers\*** and **Robert A. Johnston** (University of Kent)  
The effects of social information on visually derived semantic codes in face perception.
- 12.30–1.30     LUNCH

Session A**Ground Floor Lecture Theatre**

Symposium: Cooperation and communication in young children

Organiser: Professor Gergely Csibra

1.30 **Celia Brownell\***, **Margarita Svetlova\*** and **Sara Nichols\***  
(University of Pittsburgh)

You, me and we: Transformations in early prosocial behaviour.

2.00 **James Russell** (University of Cambridge)

Intersubjectivity: How far does it go in developmental explanation?  
(Remembrance of experiments past).

2.30 **Peter Hobson\*** and **Jessica Hobson\*** (University College London)

Communication and cooperation through identifying with others: Two studies in autism.

3.00 TEA

3.30 **György Gergely\*** (Central European University)

Why point? Mental sharing *versus* knowledge seeking.

4.00 **Elizabeth Robinson** (University of Warwick)

What do children know about learning from others?

4.30 **Michael Tomasello** (Max Planck Institute for Evolutionary Anthropology) – discussant

End of Symposium

5.00 Annual General Meeting (Lower Ground Floor Lecture Theatre)  
(EPS Members only)

6.00 **Bartlett Lecture – Professor Michael Tomasello** (Max Planck Institute for Evolutionary Anthropology)

Collaboration and communication in children and chimpanzees  
(Ground Floor Lecture Theatre)

7.00 POSTERS AND DRINKS RECEPTION. Rooms 305 and 308.

8.30 CONFERENCE DINNER, PESCATORI

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*Session B***Lower Ground Floor Lecture Theatre**

- 1.30           **Chris McManus, Rebecca Chamberlain\*, Phik-Wern Loo\*, Qona Rankin\*, Howard Riley\* and Nicola Brunswick\*** (University College London, Royal College of Art, Swansea Metropolitan University, University of Middlesex).  
Art students who cannot draw: Exploring the role of personality, dyslexia, perceptual problems, visual memory and drawing skills.
- 2.00           **Jessica R. Gilbert\*, Laura R. Shapiro, and Gareth R. Barnes\*** (Aston University)  
Processing of living and nonliving objects diverges in the visual object-processing system.
- 2.30           **Nele Demeyere\* and Glyn W. Humphreys** (University of Birmingham)  
Automatic small number perception through direct subitization.
- 3.00           TEA
- 3.30           **Alastair D. Smith, Niall Alcock\* and Kirsten Cater\*** (University of Nottingham, University of Bristol)  
Going the distance: Spatial scale of athletic experience affects the accuracy of path integration.
- 4.00           **Ann E. Fitchett\*, Alexander Easton, Madeline J. Eacott\*** (University of Durham)  
Manipulating context in a what-where-which object recognition task of episodic-like memory in rats.
- 4.30           **Jeffrey Bowers, Markus Damian, Colin Davis\*** (University of Bristol, University of London)  
Neural networks learn local representations in order to code for multiple things as the same time.
- 5.00           Annual General Meeting (Lower Ground Floor Lecture Theatre)  
(EPS Members only)
- 6.00           **Bartlett Lecture – Professor Michael Tomasello** (Max Planck Institute for Evolutionary Anthropology)  
Collaboration and communication in children and chimpanzees  
(Ground Floor Lecture Theatre)
- 7.00           POSTERS AND DRINKS RECEPTION. Rooms 305 and 308.
- 8.30           CONFERENCE DINNER, PESCATORI

*Session A***Ground Floor Lecture Theatre**

- 9.00            **Matthew R. Longo\*** and **Patrick Haggard** (University College London)  
A psychomorphometric investigation of the human hand.
- 9.30            **Stuart WG Derbyshire\***, **Jody Osborn\***, **Candy McCabe\*** and **Donna Lloyd\*** (University of Birmingham, University of Bath, University of Manchester) (Sponsor Ian Apperly)  
Utilising the rubber hand illusion to generate pain without injury.
- 10.00           **Patrick Haggard**, **Eamonn Walsh\***, **Simone Kuehn\***, **Dorit Wenke\***, and **Marcel Brass\*** (University College London, University of Ghent, Max Planck Cognition and Brain Sciences Institute)  
Just say 'no': intentional inhibition of actions in the human brain.
- 10.30           COFFEE
- 11.00           **Clare Press\***, **Cecilia Heyes** and **Martin Eimer** (University of London, University College London)  
Effects of action preparation on action perception: Facilitation or attenuation?
- 11.30           **Caroline Catmur\***, **Vincent Walsh\***, and **Cecilia Heyes** (University of Oxford, University College London)  
Automatic imitation: Independent of spatial compatibility, and dependent on the mirror neuron system.
- 12.00           **Claire Moody\***, **Gina Humphreys\***, **Silvia Gennari** (University of York)  
Comprehension of hand specific action language.
- 12.30-1.30    LUNCH

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*Session B***Lower Ground Floor Lecture Theatre**

- 9.00            **Nicholas Badcock\***, **John Hogben\***, **Janet Fletcher\*** (University of Oxford, University of Western Australia) (Sponsor Dorothy Bishop)  
Practice in a single session of the Attentional Blink: The role of temporal orienting.
- 9.30            **Sophie Forster\*** and **Nilli Lavie** (University College London)  
The role of perceptual load in mind wandering.
- 10.00           **Gillian Porter\***, **Andrea Tales\***, **Tom Troscianko\***, **Gordon Wilcock\***, **Judy Haworth\***, **Ute Leonards\*** (University of Bristol, Blackberry Hill Hospital, University of Oxford) (Sponsor Nicolas Dumay)  
Conjunction search IS different: Evidence from eye movements and task-evoked pupil dilation.
- 10.30           COFFEE
- 11.00           **Maha Nasrallah\***, **David Carmel\*** and **Nilli Lavie** (University College London, New York University)  
It is good to be bad: Enhanced detection sensitivity to negative valence.
- 11.30           **Martin Eimer** and **Monika Kiss\*** (University of London)  
Top-down control of attentional capture: New insights from ERP studies.
- 12.00           **William Matthews\*** and **Neil Stewart** (University of Warwick)  
Absolute size doesn't matter: Relative stimulus magnitude influences perceived duration.
- 12.30-1.30     LUNCH

*Session A***Ground Floor Lecture Theatre**

Symposium: Deafness, cognition and language

Organiser: Dr Chloe Marshall

- 1.30            **Bencie Woll\*** (University College London)  
Sign language: An introduction to issues in research.
- 2.00            **Pamela Perniss\***, **David Vinson\***, **Frank Seifart\***, **Gabriella Vigliocco** (University College London, University of Regensburg)  
Modality vs. typology effects: Investigating the divide.
- 2.30            **Manuel Carreiras** (Universidad de La Laguna)  
Lexical processing in Spanish Sign Language (LSE)
- 3.00            TEA
- 3.30            **Mairéad MacSweeney\***, **David Corina\***, **Heather Knapp\***, **Usha Goswami** and **Helen Neville\*** (University College London, University of California Davis, University of Cambridge, University of Oregon)  
Is phonological processing supramodal? Evidence from ERP studies with deaf adults.
- 4.00            **Kathryn Mason\***, **Kate Rowley\***, **Rosalind Herman\***, **Chloe Marshall**, **Gary Morgan\*** and **Bencie Woll\*** (City University, University College London)  
Specific Language Impairment (SLI) in British Sign Language (BSL).
- 4.30            **Aurélie Huyse\***, **Frédéric Berthommier\*** and **Jacqueline Leybaert\*** (Université Libre de Bruxelles, Gipsa-Lab)  
The role of audio-visual balance in speech perception in normally-hearing and cochlear implanted children.
- 5.00            **Fiona Kyle\***, **Ruth Campbell**, **Tara Mohammed\***, and **Mairéad MacSweeney** (University College London)  
The relationships between speechreading, language and reading in deaf and hearing children

End of Symposium

End of meeting

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*Session B***Lower Ground Floor Lecture Theatre**

- 1.30            **Colin J Davis\***, **Stephen J. Lupker\*** (University of London, University of Western Ontario) (Sponsored by Jeff Bowers)  
Sandwich priming: A new method for extreme masked priming.
- 2.00            **Caroline M. Whiting\***, **Yury Shtyrov\***, and **William Marslen-Wilson** (MRC Cognition and Brain Sciences Unit)  
Patterns of morphological analysis during visual word recognition: A MEG study.
- 2.30            **Carmel Houston-Price**, **Zoe Caloghris\*** and **Eleonora Raviglione\*** (University of Reading, Cardiff University)  
The origins of the mutual exclusivity bias in word learning.
- 3.00            TEA
- 3.30            **Sarah R. Beck**, **Kerry L.T. McColgan\***, **Elizabeth J. Robinson**, **Martin G. Rowley\*** (University of Birmingham, University of Warwick, University of Keele)  
Adults' and children's biases when thinking about chance events.
- 4.00            **Ian Apperly**, **Frances Warren\***, **Ben Andrews\***, **Jay Grant\***, **Sophie Todd\*** (University of Birmingham, University of Reading, University of Nottingham)  
Error patterns in the belief-desire reasoning of 3 to 5-year-olds recur in the reaction times from 6 years to adulthood.
- 4.30            **Patrick Burns\*** and **Teresa McCormack** (University of Birmingham, Queen's University Belfast)  
Children's and adults' causal structure judgements: The role of temporal information.
- 5.00            **Petko Kusev\***, **Peter Ayton** and **Paul van Schaik\*** (City University London, University of Teesside)  
Choice and human preferences: How accessibility, context and simplicity affect decision prospects.

End of parallel sessions

End of meeting

- 1. Julia Badger\* and Laura Shapiro** (Aston University)  
Evidence of a shift from similarity-based to category-based induction in five to seven year old children.
- 2. Rachael\* Bedford, Marko Nardini\* and Denis Mareschal\*** (University of London) (Sponsor John Wattam-Bell)  
Development of integration for disparity and texture cues to slant.
- 3. Kevin D. Cassidy\*, Kimberly A. Quinn\* and Glyn W. Humphreys** (University of Birmingham)  
Turning them into us: Recategorisation and cross race face processing.
- 4. Alexandra Cleland and Anna Hatzidaki\*** (University of Aberdeen)  
Frequency effects in word recognition: A dual-task investigation.
- 5. Nicolas Dumay and M. Gareth Gaskell** (University of Kent, University of York)  
Do competitor acquisition effects generalize to segmentation tasks?
- 6. Andrew J. Edmonds\* and Robert A. Johnston** (University of Kent)  
An own race bias in face detection.
- 7. Mark Elliott\*, Andrew Welchman\* and Alan Wing** (University of Birmingham)  
Movement synchronisation to multiple sources of auditory timing information.
- 8. Julia Buus Florentine\* and Elizabeth Wonnacott\*** (University of Oxford) (Sponsor Kate Nation)  
Exploring the role of phonological and semantic cues in determining Danish gender.
- 9. Jane Humphreys\* and Daniel Corsini\*** (University of the West of England) (Sponsor Priscilla Heard)  
The effect of similar and dissimilar pseudosigns on working memory for sign language.
- 10. Robert A. Johnston, Parveen Bhatarah\*, Ivy Ho\* and Lucy Jester\*** (University of Kent, University of Birmingham)  
An own race bias in a face matching task.
- 11. Clare N. Jonas\* and Jamie Ward** (University of Sussex)  
Spatial alphabets in synaesthesia.
- 12. Jeong-Im Kim\* and Glyn W. Humphreys** (University of Birmingham)  
Working memory and hierarchical visual perception.
- 13. Agnieszka Lech\*, Robert A. Johnston, Chris Solomon\*** (University of Kent)  
Identifying facial features: What do we really remember about a face?

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- 14. Sebastian Loth\* and Colin Davis\*** (University of London)  
(Sponsor Jeffrey Bowers)  
Do syllables matter in visual word recognition? German evidence extended and reviewed.
- 15. Hanna Marno\*, Eddy J. Davelaar\* and Gergely Csibra\*** (University of London) (Sponsor Anne Richards)  
The effect of communicative context on object perception.
- 16. Marina Martinos\*, Michael Yoong\*, Shekhar Patil\*, Rod Scott\* and Michelle de Haan** (University College London)  
The developmental profiles of children following Convulsive Status Epilepticus (CSE).
- 17. Jackie Meredith\*** (University of Middlesex)  
(Sponsor Bahman Baluch)  
Perceived emotional competence in behaviourally challenged children.
- 18. Natasza Nalesnik\* and Bahman Baluch** (Institute of Psychiatry, University of Middlesex)  
Developmental dyslexics and unimpaired children's reading and memory for words in a transparent orthography.
- 19. Sukhvinder Singh Obhi and Peggy J. Planetta** (Wilfrid Laurier University)  
(Sponsor Patrick Haggard)  
On the signals underlying conscious awareness of action.
- 20. Adam Qureshi\*, Ian Apperly and Dana Samson** (University of Birmingham, University of Nottingham)  
Are there two systems for theory of mind? Evidence from adults.
- 21. Jack C Rogers\*, William Marslen-Wilson and Matthew H Davis** (MRC Cognition and Brain Sciences Unit)  
The effect of lexical ambiguity on spoken word recognition: Homographic homophones versus heterographic homophones
- 22. Jonathan Silas\*, Joe Levy\*, Maria Kragh Nielsen\*, Lance Slade\* and Amanda Holmes\*** (Roehampton University) (Sponsor Anne Richards)  
Induced and evoked sex differences in EEG measures of a perception action matching system
- 23. Andrew Surtees\* and Ian Apperly** (University of Birmingham)  
Automatic visual perspective taking in children.
- 24. Jakke Tamminen\* and Gareth Gaskell** (University of York)  
Changing dynamics in the mental lexicon: New lexical representations strengthen over time.
- 25. Patrizia Thoma\* and Irene Daum\*** (Ruhr-University of Bochum)  
(Sponsor Shelley Channon)  
Empathy and executive function in normal aging.

**26. Sarah Elizabeth Watson\*, Gary Jones and Marco Tamburelli\*** (Nottingham Trent University)

A comparison of three nonword repetition tests varying in their degree of lexicality.

**27. Victoria Williamson\*, Alan Baddeley, Graham Hitch and Lauren Stewart** (University of London, University of York)

Comparing recall of verbal and tonal sequences: Sequence length and serial position effects.

**28. Hannah L. Witherstone\* and Gary Jones** (Nottingham Trent University)

Encoding and articulation in nonword repetition.

**29. Olga Zubko\*, David Wilkinson, and Robert A. Johnston** (University of Kent)

The role of short term memory in face recognition.

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Modelling phonological acquisition: Towards an explanation of children's error performance in nonword repetition tasks.

Marco Tamburelli, Gary Jones, Sarah E. Watson  
Nottingham Trent University  
[marco.tamburelli@ntu.ac.uk](mailto:marco.tamburelli@ntu.ac.uk)

It has been argued that nonword repetition tasks (NWRs) are a powerful diagnostic for Specific Language Impairment (SLI) (Bishop, North & Donlan 1996, Conti-Ramsden & Hesketh 2003, Dollaghan & Campbell 1998, inter alia). However, the mechanisms that underlie the performance of both children with SLI and typically-developing children in NWRs are very little understood. In this paper we present data from an experiment conducted with typically-developing five to six year olds (5;4 - 6;8) on two sets of nonwords (lexical and non-lexical) and examine the pattern of their phonological errors within the syllabic domain. We show that the children display a strong tendency for errors at the syllable onset, with fewer errors in coda position and fewer still in nuclear position. We then show how the same pattern can be simulated reasonably well by a computer model based on the EPAM chunking approach, thus shedding some light on the cognitive mechanisms underlying the specific error patterns as well as phonological development in general.

Bishop, D. V. M., T. North and C. Donlan (1996). Nonword repetition as a behavioural marker for inherited language impairment: Evidence from a twin study. *Journal of Child Psychology and Psychiatry*, 37, 391-403.

Conti-Ramsden, G. and A. Hesketh (2003). Risk markers for SLI: A study of young language-learning children. *International Journal of Language and Communication Disorders*, 38, 251-263.

Dollaghan, C. and T. F. Campbell (1998). Nonword repetition and child language impairment. *Journal of Speech, Language, and Hearing Research*, 41, 1136-1146.

Effortful comprehension of noise vocoded speech recruits a fronto-temporal network.

Alexis Hervais-Adelman<sup>1</sup>, Ingrid Johnsrude<sup>2</sup>, Robert Carlyon<sup>3</sup>, Matt Davis<sup>3</sup>  
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2. Queen's University Canada  
3. MRC Cognition and Brain Sciences Unit  
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We conducted an fMRI investigation into the neural basis of the comprehension and perceptual learning of noise vocoded (NV) speech. 15 naive participants were scanned using fast sparse whole-brain imaging. Neural responses to NV words, incomprehensible distorted speech and natural speech were measured in three test sessions. Training sessions were interleaved with test sessions and consisted of presentations of pairs of NV (D) and clear (C) words, ordered so as to provide effective perceptual learning (CD pairs) as well as ineffective orders (CC, DD, DC, cf. Hervais-Adelman, Davis, Johnsrude, & Carlyon, 2008). Behavioural data collected after each of the test sessions showed significant improvements in listeners' comprehension of NV

words as a consequence of training. Listening to NV speech during test sessions activated left insula, pre-motor, pre-frontal and inferior parietal regions, and right inferior frontal, motor and inferior temporal regions, and thalamus bilaterally, consistent with existing results for the processing of distorted or degraded speech. Effective training stimuli produced significantly more activity than ineffective stimuli in left inferior parietal, motor, and frontal areas, and in bilateral posterior temporal areas. These areas, also implicated in speech production, may play a role in guiding perceptual learning of NV speech.

Hervais-Adelman, A., Davis, M. H., Johnsrude, I. S., & Carlyon, R. P. (2008). Perceptual Learning of Noise Vocoded Words: Effects of Feedback and Lexicality. *Journal of Experimental Psychology: Human Perception and Performance*, 34(2), 460-474.

### Long term memory for sounds in humans: The influence of speech and language

Katrin Schulze<sup>1</sup>, Faraneh Vargha-Khadem<sup>1</sup>, Mortimer Mishkin<sup>2</sup>

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2. National Institute of Mental Health

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We investigated the influence of speech and language on long-term memory (LTM) of auditory material. Specifically, we asked whether humans can store long-term representations of sounds that can be neither repeated nor labeled. Participants (N = 32) were presented with a study list of auditory stimuli. Four different types of stimuli were used, which differed in the degree to which speech or language could support encoding and storage in LTM: words, pseudowords, nonverbal sounds, and words played backwards (reversed words), resulting in four study lists. Following rapid presentation of a study list, participants performed an unrelated filler task (e.g., counting tones) for 5 min to preclude rehearsal in working memory. Subsequently, participants performed an old-new recognition task in which they judged which of the stimuli had been presented for study. Recognition scores were highest for words (81%), followed by pseudowords and nonverbal sounds (each 75%), and lowest by far for the reversed words (58%; with chance, 50%). Our results indicate that memory for auditory stimuli is strongly influenced by its potential association with speech and language: The more that articulation and meaning can be used to support storage of auditory information in LTM, the better the performance appears to be.

### No role for perceptual fluency in the implicit learning of artificial grammars.

Ryan Scott and Zoltan Dienes

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[r.b.scott@sussex.ac.uk](mailto:r.b.scott@sussex.ac.uk)

A perceptual clarification task was used to examine the relationship between perceptual processing fluency, subjective familiarity, and grammaticality judgments in artificial grammar learning (AGL). Four experiments examined the effects of naturally occurring differences and manipulated differences in perceptual fluency, where decisions were based on a brief exposure to test strings (during the clarification task only) or normal exposure. When perceptual fluency was not manipulated, it was weakly related to

familiarity and grammaticality judgments, but unrelated to grammaticality and hence not a source of accuracy. Counterbalanced grammatical and ungrammatical strings did not differ in perceptual fluency but differed substantially in subjective familiarity. When fluency was manipulated, faster clarifying strings were rated as more familiar and were more often endorsed as grammatical, replicating Kinder, Shanks, Cock, & Tunney (2003) but only where exposure was brief. Results indicate that subjective familiarity derived from a source other than perceptual fluency, is the primary basis for accuracy in AGL. Perceptual fluency is found to be a dumb heuristic influencing responding only in the absence of veridical sources of judgment (Kinoshita, 2002).

Kinder, A., Shanks, D. R., Cock, J., & Tunney, R. J. (2003). Recollection, Fluency, and the Explicit/Implicit Distinction in Artificial Grammar Learning. *Journal of Experimental Psychology: General*, 132(4), 551-565.

Kinoshita, S. (2002). Feeling of familiarity: Memory attribution vs. memory module. In P.Chambres, M. Izaute & P.-J. Marescaux (Eds.), *Metacognition: Process, function and use* (pp. 79-90). Dordrecht, Netherlands: Kluwer.

#### How is the serial order of a visuo-spatial sequence coded? Insights from transposition latencies

Mark Hurlstone, Graham Hitch, and Alan Baddeley  
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A fundamental component of cognition is the ability to maintain and subsequently reproduce the serial order of novel sequences of items. In the domain of verbal short-term memory, evidence suggests that this capacity is the result of the interplay of a competitive queuing performance mechanism (Houghton, 1990), with parallel serial order representations. Recent computational modelling work and behavioural experiments (Farrell & Lewandowsky, 2004; Lewandowsky & Farrell, 2008) that considered the response latencies of transposition errors in serial recall indicate that order information is represented via a primacy gradient of activations imposed over item representations and by associations between items and positional markers. We report behavioural experiments that examined the response latencies of transposition errors in a visuo-spatial serial memory task. Results from these experiments parallel those obtained with verbal material and indicate that items within visuo-spatial sequences are priority coded by a primacy gradient coupled with positional markers. These data buttress the hypothesis that a competitive queuing mechanism equipped with parallel serial order representations underpins serial memory in the verbal and visuo-spatial domains.

Farrell, S., & Lewandowsky, S. (2004). Modelling transposition latencies: Constraints for theories of serial order memory. *Journal of Memory and Language*, 51, 115-135.

Houghton, G. (1990). The problem of serial order: A neural network model of sequence learning and recall. In *Current Research in Natural Language Generation* (Dale, R. et al, eds), pp.287-319, Academic Press.

Lewandowsky, S., & Farrell, S. (2008). Short-term memory: New data and a model. *The Psychology of Learning and Motivation*, 49, 1-48.

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Putting culture under the 'spotlight' reveals that face recognition subserves nature not nurture

Roberto Caldara<sup>1</sup>, Sebastien Millet<sup>1</sup> and Xinyue Zhou<sup>2</sup>

1. University of Glasgow

2. Sun Yat-Sen University

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Eye movement studies in Western Caucasian (WC) observers have consistently revealed systematic triangular sequences of fixations over the eyes and the mouth during face processing. We recently reported a marked cultural contrast: East Asian (EA) observers focus more on the central region of faces to extract information during face recognition (Blais et al., 2008). However, the face recognition literature has consistently shown that the critical information for face recognition is located in the eyes, and not the center of the face. Consequently, logic dictates that EA observers should also process information from the eyes to recognize faces. To directly address this issue, we monitored the eye movements of WC and EA observers performing a face recognition task with a gaze contingent paradigm. We used a 'spotlight' to dynamically control the information available to the observers using Gaussian apertures centered on observers' fixations with 2 (foveal), 5 and 8 degrees. Regardless of culture, observers relied on the eye region to recognize faces in the conditions where their perceptual span was most constrained. Strikingly, when the perceptual span increased to 8 degrees, EA observers shifted their fixations towards the face center. Cultural differences in eye movements rely on perceptual rather than information tunings.

Blais, C., Jack, R. E., Scheepers, C., Fiset, D., & Caldara, R. (2008). Culture shapes how we look at faces. *PLoS ONE*, 3(8), e3022.

Human face detection: Progress with scenes and eye movements

Markus Bindemann, Mike Burton and Christoph Scheepers

University of Glasgow

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Our ability to locate another person's face in the visual environment is a problem which has been studied rather little and remains poorly understood. This is surprising, as face detection is a prerequisite to any further face processing such as identification or expression analysis - tasks that have received a great deal of attention by psychologists. Here we will present a series of experiments investigating the nature of a human face detection "signature". These experiments focus on the impact of colour information, viewpoint, and the role of the human body, when observers try to locate another person's face within complex visual scenes. Our findings point to a system that can draw on different types of diagnostic information, but is surprisingly sensitive to variations in face view.

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Transfer among pose, illumination, and expression training in face recognition

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A key issue in face recognition is how observers learn to recognise faces across pose, illumination, and expression variations. These variations have detrimental effects on recognition of unfamiliar faces. However, the relationship between the learning of different types of image variation is still unknown. Can exposure to one type of variation affect recognition of the face in an untrained type? To answer this question, we have conducted recognition and sequential matching experiments where face training involved one type of variation but testing was in another type. For example, a face trained in different poses under the same illumination would be tested in the learned pose but in a new illumination. We examined the benefit of multiple pose training by comparing it with a baseline condition where the face was trained in a single pose. We found that higher level of exposure to pose information facilitated recognition of the trained face in a new illumination or expression. However, multiple illumination or expression training failed to transfer to a new pose. The findings suggest that generalisation of pose training may be extended to different types of image variation whereas generalisation of illumination or expression training may be confined within the trained type.

When Arnold is ‘The Terminator’, we no longer see him as a man: The temporal determinants of person perception

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The current research examined the intersection of social categorization and identity recognition in face processing. In two experiments, we used an automatic priming paradigm and manipulated prime duration (100 or 150 msec) and familiarity (familiar/famous or unfamiliar/nonfamous). In Experiment 1, participants judged the familiarity of target faces that were familiarity-congruent or -incongruent with the prime faces; in Experiment 2, participants categorized the sex of target faces that were sex-congruent or -incongruent with the prime faces. We reasoned that earlier processing would yield the same products for familiar and unfamiliar faces because of equivalent access to visually-derived categorical information but inadequate access to biographical information, whereas later processing would yield different products for familiar and unfamiliar faces because of differential access to biographical information. Indeed, we found that with less processing time, both unfamiliar and familiar faces yielded category priming but not familiarity priming; with more processing time, however, both unfamiliar and familiar faces yielded familiarity priming but only unfamiliar faces yielded category priming. The reason for this divergence, we argue, is that for familiar (but not unfamiliar) targets, the identity-based information extracted later in processing negates the influence of category-based information on responding.

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The effects of social information on visually derived semantic codes in face perception

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Facial attributes such as attractiveness, kindness, masculinity, and babyfacedness, are a readily accessible source of information referred to by Bruce and Young (1986) as "visually derived semantic codes". Much experimental research has focused on identifying the physical determinants of such attributes. In addition, they have been employed as marker variables in other face processing experiments, which often presume them to be static and invariable characteristics of a face. This may be the case in the absence of any social information. However, personality attributes known about a person may alter how their physical attributes are perceived by others. A series of experiments explored the effects of social information on the perception of visually derived semantic codes. Participants rated a number of male target faces, which were presented alongside an accompanying personality profile. The findings reveal an interplay between personality attributes and associated facial characteristics. A likeable target was rated as having a more attractive and kinder face than a dislikeable target. In addition, an extrovert was rated as having a more masculine face than an introvert. The contribution of these findings to facial attractiveness research and the implications on face processing experiments employing familiar faces are discussed.

Bruce V. & Young A. (1986). Understanding face recognition. *British Journal of Psychology*, 77, 305-327.

**Symposium:** Cooperation and communication in young children  
Organiser: Professor Gergely Csibra

You, me and we: Transformations in early prosocial behaviour

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How is prosocial behavior transformed with the emergence of an objective self at the end of the second year of life? I will present studies from our lab to illustrate developmental changes in several aspects of early prosocial behavior, including empathizing, sharing, helping, and cooperating. Individual differences analyses show that young children who are more prosocial are also more able to represent self and other explicitly in various aspects of language and play. With development of objective self-awareness between 18 and 24 months of age, children become better able to infer, differentiate, and reflect on their own and others' subjective feelings, needs, desires, and intentions. We suggest that this permits them not only to know what someone else feels, needs, or wants but also to generate prosocial actions to alter another's desires and needs, and to know that they are sharing, helping, or cooperating to do so. We further consider how children's social environments may contribute to these developments in prosocial behavior and social understanding, in particular how supportive adult interactions relate

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to the development of prosocial responding & how adult scaffolding changes over the second year with advances in social understanding.

Intersubjectivity: How far does it go in developmental explanation? (Remembrance of experiments past)

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The role in mental development of the intersubjectivity of truth is somewhat ambiguous. First, following Donald Davidson, we should focus on situations in which joint categorisers give *different* labels. This reminds us that error is necessarily possible. Staying with situations in which two people give different judgments, I look at Piagetian ‘concrete operational’ tasks, in which two children have to agree an answer and where both are wrong. What is at stake here is not intersubjective categorising but the grasp of, what I call, inter-conceptual truth. I reject the Piagetian idea that the ‘co-ordination of (social) perspectives’ can give rise to the necessary objective judgements (e.g., about quantity). It cannot because without some conception of a-social truth the clash of judgements will not be regarded *as* a clash. In support of this scepticism, I will review some studies of peer interaction in concrete operational tasks I did in the late ‘70s to mid ‘80s. I suggest these illustrate that some time around 5 years or after children can not only draw the distinction between objective and subjective truth but appreciate that ‘logico-mathematical’ truths fall into the former category. I discuss this in the context of developmental work on referential opacity.

Communication and cooperation through identifying with others: Two studies in autism

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We suggest that from early in life, human social experience is structured by the process of *identifying with* the attitudes of others. Our hypothesis is children with autism are limited in this propensity, with severe repercussions for their cognitive and motivational, as well as social-affective, development. We shall describe two studies in which we compare the communicative abilities of children with and without autism. The first study had six separate trials, in each of which one tester demonstrated an action and asked participants to get another tester (currently out of the room) to ‘do this’. The second tester entered, and at first made clumsy responses to participants’ attempts to convey what he should do. According to blind ratings of the videotapes, children with autism were almost completely distinguished from matched children without autism on an *a priori* composite of four indices of identification: emotional engagement, sharing experience in joint attention, communication of behavioural style, and shifting in communicative role. Secondly, we tested the prediction that, in virtue of their lesser propensity to identify with the attitudes (including the attitude-based communicative intentions) of others, children with autism would manifest specific forms of limitation in understanding and producing points-for-others.

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Why point? Mental Sharing versus Knowledge Seeking

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Following the early distinction between ‘proto-imperative’, instrumental *versus* ‘proto-declarative’, communicative functional uses of infant pointing, later research focused mostly on whether or not early ‘proto-declarative’ pointing implies representing the other as a communicative *mental* agent. Recently, Tomasello et al. (2007) have convincingly argued that the accumulated evidence strongly supports such a ‘rich’ mentalistic interpretation. Currently more controversial, however, is their proposal that the primary social motive behind ‘proto-declarative’ pointing is ‘*mental sharing*’, i.e., that pointing serves to satisfy the infant’s intention to a) establish joint referential attention with the other, and b) *share his or her subjective intentional attitude towards the referent with the communicative partner*. In contrast, within the framework of natural pedagogy theory (Csibra & Gergely, 2006) we have proposed that the available evidence is better explained in terms of ‘*proto-interrogative*’ pointing where the primary motive is *epistemic* rather than social in nature. In this view (Southgate et al., 2007) infants point primarily to request from knowledgeable adults relevant and kind-generalizable new knowledge about novel referents and their kinds. In this talk I’ll discuss the different implications and predictions that the social ‘mental sharing’ *versus* the epistemic ‘knowledge-seeking’ accounts entail and summarize the results of our recent attempts to directly contrast the two theories in novel experimental paradigms.

Csibra, G. & Gergely, G. (2006). Social learning and social cognition: The case for pedagogy. In Y. Munakata & M. H. Johnson (Eds.), *Processes of Change in Brain and Cognitive Development. Attention and Performance XXI* (pp. 249-274). Oxford: Oxford University Press.

Southgate, V., van Maanen, C., & Csibra, G. (2007). Infant pointing: Communication to cooperate or communication to learn? Commentary on Tomasello et al.’s essay entitled ‘A new look on infant pointing’. *Child Development*, 78, 735-740.

Tomasello, M., Carpenter, M., & Liszkowski, U. (2007). A new look at infant pointing. *Child Development*, 78, 705-722.

What do children know about learning from others?

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Much of children’s knowledge about the world is gained indirectly from what other people tell them. Previous research has shown that by around 4 years children can make appropriate evaluations of the likely truth of what others spontaneously tell them, taking into account the speaker’s past accuracy and current access to relevant information. In the research presented here, children had to take the initiative to elicit help identifying a hidden toy. The aim was to specify the conditions under which children

were appropriately flexible in their trust in a potential informant, by deliberately eliciting help from her when she was well-informed more frequently than when she was not. Children aged 3- to 5-years showed this pattern of proactive information-seeking only when the potential informant's belief about the toy's identity had been made externally manifest, though hidden from the child. Children this age were indiscriminate in their help-seeking when the potential informant's belief remained a private mental state until the child asked for help. The results have implications for an account of children's understanding of the process of transferring knowledge between minds.

## End of Symposium

### Bartlett Lecture

#### Collaboration and communication in children and chimpanzees.

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Human beings are biologically adapted for cultural life in ways that other primates are not. Humans have unique motivations and cognitive skills for understanding other persons as intentional agents like the self with whom one can share emotions, experience, and collaborative actions (shared intentionality). The motivations and skills involved emerge in human ontogeny at around one year of age, as infants begin to participate with other persons in various kinds of collaborative and joint attentional activities (cultural practices), including linguistic communication. Chimpanzees understand important aspects of intentional action - specifically that others pursue goals and perceive things relevant to those goals - especially in competitive situations. But our nearest primate relatives do not seem to have the motivations and cognitive skills necessary to engage in activities involving collaboration, shared intentionality, and, in general, things cultural.

#### Art students who cannot draw: Exploring the role of personality, dyslexia, perceptual problems, visual memory and drawing skills

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Some art students are unable to draw well and there is a suggestion that this relates to the high rate of dyslexia in art schools. In the first (questionnaire) stage of this study we used an assessed self-perceived drawing ability in 277 art students, along with measures of a history of dyslexia, a self-administered spelling test, and personality and educational variables. In the second (experimental) stage, 38 art students, stratified by

self-rated drawing ability and spelling ability, and 30 controls, carried out drawing tests. Self-perceived poor drawing art students did indeed draw less well than good drawers, but nevertheless were better than controls. Drawing ability was not related to dyslexia or spelling ability. Higher drawing ability did though relate both to being male and to being masculine, and to conscientiousness (particularly Achievement Striving). The 'house' task of Cain (1943) and the Rey-Osterrieth complex figure suggested that poor drawers are less able accurately to copy angles and proportions, and have poorer visual memory at immediate and delayed recall. We found no evidence to support the recent claim of Cohen and Jones (2008) that "the major source of drawing errors lies in the initial perception of the to-be-drawn object".

Cohen, D. J. & Jones, H. E. (2008). How shape constancy relates to drawing accuracy. *Psychology of Aesthetics, Creativity, and the Arts*, 2, 8-19.

#### Processing of living and nonliving objects and diverges in the visual object-processing system

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We used magnetoencephalography (MEG) to explore the time-course of category-specific effects. We aimed to assess the earliest time-point at which processing of living and nonliving objects diverges in the visual object-processing system. Using a superordinate-level categorisation task, participants (N=10) were shown a category label followed by a target object. They were asked to decide whether the object was a member of the previously presented category. Target objects were drawn from 3 living and 3 nonliving categories. Our behavioural data revealed no differences between living and nonliving objects. Utilising a 100 ms window surrounding the M170, we directly contrasted living and nonliving target objects using a wide-band (1-80Hz) source analysis. This analysis identified a region in left occipito-temporal cortex showing greater power for living compared to nonliving objects across our group of participants. Time-frequency findings from this region identified greater low-frequency (1-20Hz) power for living compared with nonliving target objects, peaking roughly 180-200 ms after a target object. These findings suggest an early, perceptually-driven difference in processing living versus nonliving objects, which should be considered in current theories of category-specificity. The influence of this early difference on later, semantic processing is currently being explored.

#### Automatic small number perception through direct subitization

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We present evidence for the automatic apprehension of exact small quantities, independent of pattern recognition. We examined carry-over effects between magnitudes in a quantification task (is the number of items greater or smaller than?). We examined performance across consecutive trials in which numerosities were assigned to the same

response category (both smaller or both larger than the comparison number). In every experiment reaction times were slowed when consecutive trials contained small numbers that differed in quantity compared with when there were either repeats of the same exact pattern or repeats of the same quantity. This contrasted with performance on the larger quantities, where performance did not differ across conditions in which there were repeats of the same pattern, the same exact quantity, or different quantities belonging to the same response category. The data cannot be explained in terms of simple pattern recognition, changes in surface area, simple luminosity changes, changes in visual discriminability and differences in response categories between small and large numbers. Instead, the reduced repetition effects for small numbers differing in quantity suggest that small exact quantities are recognised automatically through direct subitization.

### Going the distance: Spatial scale of athletic experience affects the accuracy of path integration

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Path integration is the process by which animals and humans update their spatial position through idiothetic (self movement) cues. There is some evidence that athletically trained individuals are more accurate in calculating their position than untrained individuals. In the present study we assessed whether different forms of athletic training affect the accuracy of path integration, with particular reference to spatial scale. A group of rugby players (large-scale training) and a group of martial artists (small-scale training) took part in a triangle completion task: they were led (blindfolded) two sides of a right-angled triangle, and were required to complete the hypotenuse by returning to the starting point. Experiments took place on a sports ground and movement profiles were recorded using Global Positioning Systems (GPS). The groups did not appear to differ in their assessment of the distance to the origin, but rugby players were found to be more accurate than martial artists in assessing the correct angle to turn. These data support evidence that the two forms of information are separately represented. Furthermore, they suggest that the spatial scale at which an individual is trained can affect the accuracy of one aspect of path integration but not the other.

### Manipulating context in a what-where-which object recognition task of episodic-like memory in rats.

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Experiments of episodic-like memory in non-human species have concentrated on showing integrated memory for what, where, and when factors. Previously this laboratory has proposed that context (which) is a more salient episode separator for rats than temporal information (when). We present further data on the role of context in a what-where-which object recognition task of episodic-like memory. Here rats must remember the relative positions of objects presented in different contexts and at test explore the

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object in a novel location relative to the arena context. We have looked at increasing the number of contexts so that episodes are more variable across trials and also reducing the number of contexts to assess the role of context interference on episode memory. Our results show that unique contextual information is essential to preserve memory across episodes. In contrast though, increasing context variability does not appear to significantly improve memory for objects, although rats could still successfully solve the task. Future research intends to look at the inclusion of multiple contexts as a method to increase the retention interval on this paradigm and to increase the memory load beyond the current standard of two episodes.

Neural networks learn local representations in order to code for multiple things at the same time.

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Parallel Distributed Processing (PDP) theories are committed to the claim that the brain employs distributed representations to encode information. However, we show that distributed representations are ill suited for coding multiple things at the same time (that is, they suffer from the superposition catastrophe). PDP models can learn to code multiple things, but they accomplish this by learning sparse (perhaps local) representations. We demonstrate this through an analysis of the hidden units in Botvinick and Plaut's (2006) PDP model of short-term memory. These findings highlight a fundamental computational advantage of localist compared to distributed representations.

Botvinick, M. M., & Plaut, D. C. (2006). Short-term memory for serial order: A recurrent neural network model. *Psychological Review*, 113, 201-233.

A psychomorphometric investigation of the human hand

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Morphometric techniques, involving the geometric analysis of landmark data, have become increasingly widespread in the biological sciences as tools for the analysis of biological shape. This method provides a precise, quantitative characterization of the veridical structure of a biological form, such as a body part like the human hand. Here, we apply this method to study the mental representation of a body part (the hand), by having participants point to where they believed landmarks on their (occluded) hand to be. These landmarks provide an implicit map of the structure underlying the mental representation of the hand, which can then be compared to the veridical structure of the participant's hand. Several systematic biases in the representation of the hand were observed, which corresponded to characteristic features of primary somatosensory representations. In contrast, when participants were asked to pick from a series of hand templates the one that most closely matched the shape of their own hand, such biases were not observed. This suggests that the implicit representation of the body is quite

different from the explicit, conscious image we have of ourselves. This implicit body image observed here may reflect a representation nearer to the 'homuncular' representation of the body.

#### Utilising the rubber hand illusion to generate pain without injury

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Pain without injury is common but difficult to model. Here we investigate whether participants experiencing the rubber hand illusion can experience pain in the rubber hand. For experiment 1, participants were sat with their left hand hidden by a partition while they viewed a rubber hand. Synchronous stroking of the hidden and rubber hand continued until the participant reported feeling the stroking sensations coming from the rubber hand. The experimenter then drove a pin into the back of the rubber hand. Experiment 2 involved pairs of participants. Participant one (P1) sat with his or her right hand hidden and their left hand visible. Participant two (P2) sat under the table with their right arm on the table in front of P1. Both participants tapped the index finger of their right hand in synchrony to induce the illusion. When P1 indicated feeling as though she was now tapping P2's index finger, P2 switched tapping to her little finger. Almost half the participants reported somatic sensations, including pain, when the rubber hand was "injured". Thirty percent of the participants reported strong discomfort, including pain, when observing asynchronous movement. Injuring or inappropriately moving a non-body part, felt as one's body, can generate pain.

#### Just say 'no': intentional inhibition of actions in the human brain

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Inhibition has long been recognised as a key function of the frontal lobes. The capacity to withhold action plays an important role in theories of volition, but has proved difficult to study experimentally. Most behavioural studies have used go/no-go or stop-signal tasks, in which a stimulus instructs participants to cancel a prepared action. Converging evidence suggests the right inferior frontal gyrus underlies such stimulus-driven inhibition of action. Often, however, we decide for ourselves to cancel an action at the last moment (normally wisely!). This form of intentional inhibition has been largely neglected, perhaps because it does not produce any convenient behavioural marker. We used the subjective experience of action preparation as a marker to identify the processes underlying intentional inhibition. Two fMRI studies showed activity in the dorsal frontomedian cortex on trials where participants prepared to make an action, but then decided to inhibit it at the last possible moment. An EEG study showed a significant

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increase in frontal beta-band power when participants intentionally inhibited voluntary actions, contrasting with the decrease in beta power when they actually executed the action. We discuss this dissociation between instructed and intentional inhibition of actions in the context of self-control and responsibility for action.

#### Effects of action preparation on action perception: Facilitation or attenuation?

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Theoretical accounts of the mirror system require that links between action and perception are bidirectional, however, there is a lack of consensus on the effects that action has on perception. We investigated this by measuring visual event-related brain potentials to observed hand actions while participants prepared responses that were spatially compatible or incompatible, and action type compatible or incompatible, with observed actions. An early enhanced processing of spatially compatible stimuli was observed, which is likely due to spatial attention. This was followed by an attenuation of processing for both spatially and action type compatible stimuli, likely to be driven by efference copy signals that attenuate processing of predicted sensory consequences of actions. Attenuation was not response-modality specific; it was found when participants prepared manual and vocal responses. The opposing effects that attentional and forward model mechanisms have on perception may explain the inconsistency of recent findings on action-perception links.

#### Automatic imitation: Independent of spatial compatibility, and dependent on the mirror neuron system

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Automatic imitation effects have been used as behavioural indices of the functioning of the human mirror neuron system (Brass et al., 2000; Kilner et al., 2003; Heyes et al., 2005). However, recent work has criticised the assumption that automatic imitation effects are mediated by the mirror neuron system on the grounds that automatic imitation effects have been confounded with simple spatial compatibility effects (Bertenthal et al., 2006; Jansson et al., 2007; Aicken et al., 2007). Additionally, direct evidence that imitation relies on the mirror neuron system is surprisingly limited. A series of experiments were performed in which automatic imitation was measured on both spatially compatible and spatially incompatible trials, in order to assess the independence of spatial compatibility and automatic imitation effects. It was found that automatic imitation effects are independent of spatial compatibility effects and follow a different time course. These results permitted the use of automatic imitation effects in a preliminary investigation of the role of the mirror neuron system in imitation. Theta burst transcranial magnetic stimulation delayed automatic imitation effects when applied to the

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left inferior frontal gyrus (considered to be a key mirror neuron system area), suggesting that this area is critical for imitation.

Aicken, M. D., Wilson, A. D., Williams, J. H., & Mon-Williams, M. (2007). Methodological issues in measures of imitative reaction times. *Brain and Cognition*, 63, 304-308.

Bertenthal, B. I., Longo, M. R., & Kosobud, A. (2006). Imitative response tendencies following observation of intransitive actions. *Journal of Experimental Psychology: Human Perception and Performance*, 32, 210-225.

Brass, M., Bekkering, H., Wohlschläger, A., & Prinz, W. (2000). Compatibility between observed and executed finger movements: comparing symbolic, spatial, and imitative cues. *Brain and Cognition*, 44, 124-143.

Heyes, C., Bird, G., Johnson, H., & Haggard, P. (2005). Experience modulates automatic imitation. *Brain Research Cognitive Brain Research*, 22, 233-240.

Jansson, E., Wilson, A. D., Williams, J. H., & Mon-Williams, M. (2007). Methodological problems undermine tests of the ideo-motor conjecture. *Experimental Brain Research*, 182, 549-558.

#### Comprehension of hand specific action language

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Many researchers have argued that the comprehension of action language involves sensory-motor re-enactments of the actions described (Barsalou 2003, Pulvermüller, 2005). The present study aimed to explore this claim and further assess the specificity of these language-induced representations. We asked whether sentences describing left or right hand actions would elicit activity within the contra-lateral hemisphere as is the case for hand action execution. In an event-related functional magnetic resonance imaging study, 18 right-handed participants completed two tasks: an action execution task where participants made right/left hand actions then a language task where participants read sentences describing the same left or right hand actions. As expected the execution of left/right hand actions elicited stronger activity in contralateral hemispheres. Contrary to our predictions the same pattern was not found for action language, in both the left and the right hemisphere sentences describing right hand actions elicited stronger activity than sentences describing left hand actions. These results challenge theories that propose we accurately re-enact the actions we read about. Rather than eliciting hemisphere specific activity, hand specific action language elicits a bilateral pattern of motor activity suggesting that action representations are not hand specific, instead they are more general in content.

Barsalou, L. W., Simmons, W. K., Barbey, A. K., & Wilson, C. D. (2003). Grounding conceptual knowledge in modality-specific systems. *Trends in Cognitive Science*, 7, 84 - 91.

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Pulvermüller, F., Shtyrov, Y., & Ilmoniemi, R. (2005). Brain signatures of meaning access in action word recognition. *Journal of Cognitive Neuroscience*, 17, 884-892.

### Practice in a single session of the Attentional Blink: The role of temporal orienting

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When observers are asked to attend to two targets presented in rapid temporal succession, correct processing of the first target (T1) results in a marked reduction in accuracy to the second target (T2). This effect has been labelled the Attentional Blink (AB) and is considered to reflect a limitation in the allocation of attention across time. In a series of three experiments, practice within a single AB session was examined. Experiment 1 demonstrated a significant improvement in target sensitivity in the second half of the experimental session. This was replicated in Experiment 2, which also examined the effect of single-target task exposure on the AB practice effect. This was found to influence the quality of AB interference, in that T1 and T2 performance were not correlated following single-target exposure. This suggested an influence of foreperiod in AB performance, whereby the inter-target interval effect was predominantly an effect of foreperiod. These findings were replicated in Experiment 3 and it was suggested that the practice effect relates to the acquisition of information regarding the temporal location of targets.

### The role of perceptual load in mind wandering

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Much attention research has focused on distraction by the external environment. In contrast the mechanisms governing distraction by internally generated stimuli have been relatively understudied. Here we examine the role of perceptual load, a key determinant of external distractor processing (e.g. Lavie, 2005), in determining an internal form of distraction by Task-Unrelated Thoughts (TUTs or "mind-wandering"). A series of four experiments demonstrates that the rate of TUT reports (including those categorized as being unintentional) was reduced as perceptual load in a visual-search task was increased. Alternative accounts in terms of increased motivation or demands on responses or verbal working memory were ruled out. In addition there was a significant correlation between the magnitude of load effects on internal (TUTs) and external (response-competition) distractors. These results suggest that exhausting perceptual capacity in task-relevant processing under high perceptual load can reduce processing of task-irrelevant information from external and internal sources alike.

Lavie, N. (2005) Distracted and confused?: selective attention under load. *Trends in Cognitive Sciences*, 9, 75-82

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Conjunction search IS different: Evidence from eye movements and task-evoked pupil dilation

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Judy Haworth<sup>2</sup> and Ute Leonards<sup>1</sup>

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We investigated the processing mechanisms underlying visual feature and conjunction search tasks, using eye movements to gauge sampling strategy and pupil dilation as a measure of processing load. We compared results across healthy younger and older groups and patients with Alzheimer's disease (AD). Our tasks were designed to be matched for search slope, inter-item similarities and perceptual grouping, to isolate the target-matching process. Task-matching in healthy people was confirmed by the feature and conjunction tasks involving equal fixation durations, number of saccades to find a target, and moment-to-moment pupillary dilation during performance suggesting equivalent effort expenditure for all. Nevertheless, eye movements showed subtle task effects: conjunction search required more saccades to reach a target-absent decision and involved shorter saccade amplitudes than feature search. Additionally, older people and especially our patients showed longer and increasingly variable fixation durations for the conjunction task. Furthermore, AD patients' pupils dilated more during conjunction than feature search. These results suggest a fundamental difference between the discrimination types: accurate target identification in a conjunction search context requires more cautious eye movement patterns, especially as ageing progresses, and seemingly greater effort in AD patients, than in single-feature search. We discuss how this might arise.

It is good to be bad: Enhanced detection sensitivity to negative valence

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Rapid and accurate detection of negative information has an adaptive value (e.g. in the facilitation of avoidance behavior). However it is currently unclear whether detection of negative information has enhanced sensitivity compared to detection of positive information. In a series of experiments we establish that detection sensitivity is enhanced for negative, compared to positive, words. Participants categorized briefly-presented (33 or 17 ms) masked words as emotional or neutral. Results showed that detection accuracy and sensitivity were higher for negative than for positive words of the same or even higher lexical frequency and of the same intensity (as rated by the same participants). This detection advantage for negative words was accompanied by a response bias in supraliminal but not in subliminal conditions. These findings establish a clear detection sensitivity advantage for negative over positive words, in support of a preferential access to perceptual processing and consciousness.

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Top-down control of attentional capture: New insights from ERP studies

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The question whether salient visual stimuli can capture attention in a bottom-up fashion or whether attentional capture is always determined by top-down task sets is still unresolved. We will present results from recent ERP studies that investigated the role of top-down task sets on attentional capture by singleton stimuli in visual search tasks. Electrophysiological indicators of attentional target selection demonstrate that singletons do not capture attention in a bottom-up fashion, but that capture is determined by whether or not their features match a currently active task set. We will also address the impact of top-down search strategies (singleton versus feature search mode) on behavioural and ERP indicators of attentional capture.

Absolute size doesn't matter: Relative stimulus magnitude influences perceived duration

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The perception of duration is fundamental to our sensory experience. Many studies have demonstrated that the apparent duration of a stimulus is positively related to its magnitude and it has been argued that there is a general magnitude representation system for duration, size and quantity. In two experiments we show that, for both visual and auditory stimuli, the effect of stimulus magnitude on perceived duration depends upon the context in which the stimuli are presented: Against a high-intensity background, low stimulus magnitudes are judged to last longer than high ones. These results refute the empirical generalization that "larger stimuli last longer" and the more specific theoretical idea that there is a common metric for absolute temporal and non-temporal magnitudes. Rather, the results suggest that it is stimulus salience which determines apparent duration, an interpretation which can accommodate a wider range of phenomena than an account based on intrinsic associations between absolute stimulus magnitudes.

**Symposium:** Deafness, cognition and language  
Organiser: Dr Chloe Marshall

Sign language: An introduction to issues in research

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The UK government's Foresight Project (2004) states that "A ... dramatic type of cross-linguistic contrast that may be uniquely valuable in elucidating the underlying properties of speech and language, comes through the comparison between spoken

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languages and native sign languages, such as BSL (British Sign Language).” (p.9). The report goes on to identify the investigation of features common to how the brain processes spoken language and sign language (SL) as one of six key questions facing researchers in language. This paper provides a brief introduction to the sign language structure, sign language development in children, and acquired impairments in sign language. The discussion will be linked to considerations of the role of modality (the channels in which language is perceived and produced) in shaping linguistic forms and language behaviour. Topics covered will include the phonology, lexicon and grammar of BSL; issues relating to iconicity, gesture and facial expression; the role of space; and feedback mechanisms. The presentation will serve as background to the other papers in the symposium.

Marslen-Wilson, W. (2004). Speech and Language, Research Review written for the Foresight Cognitive Systems Project

#### Modality vs. typology effects: Investigating the divide

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There is evidence that the differential treatment of spatial semantic domains across language modalities leads to differences in language processing (e.g. Vigliocco et al. 2005). However, the assumption that signed, but not spoken, languages require encoding spatial information about referents may not be generally true of spoken languages. Bora, spoken in parts of Columbia and Peru, obligatorily encodes visuospatial dimensions comparable to those typically encoded in signs of languages like British Sign Language (BSL). The present study investigates the divide between modality vs. typology by means of a triadic task. Speakers of Bora and English were asked to decide which two words of a triad were most similar to each other in meaning. Results indicate that Bora speakers picked the pair that preserved spatial information significantly more often than English speakers. Extension of the study to include BSL indicates that speakers of Bora and signers of BSL behave more similarly to each other than speakers of English. The results support the idea that effects that have been attributed to differences in language modality may rather be cross-modal typological effects, whose exact nature has been hitherto obscured by a typologically too narrow scope of language investigation.

Vigliocco, G., Vinson, D.P., Woolfe, T., Dye, M.W.G., and Woll, B. (2005). Language and imagery: effects of language modality. *Proceedings of the Royal Society: Biological Sciences* 272(1574): 1859-1863.

#### Lexical processing in Spanish Sign Language (LSE)

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Lexical access is concerned with how the spoken or visual input of language is projected onto the mental representations of lexical forms. To date, most theories of lexical access have been based almost exclusively on studies of spoken languages and/or orthographic representations of spoken languages. Relatively few studies have examined how lexical access takes place in deaf users of signed languages. This paper examines whether two properties, lexical familiarity and phonological similarity, which are known to influence recognition and production of spoken languages, influence lexical access (comprehension and production) in Spanish Sign Language - *Lengua de Signos Espanola* (LSE). Our results indicate that the representational factors of lexical familiarity and phonological similarity can be observed in native and non-native deaf users of LSE. In addition, the present data provide evidence for the importance of sub-lexical properties in sign language processing.

#### Is phonological processing supramodal? Evidence from ERP studies with deaf adults

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*Phonology* describes the level of analysis at which meaningless, contrastive units of language combine to form larger, meaningful units. In spoken languages these are auditory/articulatory elements. In signed languages handshapes, movements and locations combine to form signs. We address whether similar neural systems are recruited during phonological analysis of both signed and spoken languages. We used event-related potentials (ERPs) to characterize the time-course of neural activation during phonological similarity judgments in response to pairs of written words (do they rhyme?) and pairs of American Sign Language (ASL) signs (do they share the same location and movement?). Hearing participants demonstrated an enhanced negativity to the non-rhyming word pairs in contrast to rhyming pairs (N450). This was largest over right posterior regions. Of particular interest here, deaf adults making phonological similarity judgments in response to ASL signs showed the same modulation of the N450: this was similar in timing and distribution to that seen in hearing participants performing the rhyme task. In summary, our data support the notion that phonological processing in signed and spoken languages recruits similar neural processes and should be regarded to some extent as *supramodal*: that is, involving representations that in some way ‘transcend’ the sensory modalities.

#### Specific Language Impairment (SLI) in British Sign Language (BSL)

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Approximately 7% of hearing children have SLI. Hearing loss is an exclusionary criterion for SLI, so Deaf children whose first language is a signed language are typically excluded. Yet, children exposed early to signed language progress through the same developmental language stages as hearing children exposed to spoken language. While speech is characterized by rapid temporal changes, sign languages have a greater degree of simultaneity in how linguistic elements are used. These differences in the way language is processed allow us to investigate whether SLI is caused by a sensory processing deficit or a language-specific deficit. In fact, theories that SLI is caused by a rapid temporal auditory processing deficit do not predict the existence of SLI in sign language. In contrast, theories that a domain-specific deficit affects the processing solely of linguistic structure predict not only that SLI exists in sign languages, but make precise predictions as to what aspects of linguistic structure should be impaired. We report on the first study to document SLI in Deaf children who sign. We have investigated the language skills of 20 7-14 year-olds, exposed to BSL from an early age, who have normal non-verbal cognitive development but who are not developing sign language at the same rate as their classroom peers.

#### The role of audio-visual balance in speech perception in normally-hearing and cochlear implanted children

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Face-to-face communication involves both auditory and visual modalities, as illustrated by the McGurk effect. The question addressed here concerns the role of the respective weight of both modalities in audio-visual balance. Two groups of normally-hearing young adults performed a syllable-identification task in an audio-visual paradigm. Stimuli are presented in visual-only, auditory-only and audio-visual (congruent and incongruent) conditions and are embedded in noise. This paradigm measures the intelligibility gain due to auditory speech stimulus (auditory gain) and to visual speech stimulus (visual gain). The first group of participants received a non-degraded visual information while the second group (reduction group) received visual information degraded by a technique of contrasts modulation. Results show that visual reduction modifies AV balance and thereby on AV integration. Cochlear-implanted children were tested with the same paradigm but without auditory noise. They form an interesting population considering their dependence on speechreading. Results indicate that, relative to McGurk stimuli, visual reduction leads to an increase of audio-visual fusions and auditory-based responses, generally absent in CI users. Not only AV integration is restored but auditory-based responses also appear. Taken together, these data suggest that when speechreading is prevented, CI users are forced to pay attention to the auditory cue.

#### The relationships between speechreading, language and reading in deaf and hearing children

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Speechreading is a skill which is required for deaf children to access the language of the hearing community. Here we report the development of a new test of child speechreading (ToCS) specifically designed to be appropriate for deaf children's language skills. We tested 86 deaf children (with a severe/profound hearing loss) and 91 hearing children aged between 5 and 14 years. The children were also given tasks measuring NVIQ, productive vocabulary, reading accuracy and reading comprehension. We report on the associations between speechreading and a range of demographic and psychometric variables in the deaf and hearing children, and on the relationship between performance on the speechreading test and developing literacy. Among other findings: deaf and hearing children showed similar levels of performance on this test; the degree of hearing loss and type of educational placement (oral, bilingual or total communication) affected performance; productive vocabulary - irrespective of whether it was in sign or speech - was significantly associated with speechreading but only in the deaf group. Speechreading also exhibited a positive relationship with reading accuracy and comprehension skills in both the deaf and hearing children, even after statistically controlling for age, NVIQ and vocabulary. The implications of these results will be discussed.

## End of Symposium

### Sandwich priming: A new method for extreme masked priming

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An orthographically-similar masked nonword prime facilitates responding in a lexical decision task (Forster & Davis, 1984). Recently, this masked priming paradigm has been used to evaluate models of orthographic coding, models that attempt to quantify prime-target similarity. One general finding is that priming effects often do not occur when prime-target similarity is moderate, a result that we interpret as being due to uncontrolled effects of lexical inhibition. In the present research, a new version of the masked priming paradigm, sandwich priming, was introduced in an effort to minimize the impact of lexical inhibition. Masked sandwich priming involves briefly presenting the target itself prior to the presentation of each prime. Results indicate that the new paradigm was successful. The predicted priming effects were observed for Guerrera and Forster's (2008) "extreme" transposition primes (e.g., avacitno-VACATION) and for primes differing from their targets at three letter positions (e.g., coshure-CAPTURE), effects that are not found with the standard masked priming paradigm. In addition to demonstrating the usefulness of the sandwich priming technique, these results also support the assumption that inhibitory processes play an important role in lexical processing.

Forster, K. I., & Davis, C. (1984). Repetition priming and frequency attenuation in lexical access. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 10, 680-698.

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Guerrera, C. & Forster, K. (2008). Masked form priming with extreme transposition. *Language and Cognitive Processes*, 23, 117-142.

Patterns of morphological analysis during visual word recognition: a MEG study

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Evidence from masked priming points to a process of blind decomposition of any visual form that appears to be morphologically complex. Morpho-orthographic cues seem to drive this process, since the presence of both a stem and an affix are necessary to trigger segmentation. The goal of this MEG study was to examine the spatiotemporal pattern of morphological processing underlying these effects. We also investigated the effects of semantic transparency on the segmentation of complex forms, and the timing of these effects. Stimuli co-varied the presence and absence of a potential stem and affix, crossed with semantic transparency. Source analysis using L2-minimum-norm estimates revealed a left-lateralised fronto-temporal network activated during single word recognition. Using a region-of-interest analysis, we found no evidence for morphological processing at the M170 within fusiform gyrus. However, activity within anterior temporal cortex around 250ms showed differential processing for forms containing both a stem and affix (farmer, corner) relative to morphologically simple forms (scandal). We found a late anterior effect of transparency at 400ms, triggered by forms semantically related to their stem (farm-er). The results are consistent with a rapid posterior to anterior flow of processes along the temporal lobe, mapping orthographic cues onto morphological hypotheses.

The origins of the mutual exclusivity bias in word learning

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Halberda (2003) demonstrated that, like preschoolers, 17-month-old infants use a principle of Mutual Exclusivity (ME; Markman & Wachtel, 1988) to learn new words. When presented with a name-known object and an unfamiliar object and asked to “look at the dax”, infants increased their looking towards the unfamiliar object. Such behaviour is assumed to reflect children’s bias to allow each object to have only one name, although research to date has failed to pinpoint either the mechanisms underlying the bias or the factors driving its development. Infants who are raised in a bilingual environment allow us to probe competing theories of ME while examining whether it is experience of language (specifically, experience of hearing only one language) that leads infants to employ this word-learning strategy. We replicated Halberda’s study with 31 monolingual English-hearing infants and 23 bilingual (English plus other language) infants aged 17-21 months. Only the monolingual group increased their fixation of an unfamiliar object on hearing an unfamiliar word. The finding that infants who are accustomed to objects having more than one label do not develop the strategy in the same way as monolingual

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infants supports the hypothesis that development of the bias is driven by linguistic experience.

Halberda, J. (2003). The development of a word-learning strategy. *Cognition*, 87, B23-34.

Markman, E.M. & Wachtel, G.F. (1988). Children's use of mutual exclusivity to constrain the meanings of words. *Cognitive Psychology*, 20 (2), 121-157.

Adults' and children's biases when thinking about chance events.

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When guessing on the throw of a die, both adults and children prefer to guess after it has been thrown (but remains hidden) rather than before. We considered whether this bias was influenced by whether the outcome 1) was easy to imagine; 2) had been determined; or 3) the event was close to completion. In a game of chance participants guessed through which of three doors a target object would fall. Ease of imagining the outcome was manipulated using two conditions in which participants did or did not know what the target object was. Participants could guess before the exit door was determined, after the exit door was determined but before the object was behind its door, or after the object was in place (event closest to completion). Adults preferred to guess closer to the event being complete, irrespective of whether they could imagine the object. In contrast, 4-6 year olds showed no preference between the two determined events in either condition, but were influenced by imaginability: a preference to guess once an event was determined was found only for known target objects. We discuss the different processes that underlie children's and adults' guessing preferences.

Error patterns in the belief-desire reasoning of 3 to 5-year-olds recur in reaction times from 6 years to adulthood

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Three-year-old children make more accurate predictions about an agent's behaviour when the agent has a true belief than when s/he has a false belief. Four-year-old children predict action more accurately when the agent has a false belief and a desire to approach an object than when s/he has a false belief and a desire to avoid an object. However, it is not known whether these belief-desire reasoning problems continue to pose difficulties for children after they have passed these most developmentally sensitive tasks. Eighty three 6- to 10-year-olds and 20 adult participants performed a novel belief-

desire reasoning task, presented on a laptop computer that recorded both responses (correct / incorrect) and response times. Response times became faster with age but every age group responded more slowly when beliefs were false than when beliefs were true, and when the desire was to avoid rather than approach an object. Error rates showed the same pattern of difficulty as response times. The pattern of relative difficulty observed in 3- to 5-year-olds errors on belief-desire reasoning tasks is retained throughout development and into adulthood, suggesting that this pattern reflects differences in processing difficulty, not simply the order in which concepts are acquired.

#### Children's and adults' causal structure judgements: The role of temporal information

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Adults can recruit temporal information when making inferences about causal structure (Lagnado & Sloman, 2006). We examined whether children's causal structure judgements were sensitive to the relative timing of events in a simple causal system. We also studied whether such judgements supported predictions about the outcome of interventions on the system. Participants observed three discrete events that occurred on the surface of a toy-like box. Events B and C followed an initial event A. In the synchronous condition, B and C occurred simultaneously whereas in the sequential condition, B occurred before C. When asked to select from an array of possible causal structure representations in the form of causal graphical models, both children's and adults' choices were sensitive to the temporal characteristics of the event sequence. Participants judged that A was a common cause of B and C in the synchronous condition, but that A, B, and C formed a causal chain in the sequential condition. However, only adults answered questions about the hypothetical effects of interventions on B and C consistent with their causal inferences. These findings are consistent with those of Lagnado and Sloman (2006) but potentially inconsistent with an interventionist theory of causal cognition.

Lagnado, D. A., & Sloman, S. A. (2006). Time as a guide to cause. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 32, 451-460.

#### Choice and human preferences: How accessibility, context and simplicity affect decision prospects

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The leading normative (von Neumann & Morgenstern, 1947) and alternative psychological theories (e.g., Tversky & Kahneman, 1992) of judgment and decision-making share a common representational assumption: people's preferences and decisions under risk and uncertainty are task-independent. For example, these theories assume that all decisions under risk or uncertainty can be represented as gambles with monetary

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amounts representing the outcomes. In five experiments we studied the extent to which theories of judgment, decision-making and memory can predict people's preferences. We find that (a) the weighting function required to model decisions with 'high-accessible' features in memory exhibits different properties from those required to model choices between monetary gambles and (b) the accessibility (Koriat & Levy-Sadot, 2001) of events in memory affect choices between options, influencing participants' decision weights, risk preferences and choice consistency. These results indicate a failure of the descriptive invariance axiom of Expected Utility Theory and challenge those psychological theories predicting a particular pattern of preferences for all risky prospects. We highlight a need for theories which differentiate between decisions about monetary gambles and other types of decision-making under risk and uncertainty.

Koriat, A., & Levy-Sadot, R. (2001). The combined contributions of the cue familiarity and accessibility heuristics to feeling of knowing. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 1, 34-53.

Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5, 297-323.

von Neumann, J., & Morgenstern O. (1947). *Theory of games and economic behaviour* (2nd ed.). Princeton, NJ: Princeton University Press.

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### 1. Evidence of a shift from similarity-based to category-based induction in five to seven year old children

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Sloutsky, Kloos and Fisher (2007) found that five year old children were biased towards similarity-based induction. We investigated the development of induction strategies in 146 five to seven year old children, and compared the influence of high-similarity vs. low-similarity distractors. Children were trained to categorise novel animals following a rule that pitted category membership against appearance and were then asked to generalise a hidden property of a target to one of two test items (one same-category choice; one distractor similarity-choice). We found a clear shift in induction choices with seven year olds making significantly more category-based choices than five year olds. Similarity-based choices were more frequent for high-similarity distractors, but this did not interact with age, indicating that older children were equally distracted by very high levels of similarity as younger children. These findings support the existence of a shift from similarity-based to category-based induction, and suggest that this shift is likely to be triggered by the development of more sophisticated reasoning abilities rather than an increased ability to ignore highly similar distractors.

Sloutsky, V. M., Kloos, H., & Fisher, A. V. (2007). When Looks Are Everything: Appearance Similarity versus Kind Information in Early Induction. *Psychological Science*, 18, 179-185

### 2. Development of integration for disparity and texture cues to slant

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Adults can combine multiple sources of sensory information optimally to reduce perceptual variance. By contrast, children aged up to 8 years do not reduce variance given visual and self-motion cues to location or visual and haptic cues to form (Nardini et al. and Gori et al., *Curr. Biol.* 2008). To investigate integration within a modality, we examined children's use of visual disparity and texture cues to slant. Adults and 4-8 year olds judged which of two simultaneously presented slopes was shallowest. Trials provided either one information source (disparity or texture), or both. In line with previous findings, adults' thresholds were reduced given both cues rather than one. Children's thresholds for all conditions reduced with age, but no age group showed an advantage for two cues compared with the best single cue. In "conflict" conditions measuring cue weighting, adults relied more on texture for slopes near the horizontal (in which texture is most reliable), whereas children used the same weightings irrespective of slope. These results suggest that while adults integrate stereo and texture information optimally by weighting them according to reliability, children as old as 8 years do not integrate these cues or weight them according to reliability.

Gori, M., Del Viva, M., Sandini, G., and Burr, D.C. (2008). Young children do not integrate visual and haptic information. *Curr. Biol.* 18, 694-698.

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Nardini, M., Jones, P., Bedford, R., and Braddick, O. (2008). Development of cue integration in human navigation. *Curr. Biol.* 18, 689-693.

### 3. Turning them into us: Recategorisation and cross race face processing

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The current research examined the contributions of perceptual expertise and social categorisation to the cross-race effect (CRE), or better discrimination/recognition for same-race (SR) than cross-race (CR) faces. We primed White participants to categorise upright and inverted SR and CR faces as ingroup or outgroup members and assessed accuracy in perceptual discrimination (Experiment 1) and recognition memory (Experiment 2). We reasoned that if differential perceptual expertise accounted for the CRE, then participants would show better discrimination/recognition for SR than CR faces irrespective of ingroup/outgroup categorisation, and that inversion would be more disruptive for SR than CR faces; in contrast, if social-categorisation-related motivation accounted for the effect, then participants would show better discrimination/recognition for ingroup than outgroup faces irrespective of race, and that inversion would be more disruptive for ingroup than outgroup faces. Results from both experiments showed that ingroup/outgroup categorisation had no effect on SR processing, yielding equivalent inversion effects and suggesting no role for motivation. In contrast, ingroup/outgroup categorisation had a significant effect on CR processing, yielding stronger inversion effects for ingroup than outgroup SR faces and suggesting increased motivation to individuate ingroup faces. Thus, perceptual expertise and social categorisation both play roles in the CRE, but in different ways.

### 4. Frequency effects in word recognition: A dual-task investigation

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When people respond to two stimuli in quick succession, response times (RTs) to the second stimulus increase as stimulus onset asynchrony (SOA) decreases; a processing bottleneck allows only one task to engage critical operations at a time. We present two experiments investigating bottleneck effects in word recognition; in particular the studies investigate the locus of frequency effects. In Experiment 1, a pitch discrimination task was followed by a lexical decision to a visual word. As the SOA between tasks increased, RTs to the lexical decision task decreased. In addition, the frequency effect was underadditive with SOA; the frequency effect was 26ms smaller at the shortest SOA relative to the longest SOA. This replicates Cleland et al. (2006), but conflicts with the findings of McCann et al. (2000). In Experiment 2, the list composition of the visual words was varied so that items could appear in "pure" lists (words of a similar frequency) or "mixed" lists (high and low frequency mixed together). The underadditive frequency effect was replicated; however there was an additional effect of list composition that was not underadditive with SOA. The findings are discussed with reference to models of word recognition that allow a pervasive influence of frequency.

Cleland, A.A., Gaskell, M.G., Quinlan, P.T., & Tamminen, J. (2006). Frequency effects in spoken and visual word recognition: Evidence from dual-task methodologies. *Journal of Experimental Psychology: Human, Perception & Performance*, 32, 104-119.

McCann, R. S., Remington, R. W., & Van Selst, M. (2000). A dual-task investigation of automaticity in visual word recognition. *Journal of Experimental Psychology: Human Perception and Performance*, 26, 1352-1370.

#### 5. Do competitor acquisition effects generalize to segmentation tasks?

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This study looked at whether competitor acquisition effects (Gaskell & Dumay 2003) generalize to segmentation tasks. Participants learnt fictitious words embedded in existing words (muck) as their second syllable (lirmucktoze), through repeated exposure in phoneme monitoring. Exposure effects were tested immediately, the next day, and after a week. Involvement of the novel words in lexical competition was indexed using pause detection (Experiment 1) or word spotting (Experiment 2); in both cases the stimuli were bisyllabic sequences compatible with the newly acquired words (lirmuckt). Explicit knowledge about the novel words was assessed using recognition and recall. In both experiments the recognition performance improved between the immediate test and the first retest, with no subsequent change, whereas free recall improved from day 1 to day 8. In line with our previous results, pause detection showed no change in lexical activity immediately, but a clear inhibitory competitor effect after 24h, and an even stronger effect a week later. Interestingly, word spotting showed a similar time course in the emergence of these effects: whereas exposure led to an immediate facilitatory trend, it resulted in significant inhibition after 24h and after a week. In other words, post-sleep lexical consolidation effects do generalize to competition for segmentation.

Gaskell, M.G., & Dumay, N. (2003). Lexical competition and the acquisition of novel words. *Cognition*, 89, 105-132.

#### 6. An own race bias in face detection

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Models of face perception have mostly been concerned with mapping the processes of recognition and semantic information retrieval. More recently, however, research has also addressed an important prerequisite for face recognition; that of face detection. This refers to the localisation of a face within a scene and, in the current study labels the task of determining that an item is a face rather than another object. Previously, Lewis & Edmonds (2003) examined which features of the face (forehead, eyes, nose, mouth, chin) were relevant for detection. It was found that obscuring the eyes made face detection much more difficult compared to obscuring other features. The current study

extended this finding to consider both own and other race faces in order to determine whether the own race bias demonstrated in many face processing tasks also operates at this very early stage. In the present study we replicated the findings of Lewis & Edmonds (2003) in respect to own race faces but have revealed a different pattern of feature importance for other race faces. The implications of these early differences as a basis for the own race bias in face recognition are discussed.

Lewis, M. B. & Edmonds, A. J. (2003). Face detection: Mapping human performance. *Perception*, 32, 903-920.

### 7. Movement synchronisation to multiple sources of auditory timing information

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Synchronisation with multiple sources of timing information (e.g. conductor, surrounding musicians) is a feature of performing in a music ensemble. In this study we investigate how people synchronise with two metronomes of the same mean interval but varying in reliability and offset. We used a standard finger tapping task and presented participants with simultaneous auditory metronomes distinguished by different tone frequencies (MatTAP, (Elliott, Welchman, & Wing)). The metronomes were set out of phase with each other by a value between 0 and 150ms and were also varied in reliability by randomly 'jittering' the interval around the mean, with one metronome more reliable than the other. Participants demonstrated strong evidence of integration of the two tones, with mean asynchrony dependent both on the degree of metronome offset and the temporal position of the more reliable metronome. Participants also showed a small increase in variability compared with tapping to a completely periodic metronome. This increase depended on the lower level of jitter applied. Our results suggest that when people synchronise with multiple timing cues they utilise information about temporal reliability to determine the weight they give to the various cues to accomplish accurately timed action.

Elliott, M. T., Welchman, A. E., & Wing, A. M. MatTAP: A MATLAB toolbox for the control and analysis of movement synchronisation experiments. *Journal of Neuroscience Methods*, In Press.

### 8. Exploring the role of phonological and semantic cues in determining Danish gender

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Psycholinguistic research on grammatical gender provides a testing ground for models of lexical structure and retrieval. The highly irregular nature of gender, contrasted with the few errors native speakers make, has often been taken to support individual lexical storage. However, closer inspection of gender systems reveals surprising regularity (Corbett, 1991), though it is unknown if this is universal. Danish gender

assignment, with two categories ('neuter', 'common'), has had little investigation. The system appears highly arbitrary, however books for second language learners point to some phonological and semantic consistencies (Allan et al., 1995). Are native speakers aware of these? Native Danish speakers assigned gender to 36 nonce words, with one of 6 phonological endings (3 suspected common-biasing, 3 suspected-neuter-biasing) and paired with a picture from one of 6 semantic classes (3 suspected-neuter-biasing, 3 suspected-common-biasing). Data indicated an overall preference to assign 'common' gender, reflecting a statistical bias across Danish, but also significant main effects of both semantics and phonology. In post-experiment questionnaires, participants reported primarily relying on phonological endings. These findings suggest that Danish gender is more regular than previously thought. Though sometimes unaware, native speakers are sensitive to these patterns.

Allan, R., Philip Holmes, P., & Nielsen, T. L. (1995). *Danish: A comprehensive grammar*. London: Routledge.

Corbett, G. G. (1991). */Gender/*. Cambridge: Cambridge University Press.

#### 9. The effect of similar and dissimilar pseudosigns on working memory for sign language

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Working memory for sign language involves visual representations that equate to the phonological loop in hearing people, according to Wilson and Emmorey (2003), who found that deaf signers' recall was disrupted when either pseudosigns or moving shapes were presented during a retention interval. Further, pseudosigns were more disruptive than moving shapes, paralleling research in the hearing modality where linguistic stimuli are more disruptive than tones or music (e.g. LeCompte, Neely, & Wilson, 1997). Exploring further similarities between the two systems, we predicted that there would be an effect of visual similarity in the interfering material, paralleling well-established phonological similarity effects. The results of our study showed that similar pseudosigns impaired recall more than dissimilar. However, recall reached near ceiling, an effect attributable to the fact that, based on previous research, the study used only four items in each testing block. Although some authors (see Emmorey, 2002) suggest that the sign-based loop in working memory has a smaller capacity than the hearing population's phonological loop, this study suggests that the sign-based loop may have a similar capacity to the phonological loop and, insofar as recall performance is affected by the type of intervening stimulus, performs in an equivalent way.

Emmorey, K. (2002). *Language, cognition, and the brain: Insights from sign language research*. Mahwah, NJ: Erlbaum.

LeCompte, D.C., Neely, C.B., & Wilson, J.R. (1997). Irrelevant speech and irrelevant tones. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, 23, 164-180.

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Wilson, M., & Emmorey, K. (2003). The effect of irrelevant visual input on working memory for sign language. *Journal of Deaf Studies and deaf Education*, 8, 97-103.

#### 10. An own race bias in a face matching task

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The existence of an own race bias in face processing is well established in tasks that require access to long term memory. However, increasingly, evidence of its presence has also emerged in non-recognition tasks that do not address long term memory (e.g., sex classification or age judgement). The current study examined performance in a task that required identifying faces but did not entail access to long term memory. Participants made same-different decisions in a sequential face matching task to pairs of Caucasian and Asian faces. All sets of faces had been matched on the degree or similarity and dissimilarity between face pairs. The time allowed for viewing the first face in each pair was varied from 3000ms to 100ms in order to assess how readily information could be extracted from own and other race faces. Clear evidence of a bias was demonstrated that showed responses were made more rapidly to own race than to other race face pairs. However, this advantage was restricted to same decisions and did not emerge for different decisions. These findings are discussed in terms of possible loci for the own race bias in face processing.

#### 11. Spatial alphabets in synaesthesia

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Visuo-spatial forms are a type of synaesthesia in which members of sequences take on spatial locations relative to the body. The alphabet is one sequence which may be represented in this way. In this investigation, 268 spatial-alphabet synaesthetes were asked to record breaks, gaps or direction changes in their representations and a sub-group took part in an experiment in which they were shown a letter and asked what came before or after it in the alphabet. It has previously been shown that members of the general population chunk the alphabet into verbal groups corresponding to the 'alphabet song' (Klahr, Chase, & Lovelace, 1983). Having a visual as well as verbal representation of the order of the letters reduces this tendency and produces more idiosyncratic patterns.

Klahr, D., Chase, W. G., & Lovelace, E. A. (1983). Structure and Process in Alphabetic Retrieval. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 9(3), 462-477.

12. Working memory and hierarchical visual perception.

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Visual selection emerges from the competition between endogenous control processes and exogenous cues. Amongst possible factors that influence the endogenous control system is working memory. Using Navon letters, we explored if and how items in working memory affect the perception of visual targets at local and global levels in compound letters. 25 participants looked for a target letter presented at local or global level while holding a regular block letter as a memory item. An effect of validity was found when memory items and targets were same, performance was better than when they were different. Although the effect of level (global precedent effect) was not found in the baseline condition, under memory load condition a global bias tended to emerge suggesting that attention tends to be biased to the global level of form when working memory is loaded. Interestingly, in no-memory priming condition, target perception was faster when a memory item matched the letter of the distractor level in a compound stimulus than it was in the memory condition. The relations between working memory and hierarchical coding of visual forms are discussed.

13. Identifying facial features: What do we really remember about a face?

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A series of experiments examined which features witnesses can generally recall and which features are too detailed or subtle for witnesses to remember and recall during an interview. Participants were told that they were helping to develop a new forensic questionnaire for eyewitness interrogations. Half of the participants were introduced to a face for 60 seconds then the photo was removed and they were asked to complete the questionnaire of identification record. The other half of the participants (Judges) followed a similar procedure; however, the face was visible to them for the whole time. All participants returned a week later to repeat the questionnaire but none of the participants saw the face during this phase. Chi-Square was conducted to determine differences among the frequency of the correctly chosen facial features. The largest amount of differences among prescribing facial features was found among Participants and the descriptions provided by Judges made while looking at the face. Witnesses did not have problems with recalling information about general characteristics like sex, race, hair style. The most difficult traits to report were connected with individual features especially the spacing of features.

14. Do syllables matter in visual word recognition? – German evidence extended and reviewed.

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Although research has established the phonological syllable as a processing unit in speech production (e.g., Levelt & Wheeldon, 1994), its role in recognition is somewhat controversial. There was no clear syllabic effect in speech perception in English (e.g., Cutler, Mehler, Norris, & Segui, 1986), and also no clear-cut effects in visual word recognition in English (Macizo & van Petten, 2006). However, inhibitory effects of syllable frequency have been reported in German visual word recognition (Conrad, Stenneken, & Jacobs, 2006). In this poster we examine the latter effects more closely, and conclude that they find their basis in morphological processing rather than in syllabification processes. This criticism is applicable to (virtually) all items in German syllable frequency research (Hutzler, Conrad, & Jacobs, 2005; Conrad & Jacobs, 2004; Conrad, Stenneken, & Jacobs, 2006). We report a new experiment that shows no effect of first syllable frequency in a lexical decision task in German. These data challenge the claim that syllabic units affect visual word recognition.

Conrad, M., & Jacobs, A. (2004). Replicating syllable frequency effects in Spanish in German: One more challenge to computational models of visual word recognition. *Language and Cognitive Processes*, 19, 369-390.

Conrad, M., Stenneken, P., & Jacobs, A. (2006). Associated or dissociated effects of syllable frequency in lexical decision and naming. *Psychonomic Bulletin & Review*, 13, 339-345.

Cutler, A., Mehler, J., Norris, D., & Segui, J. (1986). The syllable's differing role in the segmentation of French and English. *Journal of Memory and Language*, 25, 385-400.

Hutzler, F., Conrad, M., & Jacobs, A. (2005). Effects of syllable-frequency in lexical decision and naming: An eye-movement study. *Brain and Language*, 92, 138-152.

Levelt, W., & Wheeldon, L. (1994). Do speakers have access to a mental syllabary? *Cognition*, 50, 239-269.

Macizo, P., & Van Petten, C. (2007). Syllable frequency in lexical decision and naming of English words. *Reading and Writing*, 20, 295-331.

### 15. The effect of communicative context on object perception

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The effect of communicative context on object perception Humans, uniquely among animals, learn from each other by receiving semantic information via communication. We hypothesized that such tendency is supported by perceptual biases that would make people more likely to extract semantically relevant features of a scene in a communicative context. Thus, when people observe an object in an ambiguous communicative context, they should exhibit a bias to encode the object-permanent features (e.g., colour, shape) at the expense of its transient features (such as location). In our study, three groups of 24 people saw short movies of 5 objects either in a non-communicative "reaching context" or in a communicative "pointing context". The movies were followed by a still frame of the objects, with either the location or the identity of

one object altered. The participants' task was to try to detect these changes. Our results revealed that when people saw the objects in the pointing context, change detection was better for identity than for location. This result supports the hypothesis that communicative actions direct attention towards the permanent identity-relevant features of an object-referent, and, as a result, help the future recognition of that object. We conclude that social environment that involves communicative actions shapes the perception of objects.

#### 16. The developmental profiles of children following Convulsive Status Epilepticus (CSE)

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Convulsive Status Epilepticus (CSE) is the most common medical neurological emergency in childhood. The developmental profiles of children following CSE have not been systematically investigated, though it has been suggested that CSE following prolonged febrile seizures (PFS) is associated with better outcome compared to other aetiologies. In this study we wanted: (1) to determine whether infants with PFS perform better than infants with CSE associated with other aetiologies, (2) to assess whether children with PFS in fact have normal function soon after the CSE event. 26 infants were assessed using the Bayley Scales of Infant and Toddler development (Bayley-III). The infants were assessed within a mean of 27 days from the CSE. A t-test revealed that the PFS group had significantly better cognitive, language and motor composite scores compared to the non-PFS group. A one sample t-test revealed that the PFS group show impaired performance relative to the norm on the cognition and the language scales but not the motor scales. As predicted, PFS group are performing better than the non-PFS group. However, within approximately a month following the CSE, the PFS group still show impaired performance relative to the standardized norm in cognition and language.

The Bayley Scales of Infant and Toddler Development, Third Edition (Bayley III)

#### 17. Perceived emotional competence in behaviourally challenged children

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Self-rated emotional competence in affective perception, empathy and expressivity of 20 children excluded from mainstream schooling for severe social, emotional and behavioural difficulties (SEBD) was examined using three computer administered questionnaires. In comparison to typically developing peers, deficiencies were found in cognitive and affective empathy, interpersonal perception and gregarious and intimate emotion; including the regulation of aversive emotion. This study supports the premise that severe behavioural disturbance involves altered emotional processes, a qualitative difference in cognition, which may have a predictive function. These new self-

report tests may also have an ongoing value in applied research, particularly with vulnerable children.

18. Developmental dyslexics and unimpaired children's reading and memory for words in a transparent orthography

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Word reading and short-term memory performance of forty two developmental dyslexics (mean age 10.1 years,  $SD = .7$ ) and thirty three unimpaired reading age matched (mean age of 8.5,  $SD = .5$ ) and thirty six unimpaired chronological age matched children (mean age of 10.6,  $SD = .7$ ) was investigated in transparent Polish orthography. Fifty of the children were instructed that they were expected to recall the list of (12 high frequency mainly concrete) words after reading them aloud (Condition A), whilst others had no such instructions (Condition B). Overall, word reading was significantly slower for developmental dyslexics compared to reading age (RA) and chronological age (CA) controls. However, developmental dyslexics' recall of words was comparable to CA and significantly superior to RA both in conditions A and B of the experiment. The implications of these results are discussed in relation to a recent work by Baluch & Danaye-Tousie (2006).

Baluch, B & Danaye-Tousi, M (2006) Spelling transparency and its impact on dyslexic and unimpaired children's memory for words. *Annals of Dyslexia*, vol 56,2,319-334 .

19. On the signals underlying conscious awareness of action

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To investigate whether conscious judgments of movement onset are based solely on pre-movement signals or whether sensory feedback also play a role, participants judged the onset of finger and toe movements that were either active or passive. Judgments were made by reporting the position of a rotating clock hand presented on a computer screen and were then compared to the actual measured time of movement onset. In line with previous studies, judgment errors were anticipatory for both finger and toe movements. Judgments of active movements were significantly more anticipatory than judgments of passive movements. This is consistent with a "pre-movement signal" account of action awareness. However, judgments of active toe movement onset time were less anticipatory than judgments of active finger movement onset time. This pattern of results is not consistent with a pure efferent account of conscious awareness of action onset as this account predicts more anticipatory judgments for toe movements compared to finger movements. Instead, the data support the idea that conscious judgments of movement onset are based on at least two information streams comprised of efferent (i.e., premotor, efference copy) and reafferent (i.e., feedback from the movement) components.

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20. Are there two systems for theory of mind? Evidence from adults

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Theory of mind (ToM) (the ability to attribute mental states in explaining and predicting behaviour) and executive function (EF) are complex cognitive processes supported by similar neural systems. The current study investigated whether the relationships observed between EF and ToM in development also exist in adults. Adult participants undertook a battery of executive tasks, and two ToM tasks: a test of ToM-use (Keysar, Lin & Barr, 2001) and a level-1 visual perspective taking task (Samson, Apperly, Braithwaite & Andrews, submitted). Structural equation modelling indicated that the ToM-use task was related to both aspects of inhibitory control that were established (the latent variables of response inhibition and of response selection) and the other was related only to the latent variable of response inhibition. Significantly more of the variance in the ToM-use task was explained by the inhibitory factors than in the Level-1 perspective task. The ToM tasks did not covary, suggesting they have independent functional bases. The pattern of data suggests that there are two underlying systems of theory of mind, a flexible and cognitively demanding system (used for the ToM-use task), and an inflexible but fast and cognitively efficient system (used for the Level-1 perspective taking task).

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

Samson, D., Apperly, I. A., Braithwaite, J. J. & Andrews, B. J. (submitted). Seeing it their way: What other people see is calculated by low-level and early acting processes.

21. The effect of lexical ambiguity on spoken word recognition: Homographic versus heterographic homophones.

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Reports of faster visual lexical decisions for semantically ambiguous words versus unambiguous controls have been interpreted as evidence for facilitatory feedback from multiple semantic representations (Rubenstein et al., 1970). However, more recent experiments have suggested two opposite effects of lexical ambiguity: polysemous words (*twist*) with multiple related senses show an ambiguity advantage whereas homographs with multiple unrelated meanings (*bark*) delay word recognition due to semantic competition (Rodd et al., 2002). However the homophony/polysemy distinction is subjective and further data is therefore valuable. Assessing responses to spoken words allows us to use homographic (*bark*) as well as heterographic (*knight/night*) homophones for which two separate representations exist. In both an auditory lexical decision task and semantic categorisation task subjects responded to 72 homographs, 72 homophones and 72 single-meaning controls matched for the number of senses, overall frequency, number

of phonemes and number of syntactic classes. Both tasks show significantly slowed response times for both groups of ambiguous words versus matched controls. There was no difference between the homographs and homophones. This suggests that the ambiguity disadvantage is largely due to semantic not orthographic competition. This ambiguity disadvantage is consistent with neural network accounts (Rodd et al., 2004) of word recognition; ambiguous spoken words activate multiple semantic representations, which compete during identification.

Rodd, J.M, Gaskell, M.G., & Marslen-Wilson, W.D. (2002) Making Sense of Semantic Ambiguity: Semantic Competition in Lexical Access. *Journal of Memory and Language*, 46, 245–266

Rodd, J.M, Gaskell, M.G., & Marslen-Wilson, W.D. (2004) Modelling the Effects of Semantic Ambiguity in Word Recognition. *Cognitive Science*, 28, 89-104

Rubenstein, H., Garfield, L., & Millikan, J. A. (1970). Homographic entries in the internal lexicon. *Journal of Verbal Learning and Verbal Behaviour*, 9, 487-494

## 22. Induced and evoked sex differences in EEG measures of a perception action matching system

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Recent EEG research is said to support the involvement of a perception/action matching system (P/AMS) in social cognition. Induced decreases in 'mu' power, during performance and observation, index activation of a P/AMS system (Cochin et al., 1999). Evoked event related potentials (ERPs) indexing motor activity have also been demonstrated during the observation of movement, linking ERPs to a P/AMS (Kilner et al., 2008; van Schie et al., 2008). To date, only modulation of induced activity has been studied in relating a P/AMS to social cognition (Bernier et al., 2007; Oberman, et al., 2005). We recorded 128-channel EEG from male and female participants while they observed and performed simple movements. Participants also completed several questionnaires pertaining to aspects of social cognition, such as empathy and systemising traits (IRI, EQ, SQ-R). Females showed stronger mu attenuation during observation (but not performance) of an action, and males showed increased mean amplitude in motor-related ERPs for both performance and observation of an action. However, neither induced nor evoked activity was associated with social cognition psychometrics. Our results suggest that both evoked and induced components of the EEG are modulated by sex differences in a P/AMS. These results suggest that there may be two dissociable processes underlying a P/AMS. Furthermore, we argue that during the observation of simple movements, socio-cognition does not modulate a P/AMS.

Bernier, R., Dawson, G., Webb, S. & Murias, M. (2007). EEG mu rhythm and imitation in individuals with autism spectrum disorder. *Brain and Cognition*. 64, 228-237.

Cochin, S., Barthelemy, C., Roux, S. & Martineau, J. (1999). Observation and execution of movement: similarities demonstrated by quantified electroencephalography. *European Journal of Neuroscience*. 11:1839-42.

Kilner, M.J., Vargas, C., Duval, S., Blakemore, S-J. & Sirigu, A. (2004). Motor activation prior to observation of a predicted movement. *Nature Neuroscience*, 7(12), 1299-1301.

### 23. Automatic visual perspective taking in children

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It is well-known that 2- to 5-year-old children are prone to egocentric errors on perspective-taking tasks. It is less clear how older children perform such tasks successfully. A level-1 perspective-taking task examined the time it took older children to make perspective judgements. 6-, 8- and 10-year old children (total n=112) and adults completed a computer-based task. Participants were presented with a picture of a room containing an avatar and a number of coloured discs. On each of 48 trials they were cued to take either their own perspective or that of the avatar and then judged the number of discs that could be seen from that perspective. Self and other perspectives were either consistent or inconsistent. All groups were slower and more error prone when presented with inconsistent stimuli. Participants suffered intrusions from the perspective of self when judging the perspective of another and from the perspective of other when judging their own perspective. We have demonstrated that reaction times can be used to study children's perspective-taking. The egocentric interference demonstrated seems to be analogous to errors made by younger children. Interference from another perspective suggests that perspective-taking occurs (perhaps automatically) even when it is not beneficial to task performance.

### 24. Changing dynamics in the mental lexicon: new lexical representations strengthen over time

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Adding a new word to the mental lexicon involves several processes, such as creating a new lexical representation and integrating it with existing knowledge. Some of these processes occur immediately while others operate over a longer period (or during sleep, cf. Dumay & Gaskell, 2007). Here we looked at the representation of meaning and form of novel words. In three two-day studies participants learned novel written words and their meanings (e.g., "feckton is a type of cat"). Different words were trained on each day, and learning was investigated at the end of the Day 2 session. A semantic decision task showed faster RTs to words learned on Day 1 than Day 2, showing explicit access to meaning speeding up over time. In contrast, a semantic priming task (lexical decision primed by semantically associated novel word primes) showed equally efficient online semantic access to Day 1 and 2 words. A similar dissociation appeared in two semantic

judgment tasks (self-paced vs. online). Cued recall of word forms showed an advantage for Day 1 words, demonstrating strengthening form knowledge. We conclude that form representations and explicit speeded access to meaning stabilise over time, while online access to meaning is robust from the onset.

Dumay, N., & Gaskell, M. G. (2007). Sleep-associated changes in the mental representation of spoken words. *Psychological Science*, 18, 35-39.

#### 25. Empathy and executive function in normal aging

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Empathy is thought of as a multifaceted construct involving cognitive perspective-taking, an affective component enabling the individual to share another person's emotional state and self-regulation allowing the maintenance of a distinction between the self and the other person. Recent studies have suggested a role for executive control function in the regulation of empathic responding. The prefrontal cortex has been implicated as an important neuroanatomical substrate of empathy and executive control. Both the prefrontal cortex and executive functioning seem to be disproportionately affected by aging processes, but little is known about changes in empathy and about the relationship between different empathic and executive subcomponents during normal aging. In the present investigation, 108 healthy individuals of three consecutive age groups were assessed on a self-rating scale focusing on cognitive perspective taking, empathic concern and personal distress. Furthermore, standard executive measures of cognitive flexibility, working memory and response inhibition were administered. The oldest group was impaired relative to the younger groups on executive function, but did not show evidence of impaired empathic responding. There were no systematic associations between the different subcomponents of empathy and executive function. The findings suggest that empathy does not necessarily rely upon intact executive function.

#### 26. A comparison of three nonword repetition tests varying in their degree of lexicality.

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Two explanations of nonword repetition (NWR) exist: repetition is constrained by phonological working memory; repetition is limited by the child's long-term lexical knowledge. These two explanations are difficult to tease apart, because many NWR tests have used nonwords that have a lexical component, thereby inviting the use of phonological working memory (to store the nonword) and long-term lexical knowledge (because lexical parts of the nonword activate existing lexical knowledge). We tested 30 children (5;4-6;8) on three NWR tests that varied in lexicality: (1) The CNRep that uses nonwords which include familiar morphemes; (2) The NRT that systematically compares lexical versus non-lexical nonwords; (3) a new NWR test that contained all non-lexical nonwords but included low-probability and very-low-probability phoneme sequences.

The results indicate a clear effect of lexicality: performance was significantly better for the CNRep and the lexical nonwords of the NRT as compared to the non-lexical nonwords of the NRT and the non-lexical nonwords of the new repetition test. Lexicality has a clear effect on repetition performance whereas distinctions across low-frequency items make no difference to performance. This study further supports the necessity for nonwords to be entirely non-lexical to properly test the influence of phonological working memory.

#### 27. Comparing recall of verbal and tonal sequences: Sequence length and serial position effects

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The aim of this paper was to compare short-term recall of novel letter and tone sequences using an analogous behavioural task. A new visual grid response was developed to allow both musicians and nonmusicians to perform letter and tone recall. We tested immediate serial recall of sequences ranging in length from four to eight items (letters or tones). The analysis focused on the main effect of sequence length and the appearance of the serial position curves. There were similar sequence length effects across verbal and tonal conditions, but consistently attenuated primacy and recency in the tone serial position curves compared to the verbal curves. This dual pattern of results did not vary as a function of musical expertise. The results are discussed in terms of the validity of the new response method, the unique demands of comparing verbal and tonal serial recall, and future plans to test verbal and tonal memory in individuals with amusia (tone-deafness). Finally, comment is made upon potential implications for the processing of language and music in short-term memory.

#### 28. Encoding and articulation in nonword repetition.

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Nonword repetition (NWR) is a task that has been used extensively to examine children's vocabulary acquisition. However, NWR performance has been explained by both working memory and long-term memory. Since NWR involves both encoding and articulation, identifying the relative contributions of each would shed light on the relative contributions of working memory and long-term memory on the NWR process. This study administered 2-3-syllable nonword recognition and nonword repetition tests on two independent groups of 31 children (M=5;07). The recognition test involved the target nonword presented alongside two foils: a nonword foil (one phoneme of target changed to create another nonword) and a real-word foil (one phoneme of target changed to create a real-word syllable). The repetition test involved recall of the spoken nonword after a specified pause duration (matching the time until the target was heard in the recognition test). The results show that: (a) recognition and repetition accuracy are greater for 2-

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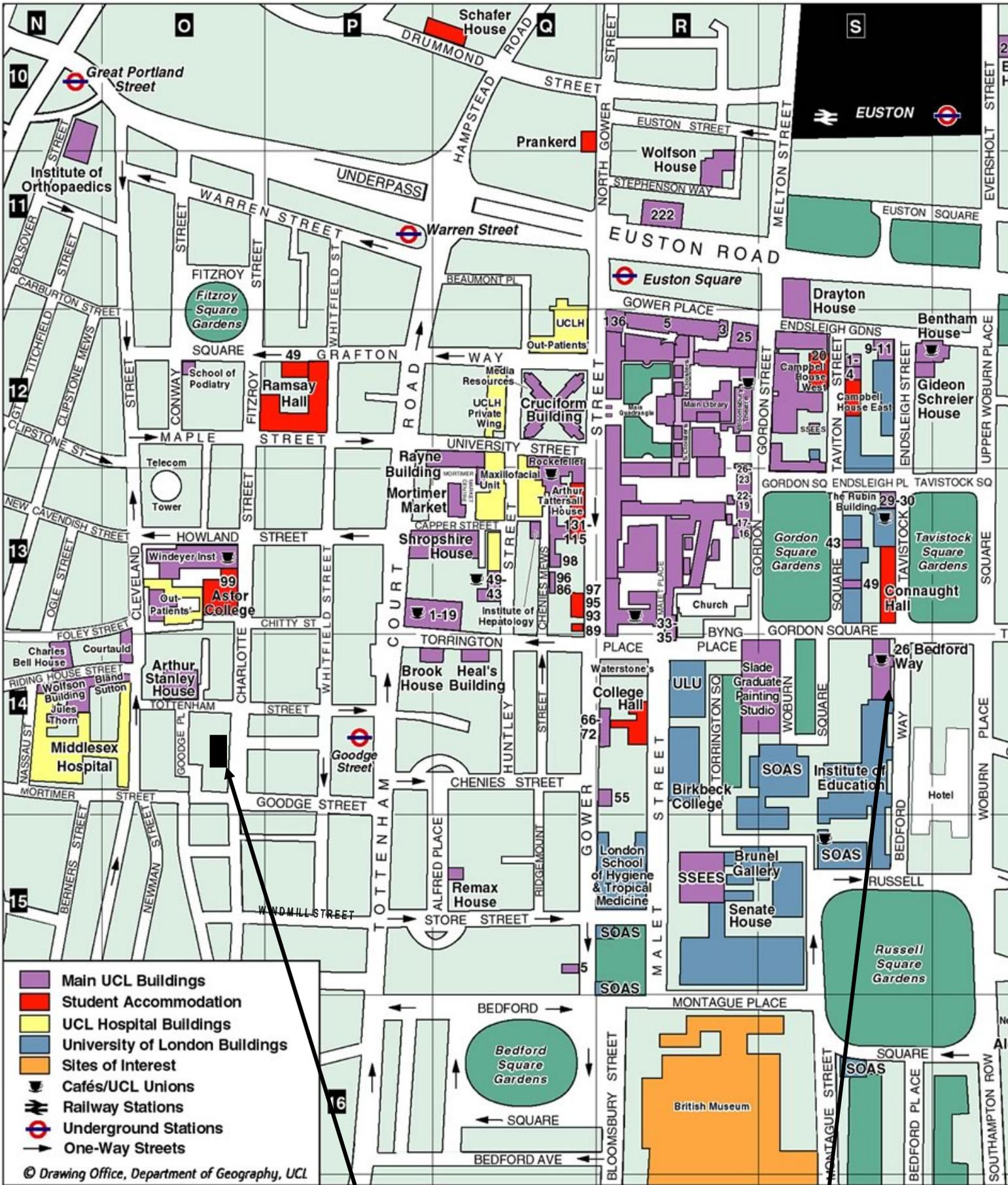
syllable nonwords; (b) recognition and repetition are influenced by lexical knowledge; and (c) the processes of encoding and articulation involve an equal amount of error. Although working memory influences NWR performance, the results indicate that lexical knowledge appears to play the greater role.

#### 29. The role of short term memory in face recognition

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The ability to process faces varies across individuals. Some people claim to never forget a face while others consider themselves poor at recognizing even recent acquaintances. This study examined short term memory (STM) capacity as a source of this variability. Previous researchers have reported that STM capacity correlated positively with performance on a face matching task. In the current study, participants previously classified as good or poor recognisers, were employed to examine the effects of STM using a delayed match-to-sample task. Participants saw 2, 4 or 6 sample faces, followed by a distracter-mask, after which a target face appeared. On each trial, participants judged whether the target face was the same or different as one of the sample set of faces presented earlier. Findings indicated that both groups of performers were faster at making same/different judgements during trials where load was low compared to when it was high. However, whilst good performers were progressively less accurate as load increased from 2 to 6 faces, performance of poor recognisers showed no difference after medium load (4 faces). This suggests that good and poor face recognisers may be differentiated on the basis of their STM capacity.

## NOTES



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