

**E|P|S**

Experimental  
Psychology  
Society

# PLYMOUTH MEETING

10 – 12 JULY 2006

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A scientific meeting will be held at the new Portland Square Building, University of Plymouth on 10 - 12 July, 2006. The local organiser is Professor Jonathan Evans.

### **Symposia:**

Monday, 10<sup>th</sup> July, 2.00pm – 6.00pm

Categorical influences on perception

Organisers: Dr P. Sowden and Professor J. B. Davidoff

Tuesday, 11<sup>th</sup> July, 9.00am – 12.30pm

The neural basis of face perception

Organiser: Dr A. Calder

Tuesday, 11<sup>th</sup> July, 2.00pm – 5.30pm

Human reasoning

Organiser: Professor J. St B. T. Evans

Wednesday, 12 July, 9.00am – 12.30pm

Attributional and source judgements in memory

Organisers: Professor T. Perfect and Dr M. Verde

### **Poster Session**

This will be held in conjunction with the drinks reception on Monday 10<sup>th</sup> July at 6pm in the Atrium B of the Portland Square Building adjacent to the lecture theatres used for the conference. Delegates may put up posters from 12 noon on Monday 10th July and should take them down by 7.30pm.

### **Presentations**

Sessions will be held on the ground floor in lecture theatres Devonport and Stonehouse. Both theatres have OHPs and PCs with data projectors for PowerPoint presentations. Presenters are encouraged to email their presentations ahead of time, or bring them on CD rom or USB, but may provide their own laptops (and connector leads if Mac users). The on-site computers run PowerPoint under Windows XP.

Any queries about facilities in the theatres should be sent to: Professor Jonathan Evans, (jonathan.evans@plymouth.ac.uk 01752 233157).

Tea and coffee will be served on the ground floor in Atrium A.

### **Reception and Conference Dinner**

The School of Psychology, University of Plymouth, welcomes EPS delegates to a drinks reception from 6pm on Monday evening, 10<sup>th</sup> July in Atrium A of the Portland Square Building. The conference dinner will be on campus on Tuesday 11<sup>th</sup> July at 8.00pm at the Babbage Building. The refectory is on the fourth floor with views over Plymouth and Cornwall.

A booking form for the dinner is enclosed.

1-2 LUNCH and COFFEE

Session A

**Devonport Lecture Theatre**

- Symposium:** Categorical influences on perception  
Organiser: Dr Paul Sowden and Professor Jules Davidoff
- 2.00 **Manfred Fahle\*** (Bremen University, Bremen, Germany)  
Perceptual learning and visual categorization
- 2.30 **Debi Roberson, Ljubica Damjanovic\*, and Michael Pilling\***  
(University of Essex and MRC Institute of Hearing Research)  
Categorical perception of facial expressions: A prototype effect?
- 3.00 **Paul T. Sowden and Leslie A. Notman\*** (University of Surrey)  
Influences of categorisation on early visual processing: Evidence from psychophysics
- 3.30 **Joel Fagot\*, Ed Wasserman\*, and Jules Davidoff** (CNRS-INCM  
Marseille, France, University of Iowa, and Goldsmiths, University of  
London)  
Cross-species differences in perceptual processing
- 4.00 TEA (Atrium A)
- 4.30 **Anna Franklin\*, Amanda Holmes\*, Alexandra Clifford\*, and Ian  
R. L. Davies** (University of Surrey and Roehampton University,  
Whitelands College, London)  
The nature of Categorical Perception of colour: Neurophysiological  
evidence from event-related brain potentials on a visual oddball task
- 5.00 **Philippe Schyns\*** (University of Glasgow)  
Learning to attend to diagnostic features
- 5.30 **David J. Freedman\*** (Harvard Medical School, Boston, USA)  
Neuronal mechanisms of visual categorization
- End of Symposium
- 6.00 **Drinks Reception** (Atrium A of the Portland Square Building)  
and  
**Poster Session** (Atrium B of the Portland Square Building)

1-2 LUNCH and COFFEE

Session B

**Stonehouse Lecture Theatre**

- 2.00 **Linda Wheeldon, Mark Smith\*, Ian Apperly, Nicola Bergin\*, and Caroline Townsend\*** (University of Birmingham)  
The effect of syntactic structure on lexical priming during sentence production
- 2.30 **S. Gennari\*, M. MacDonald\*, B. Postle\*, and M Seidenberg\*** (University of York and University of Wisconsin-Madison, USA) (Sponsored by Gerry Altmann)  
Processing ambiguous words in contexts: Semantic and syntactic effects in the representation of motion in temporal cortex
- 3.00 **Dana Samson\*, Catherine Connolly\*, and Glyn W. Humphreys** (University of Birmingham)  
When “happy” means “sad”: A case of an executive semantic processing deficit following damage to the right prefrontal cortex
- 3.30 **Anna Pecchinenda\* and Christiane Ganteaume\*** (University of Hull) (Sponsored by Michal Lavidor)  
Spreading of activation is the mechanism underlying affective priming effects in a semantic categorization task with several response alternatives
- 4.00 TEA (Atrium A)
- 4.30 **David Saldaña\* and Uta Frith** (University of Seville, Spain and Institute of Cognitive Neuroscience, London)  
Can autistic readers access physical and social world knowledge when making inferences from text?
- 5.00 **Russell Hutter\*** (University of Reading) (Sponsored by Philip Beaman)  
Constituent inhibition in incongruent social combinations
- 5.30 **Simone Schnall\*, Kent D. Harber\*, Jeanine Stefanucci\*, and Dennis R. Proffitt\*** (University of Plymouth, Rutgers University at Newark, USA, and University of Virginia, USA) (Sponsored by Tim Perfect)  
Social support and the perception of geographical slant
- 6.00 **Drinks Reception** (Atrium A of the Portland Square Building)  
and  
**Poster Session** (Atrium B of the Portland Square Building)

*Session A***Devonport Lecture Theatre****Symposium:** The neural basis of face perception

Organiser: Dr Andy Calder

- 9.00            **Doris Tsao\*** (Institute for Brain Research, University of Bremen, Germany)  
Neural machinery for detecting and measuring faces in a macaque face area
- 9.30            **Timothy J. Andrews\*** (University of York)  
Are faces and objects represented by a modular or distributed neural code?
- 10.00          **Andrew J. Calder** (MRC Cognition and Brain Sciences Unit, Cambridge)  
Adaptation of eye gaze perception
- 10.30          COFFEE (Atrium A)
- 11.00          **Brad Duchaine\*** (University College London)  
Normal configural processing of non-face stimuli in prosopagnosia
- 11.30          **Olivier Pascalis\*** (University of Sheffield)  
On the development of face processing
- 12.00          **Gemma Calvert** (University of Bath)  
A combined fMRI, MEG and intracranial EEG investigation of audio-visual speech
- End of Symposium
- 12.30          **Michelle de Haan\* and Jane Cownie\*** (UCL Institute of Child Health) (Sponsored by Uta Frith)  
The N170 for fearful faces: Do eyes make all the difference?
- 1-2            LUNCH

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*Session B***Stonehouse Lecture Theatre**

- 9.00            **Rebecca Lawson** (University of Liverpool)  
Local and global processing biases fail to influence face, object and word recognition
- 9.30            **Nathan Weber\*, Anthony Hogan\*, and Paul Williamson\*** (Flinders University, Adelaide, South Australia) (Sponsored by Tim Perfect)  
Do we know what we don't know? A comparison of the confidence-accuracy relationship for positive and negative recognition decisions
- 10.00           **G. Markopoulos\* and A. Rutherford** (Keele University)  
A dual-process approach to global environmental context-dependent memory recognition effects
- 10.30           COFFEE (Atrium A)
- 11.00           **Ian Dennis\*, Hassina Carder\*, and Tim Perfect** (University of Plymouth)  
Can instance theory explain the conclusion congruence effect in repetition priming?
- 11.30           **P. C. Filippopoulos\* and J. H. Wearden** (Keele University)  
The role of reference memory in time judgements
- 12.00           **Stephen Darling, Jelena Havelka\*, and Hamid Aljufairi\*** (University of Edinburgh)  
Working memory, spatial bootstrapping and remembering your PIN number
- 12.30           **Geoff Ward and Lydia Tan\*** (University of Essex)  
The role of inter-item associations on the encoding and retrieval processes in free recall
- 1-2             LUNCH

*Session A***Devonport Lecture Theatre**

- Symposium:** Human reasoning  
Organiser: Professor Jonathan St B. T. Evans
- 2.00      **Keith E. Stanovich\* and Richard F. West\*** (University of Toronto and James Madison University)  
The cognitive correlates of myside bias in natural and constrained contexts
- 2.30      **Steven A. Sloman\*** (Brown University)  
Causal decision making: Choice as intervention
- 3.00      **Simon J. Handley\*, Jonathan St B. T. Evans, Helen Neilens\*, and David E. Over\*** (University of Plymouth and University of Sunderland)  
The mental representation of abstract conditional sentences: A study of qualitative individual differences
- 3.30      TEA (Atrium A)
- 4.00      **Walter Schaeken\*, Wim De Neys\*, and Ellen Gillard\*** (University of Leuven, Belgium)  
Dual task impact on scalar implicatures
- 4.30      **Clare Walsh\*, Ruth Byrne\*, Phil Johnson-Laird, Steven Sloman\* and Giuliana Mazzoni\*** (University of Plymouth, Dublin University, Princeton University, and Brown University, USA)  
Resolving contradictions
- 5.00      **Jonathan St B. T. Evans** (University of Plymouth)  
Discussion session
- End of Symposium
- 5.30      EPS Business Meeting (Stonehouse Lecture Theatre)
- 8.00      Conference Dinner (Babbage Building, 4<sup>th</sup> floor)

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*Session B***Stonehouse Lecture Theatre**

- 2.00            **Ljubica Damjanovic\* and J. Richard Hanley** (University of Essex)  
Remembering faces and knowing voices
- 2.30            **Romina Palermo\*, Laura Schmalzl\*, and Laurie Miller\***  
(Macquarie Centre for Cognitive Science (MACCS), Macquarie  
University, Australia and Neuropsychology Unit, Royal Prince Alfred  
Hospital, Australia) (Sponsored by Andy Calder)  
Affective priming from faces: The influence of spatial frequency,  
prime duration and amygdala damage
- 3.00            **Mike Burton and Markus Bindemann\*** (University of Glasgow)  
How important are eyes for face detection? Not very
- 3.30            TEA (Atrium A)
- 4.00            **Markus Bindemann\*, Rob Jenkins, and A. Mike Burton**  
(University of Glasgow and MRC Cambridge)  
Cues to the direction of social attention: The usual capacity limits for  
face processing?
- 4.30            **E. Charles Leek\* and N. Thacker\*** (University of Wales and  
University of Manchester) (Sponsored by Steve Tipper)  
The structure of 3-D shape representations in human vision revealed  
by eye movement patterns during single object recognition
- 5.00            **Filipe Cristino\* and Roland Baddeley** (University of Bristol)  
Where do we look when walking down the street?
- 5.30            EPS Business Meeting (Stonehouse Lecture Theatre)
- 8.00            Conference Dinner (Babbage Building, 4<sup>th</sup> floor)

*Session A***Devonport Lecture Theatre**

- Symposium:** Attributional and source judgements in memory  
Organisers: Professor Tim Perfect and Dr Michael Verde
- 9.00            **Deanne L. Westerman\***, **Marianne E. Lloyd\***, and **Jeremy K. Miller\*** (State University of New York at Binghamton, USA, Temple University, and Willamette University)  
When does modality matter? Illusions of recognition memory based on perceptual and conceptual sources of fluency
- 9.30            **P. A. Higham\***, **M. M. Arnold\***, and **D. L. Westerman\*** (University of Southampton)  
Emotional or rational? The basis of the identification effect in recognition memory
- 10.00           **Michael F. Verde\*** (University of Plymouth)  
Metacognition and SDT models of recognition: The role of information selection
- 10.30           COFFEE (Atrium A)
- 11.00           **Tim Perfect and Louisa-Jayne Stark\*** (University of Plymouth)  
Unconscious plagiarism: How to turn “your ideas” into “my ideas” in four easy steps
- 11.30           **Jason L. Hicks\*** (Louisiana State University, U.S.A.)  
The influence of conceptual associations on true and false source memory
- 12.00           **Jon S. Simons** (University of Cambridge, Addenbrooke's Hospital)  
Source memory and the brain: Insights from neuropsychology and neuroimaging
- End of Symposium
- 12.30           **Peter E. Morris and Catherine O. Fritz\*** (Lancaster University)  
Part-set cuing impairment of recall from expository texts
- 1-2              LUNCH

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*Session B***Stonehouse Lecture Theatre**

- 9.00            **Stephen Monsell and Guy Mizon\*** (University of Exeter)  
The impact of recent stimulus-task binding on task-switch costs
- 9.30            **Polly Dalton\* and Charles Spence** (University of Oxford)  
Audiovisual attentional capture in sequential search tasks
- 10.00          **D. T. Smith\* and T. Schenk\*** (University of Durham) (Sponsored by  
Simon Liversedge)  
Saccade planning and covert attention dissociated by an antisaccade  
task
- 10.30          COFFEE (Atrium A)
- 11.00          **Julie Castronovo\*, Marie-Eve Vanhoolandt\*, Virginie Crollen\*  
and Xavier Seron\*** (Unité de Neurosciences Cognitives (NESC),  
UCL, Louvain-la-Neuve, Belgium and Centre de Rééducation  
Neuropsychologique, Cliniques Universitaires Saint-Luc, Brussels,  
Belgium) (Sponsored by Martin Edwards)  
Numerical estimation in blind subjects: Evidence of the impact of  
blindness
- 11.30          **Ian Apperly and Dan Carroll\*** (University of Birmingham)  
How do symbols affect children's strategic reasoning on a reverse-  
contingency task?
- 12.00          **Catherine O'Hanlon\* and Debi Roberson** (University of Essex)  
Linguistic and attentional constraints in the learning of colour and  
shape terms by three-year-olds
- 12.30          **D. Eastough\* and M. G. Edwards** (University of Birmingham)  
Object feature labelling and movement kinematics in prehension
- 1-2            LUNCH

*Session A***Devonport Lecture Theatre**

- 2.00            **Lisa K. Son\*** (Barnard College, New York) (Sponsored by Tim Perfect)  
When metacognition defies cognition: The case of the spacing effect
- 2.30            **Mark Haselgrove, John M. Pearce, and Guillermo R. Esber\***  
(Cardiff University)  
Within-event learning in blocking
- 3.00            **Paul N. Wilson, Tim Alexander\*, and Stuart P. Wilson\***  
(University of Hull and University of Sheffield)  
Cue-interactions between concurrently trained shapes that indicate a target location in a virtual-environment
- 3.30            **Anthony McGregor\* and John M. Pearce** (Cardiff University)  
Overshadowing of spatial learning based on geometric cues
- 4.00            TEA (Atrium A)
- End of meeting

*Session B*

**Stonehouse Lecture Theatre**

- 2.00            **Helen Neilens\***, **Simon J. Handley**, and **Stephen E. Newstead**  
(University of Plymouth)  
Dual processes, training and the selection task
- 2.30            **Sonja M. Geiger\*** and **Klaus Oberauer\*** (University of Potsdam)  
(Sponsored by Jonathan Evans)  
No moles, no molehills? A test of two probabilistic theories of reasoning
- 3.00            **Shira Elqayam\***, **Jonathan Evans**, **David Over\***, and **Eyvind Ohm\*** (Centre for Thinking and Language, University of Plymouth)  
A suppositional theory of disjunctions
- 3.30            **Rachel McCloy\*** and **C. Philip Beaman** (University of Reading)  
When does ignorance make us smart? Additional factors guiding heuristic inference
- 4.00            TEA (Atrium A)
- End of meeting

1. **R. Black\***, **J. Patel\***, **R. Latto**, and **R. Lawson** (University of Liverpool)  
Reducing effective IPD allows identification of more differences in images
2. **Stephanie Burnett\***, **Stephanie Thompson\***, **Geoff Bird\*** and **Sarah-Jayne Blakemore\*** (Institute of Cognitive Neuroscience, UCL) (Sponsored by S Blakemore)  
Self-judged emotion development during adolescence
3. **Robert Child\*** and **Marco Bertamini** (University of Liverpool)  
The surprising benefit of surprise: Unexpected events trigger increased detection of local and non-local changes
4. **Amanda Clapp\***, **Aureliu Lavric**, and **Kathleen Rastle** (University of Exeter and Royal Holloway, University of London)  
ERP evidence of morphological analysis from orthography: A masked priming study
5. **Evridiki Fioratou\*** and **Kenneth J. Gilhooly** (University of Hertfordshire)  
Verbalisation and working memory aid effects on insight and non-insight problem solving
6. **Catherine O. Fritz\***, **Peter E. Morris**, **Caroline Wade\***, and **Peter J. Hampson\*** (Lancaster University and University of the West of England)  
Target familiarity in retrieval practice and multi-trial learning contexts
7. **María J. Funes\***, **Juan Lupiáñez\***, and **Glyn Humphreys** (University of Birmingham and University of Granada)  
Decomposing top-down and bottom-up deficits in conflict adaptation after frontal lobe damage
8. **Christiane Ganteaume\*** and **Anna Pecchinenda\*** (University of Hull)  
(Sponsored by Michal Lavidor)  
The conditionality of the affect-behavior link: Arm-flexion and extension responses depend on the intentional processing of valence but not on the situational meaning
9. **N. R. Harrison\***, **G. F. Meyer\***, and **S. M. Wuerger\*** (University of Liverpool)  
(Sponsored by Rebecca Lawson)  
Crossmodal integration: An event-related potential (ERP) study of motion-specific auditory-visual interaction processes
10. **Daniel Heussen\*** and **James A. Hampton** (City University, London)  
Plausibility of property explanations
11. **L. Hill\*** and **M. O. Scase** (De Montfort University, Leicester)  
The impact of individual features upon face recognition
12. **J. A. Martin\***, **C. Hughes\***, **D. Peters\***, and **M. G. Edwards** (University of Birmingham and University of Worcester)  
Ageing dexterity: Speed or selection?

- 13. Marc Ouellet\*, Christine Haecker\*, and Antje S. Meyer** (University of Birmingham and University of Granada)  
The effects of homophonous and phonologically related primes in object naming tasks
- 14. Sylvie Serpell\*, Steve Newstead, and Simon Handley\*** (University of Plymouth)  
Necessary and possible inference: The role of counter-example search
- 15. Anna L. Southall\*, Glyn W. Humphreys, and Antje S. Meyer** (University of Birmingham)  
Semantic interference in visual search – Effects of age and frontal lobe damage
- 16. Sarah White\*, Elisabeth Hill, and Uta Frith** (Institute of Cognitive Neuroscience, University College London and Goldsmiths College London)  
What can macrocephaly tell us about autism?

**Symposium:** Categorical influences on perception

Organiser: Dr Paul Sowden and Professor Jules Davidoff

Perceptual learning and visual categorization

Manfred Fahle  
Bremen University, Bremen, Germany  
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Both perceptual learning and categorization were usually considered as rather cognitive tasks, subserved by “higher” cortical areas while early sensory areas were, according to this view, just hard-wired filters. But recent psychophysical results in both fields, perceptual learning and categorization, are highly specific for elementary stimulus features such as orientation and visual field position. These results argue for the modification, through training, of even early sensory processing. Both electrophysiological (single cell and field potential) recordings and the results of fMRI studies are compatible with this view of plasticity of primary sensory cortices. There are clear advantages of such “matched” early filters, such as more effective noise reduction. Moreover, some effects of “attention” such as faster and better detection, as well as stronger cortical activation, *might* indeed be caused by an adaptation of early filters under top-down influence. But there are also disadvantages. The early filters must be task-dependent, and thus rely on time-consuming top-down influences from higher cortical areas matching the filters to each actual task. The talk will summarize some of the experimental results favouring an early selection of sensory inputs as a result of perceptual learning and relate these results to the effects of categorization-driven adjustments.

Categorical perception of facial expressions: A prototype effect?

Debi Roberson<sup>1</sup>, Ljubica Damjanovic<sup>1</sup>, and Michael Pilling<sup>2</sup>  
1. University of Essex  
2. MRC Institute of Hearing Research  
[robedd@essex.ac.uk](mailto:robedd@essex.ac.uk)

We report data from three experiments that examined the nature of Categorical Perception (CP) for facial expressions (the phenomenon that morphed stimuli crossing a boundary between categories are discriminated better than items within the category). Verbal interference was found to selectively remove CP for facial expressions but only under blocked conditions. When trials are randomly presented, CP for facial expressions is preserved. However, the pattern of within-category errors is asymmetric, and stimuli closest to the category prototype are erroneously identified more often than those close to the boundary. Moreover, a model based on naming alone fails to accurately predict performance on this task. The data best fit a model in which use of the verbal code (e.g. “happy”) activates a representation of the expression prototype in memory, which is retained as the visual memory fades. A further experiment investigated the phenomenon using Stroop type interference and found similar results.

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Influences of categorisation on early visual processing: Evidence from psychophysics

Paul T. Sowden and Leslie A. Notman  
University of Surrey  
[P.Sowden@surrey.ac.uk](mailto:P.Sowden@surrey.ac.uk)

Whilst intuition might suggest that stimuli that look alike are categorised together it has also been noted that stimuli that are categorised together, come to look more alike and that those that are categorised apart become more dissimilar. Acquisition of such categorical perception (CP), following category learning, has been taken to show an influence of categorisation on perception. However, there has been debate about whether these effects are really localised to early perceptual processing or result from later cognitive processing strategies. We trained observers to categorise a variety of simple (Gabor patches, compound gratings) and complex stimuli (morphed cytological images) and then measured the specificity of acquired CP effects on dimensions of early visual analysis including spatial frequency, retinal location and orientation. We find that for both simple and complex stimuli, acquired CP effects are highly specific to the values on these dimensions experienced during category learning. Further, we find that CP effects do not develop when stimuli are manipulated to reduce the role of intra-cortical connections in early visual analysis. Thus, we argue that acquired CP effects may, in part, reflect categorisation driven adjustments to early perceptual processing.

Cross-species differences in perceptual processing

Joel Fagot<sup>1</sup>, Ed Wasserman<sup>2</sup>, and Jules Davidoff<sup>3</sup>  
1. CNRS-INCM Marseille, France  
2. University of Iowa  
3. Goldsmiths, University of London  
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How do baboons categorize stimuli varying along a continuous dimension? Do they show evidence of categorical perception, or do they process the continuum as such? Two converging lines of research will be presented on these issues. The first one used arrays of icons that differed in entropy; the baboons had to categorize these arrays as showing the same or different conceptual relation. Performance of baboons was a direct function of the entropy, while humans showed a categorical perception profile with a clear-cut boundary between the same (0 entropy value) and different (more than 0 entropy value) stimuli. The second line assessed the processing by baboons of a colour continuum in the green/blue range. Several experiments revealed that baboons do not show evidence of perceptual categorisation with this continuum while humans split the same continuum in two distinct green and blue categories. Psychophysical measurement of perceptual colour thresholds suggested, that this difference between species is more conceptually than perceptually based (Fagot et al., in press). The data will be discussed with respect to Notman, Sowden and Özgen (2005).

Fagot, J., Goldstein, J., Davidoff, J. & Pickering, A. (in press) Cross-species differences in color categorization. *Psychonomic Bulletin and Review*

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Notman, L, Sowden, P.T. & Özgen, E. (2005). The nature of learned categorical perception effects: a psychophysical approach. *Cognition*, 95, B1-B14

The nature of Categorical Perception of colour: Neurophysiological evidence from event-related brain potentials on a visual oddball task

Anna Franklin<sup>1</sup>, Amanda Holmes<sup>2</sup>, Alexandra Clifford<sup>1</sup>, and  
Ian R. L. Davies<sup>1</sup>

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Both adults and infants are faster at discriminating two colours if they belong to a different category (between-category) than the same (within-category), even when between- and within-category chromatic separation sizes are equated (eg., Bornstein & Korda, 1984; Franklin, & Davies, 2004). The underlying nature of this Categorical Perception (CP) effect has been under debate and the role of linguistic, perceptual, memorial and decision processes is still unclear. Here, we recorded adults' event-related brain potentials (ERPs) on a visual oddball task to explore the neurophysiological mechanisms of colour CP. ERPs were recorded in response to a frequent colour (eg., Green1) and in response to two deviant colours that were equal in their chromatic separation from the frequent colour and were either within- (eg., Green2) or between-category (eg., Blue1). The ERPs were analysed to establish the time course and nature of within- and between-category colour discrimination. Significant differences in within- and between-category discrimination were found in the amplitude and latency of components reflecting perceptual processes (eg., the N2/P3a orienting complex). The findings are discussed in relation to the debate about the nature of colour CP.

Bornstein, M.H. & Korda, N. (1984). Discrimination and matching within and between hues measured by reaction times: some implications for categorical perception and levels of information processing. *Psychological Research*, 46, 207-222.

Franklin, A. & Davies, I.R.L. (2004). New evidence for infant color categories. *British Journal of Developmental Psychology*, 22, 349-377.

Learning to attend to diagnostic features

Philippe Schyns  
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When confronted with complex visual stimuli such as faces, objects or scenes, the human recognition system can quickly isolate diagnostic (i.e. task-relevant) information to categorize stimuli. For example, upon seeing a face, the visual system will extract the relevant information to judge its gender, expression, or identity, depending on the cognitive goals of the observer. To study such processes of diagnostic information extraction in an information system such as the brain, three generic questions must be addressed. The first question is that of form: What is the nature of the brain activity

supporting information extraction (i.e. the states of the brain correlated with information processing?) The second question is that of content: What is the information content processed in these brain states? The third question is that of transition: How does information flow from one brain state to the next between stimulus onset and behavioral response? I will present new methods and results that illustrate how information states related to the extraction of facial information can be estimated and interpreted directly from brain activity.

#### Neuronal mechanisms of visual categorization

David J. Freedman  
Harvard Medical School, Boston, USA  
[David\\_freedman@hms.harvard.edu](mailto:David_freedman@hms.harvard.edu)

Our perception of the environment is not a faithful registration of its physical attributes. Instead, we carve the world into meaningful groupings, or categories. For example, knowing that a new gadget is a "camera" instantly and effortlessly provides a great deal of information about its relevant parts and functions. The ability to categorize stimuli is a cornerstone of complex behavior. Categories are evident in all sensory modalities and range from relatively simple (e.g., color perception) to the most abstract human concepts. While much is known about how the brain processes simple sensory features (i.e. color, orientation, and direction of motion), less is known about the neuronal processes that encode the category membership, or meaning, of stimuli. This talk will review a series of experiments aimed at understanding the respective roles of several interconnected brain areas during visual categorization. By recording the activity of individual neurons in monkeys trained to categorize visual stimuli, we found that activity in two brain areas, the lateral prefrontal cortex (PFC) and lateral intraparietal area (LIP), robustly encoded the category membership of visual stimuli. This suggests that both the PFC and LIP may be important stages for the transformation of visual information to more abstract representations of the categorical meaning of visual stimuli.

#### **End of symposium**

#### The effect of syntactic structure on lexical priming during sentence production

Linda Wheeldon, Mark Smith, Ian Apperly, Nicola Bergin, and  
Caroline Townsend  
University of Birmingham  
[l.r.wheeldon@bham.ac.uk](mailto:l.r.wheeldon@bham.ac.uk)

When we have produced a spoken word we can produce it more quickly and accurately on a subsequent occasion. Such lexical repetition effects have been demonstrated in a wide number of tasks and have been shown to be robust and relatively long lived (e.g., Wheeldon and Monsell, 1992). We report five experiments which used a picture description methodology to investigate the effect of lexical repetition across sentences. Participants generated coordinate noun phrase sentences such as "The apple and the dog move up" as well as prepositional sentences such as the "The apple moves towards the dog". In three experiments, a pictured object was repeated across similar

syntactic structures in either similar or different sentence positions. Lexical repetition speeded sentence production only when it occurred on the first item of the target sentence. However, its occurrence was also dependent on the syntactic role of the to-be-repeated word in the prime sentence. In particular, a noun or prepositional phrase did not result in facilitation when it was repeated in subject head position. Two further experiments demonstrate that lexical repetition returns when the effect of syntactic structure is removed. Theoretical explanations for this interaction between lexical and syntactic repetition will be explored.

Wheeldon, L. R. & Monsell, S. (1992). The locus of repetition priming of spoken word production. *Quarterly Journal of Experimental Psychology*, **44**, 723-761.

Processing ambiguous words in contexts: semantic and syntactic effects in the representation of motion in temporal cortex

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Current neuro-cognitive models of language processing propose that lexical semantic attributes are stored in the temporal lobe and subsequently collected for further manipulation in frontal areas like left inferior frontal gyrus (LIFG). In this study, we examined how the brain computes minimal two-word combinations resulting in different interpretations to investigate whether temporal lexical-semantic attributes are processed independently from frontal mechanisms or interact with them. Object-action-ambiguous words like bowl were presented in noun contexts (the bowl) or verb contexts (to bowl), as did unambiguous controls like tray or flog. Critically, ambiguous words required contextual combination to establish an object or action interpretation. LIFG and posterior middle temporal gyrus (PMTG) were both modulated by context and ambiguity (verb contexts elicited more activity than noun contexts and ambiguous words elicited more activity than unambiguous ones). Results in LIFG agree with its known role in semantic selection and syntactic combination but the context effect in PMTG, an area more responsive to action than object lexical-semantic motion attributes, indicates that PMTG received context information (thereby strengthening the contextually appropriate action meaning in verb contexts). Results support an interactive and distributed view of processing engaging distant anterior and posterior.

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When “happy” means “sad”: A case of an executive semantic processing deficit following damage to the right prefrontal cortex

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In the last decade, there has been an accumulating body of evidence showing that semantic processing is not only sustained by the temporal lobes, but also by the prefrontal cortex. In previous studies, it is the left inferior prefrontal cortex that has been associated with semantic processing, especially for executive or controlled aspects of semantic processing. In this study, we report the case of a patient, PW, who had difficulties overruling automatic semantic activation. PW was presented with semantic judgement tasks in which he was asked to choose among a set of words the one which was related to a cue according to a predefined semantic dimension. PW made errors particularly when the distractor word was more strongly associated to the cue than the target (e.g. choosing “sad” instead of “cheerful” as synonym of “happy”) and he made more errors when the task demanded that he match words opposite rather than similar in meaning. Interestingly, the patient’s lesion affected the right (and not the left) prefrontal cortex. This case shows the necessary role of the right prefrontal cortex in executive semantic processing. We suggest that the right side is recruited especially when the demands on executive semantic processing are high.

Spreading of activation is the mechanism underlying affective priming effects in a semantic categorization task with several response alternatives

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Under which circumstances affective priming effects (faster responses when the prime and target have the same valence than when they have a different valence) are due to spreading of activation or to response conflict mechanisms remain unclear. That affective priming effects do not occur in a semantic categorisation task, but occur in an evaluative decision task, provides support to the response conflict account (De Houwer, Hermans, Rothermund, & Wentura, 2002). In contrast, that affective priming effects occur with a conditional pronunciation task in which valent targets are pronounced on the basis of their semantic category provides support to the spreading activation account (Pecchinenda, Ganteaume, & Banse., in press). The present study investigates whether the number of response alternatives in the semantic categorization task impacts the degree to which spreading activation underlies affective priming effects. Participants performed a semantic categorisation task with valent stimuli belonging to four different categories and therefore allowing four response alternatives. Significant affective priming effects were found,  $F(1, 25) = 71.45$ ,  $MSE = 5286$ ,  $p < .001$ , indicating that affective priming due to spreading of activation can be obtained when targets are semantically encoded and there are several response alternatives.

De Houwer, J., Hermans, D., Rothermund, K., & Wentura, D. (2002). Affective priming of semantic categorization responses. *Cognition and Emotion*, 16, 643-666.

Pecchinenda, A., Ganteaume, C., & Banse, R. (in press). Investigating the mechanisms underlying affective priming effects using a conditional pronunciation task. *Experimental Psychology*.

Can autistic readers access physical and social world knowledge when making inferences from text?

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Individuals with autism frequently show impairments in reading comprehension. One explanation could be poor inferencing and inadequate activation of world knowledge. The present study tested this with a task that required participants to answer world-knowledge questions that were either relevant or irrelevant given the preceding text (Singer & Halldorson, 1996). Sixteen normally developing adolescents and 16 poor comprehenders with autism were matched on word reading, chronological age and IQ. Accuracy was at ceiling, while reading times differed between conditions. Thus, for example, the question: “*Can people cry because they are happy?*” was read faster when it was relevant to the preceding sentences, such as “*Maria had never won a race before. The tears streamed down Maria’s face*”, compared to being preceded by “*Maria had never lost a race. The tears streamed down her face*”. One experiment involved physical world knowledge, the other social world knowledge and in both a main effect was found, showing that relevant questions were read more quickly than irrelevant questions. No interaction of group by question type was found, indicating that autistic readers, just like controls, were activating appropriate world knowledge primed by the inferences they had made. These results suggest that in our autistic readers comprehension problems were not due to an inability to make implicit inferences or to draw on relevant world knowledge.

Singer, M., & Halldorson, M. (1996). Constructing and validating motive bridging inferences. *Cognitive Psychology*, 30 (1), 1-38.

Constituent inhibition in incongruent social combinations

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The social perceiver’s world is made up of multiple social categories. Furthermore, the fit between constituent social categories can change perceptions of targets. Indeed, previous research (Kunda, Miller, & Claire, 1990), has shown that perceiving incongruent combinations, e.g. a ‘Harvard educated Carpenter’, is likely to

result in the generation of new 'emergent attributes' that are independent of the constituents. A further consequence of incongruent combination that has received less attention is the inhibition of 'constituent attributes' (attributes common to both the constituents and combination). In Experiment 1, participants generated attributes for congruent or incongruent social category combinations. Descriptions of the incongruent combination were less likely to use constituent attributes, suggesting inhibition in constituent application. In Experiment 2, when the number of attributes generated was held constant across incongruent and congruent combinations, participants describing the incongruent combination not only reduced constituent attributes but also produced more emergent attributes. Therefore, supporting the idea that when compelled to think about incongruent combinations perceivers not only reduce constituent application but in turn produce more emergent attributes. In Experiment 3, it was shown that the reduction in constituent attributes is driven by executive resources, specifically those tapping inhibition.

Kunda, Z., Miller, D. T., & Claire, T. (1990). Combining social concepts: The role of causal reasoning. *Cognitive Science*, 14, 551-577.

#### Social support and the perception of geographical slant

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Research has shown that the perception of geographical slant is influenced by physiological resources available to the perceiver. In two studies we found that psychosocial resources can also affect slant perception. Participants who were encumbered with a heavy backpack estimated a hill to be less steep when they had a friend at their side, compared to participants who were alone (Experiment 1). Similarly, participants who thought of a significant other during an imagery task found the hill less steep than participants who either thought of a disliked person, or a neutral person (Experiment 2). In both studies, the effects were moderated by the quality of the supportive relationship. Confounds such as mood, social desirability, and social facilitation did not account for these effects. Thus, psychosocial resources appear to affect how the physical world is perceived.

**Symposium:** The neural basis of face perception  
Organiser: Dr Andy Calder

Neural machinery for detecting and measuring faces in a macaque face area

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What are the neural circuits underlying face perception in primates? Using functional magnetic resonance imaging (fMRI) in alert monkeys, we found three regions in the temporal lobe that show increased blood flow to images of faces compared to images of objects. In two macaques, single-unit recordings targeted to the largest face-selective region revealed that 97% of the visually responsive neurons (N = 316) in this region were strongly face selective, indicating that a dedicated cortical area exists to support face processing in the macaque. The unprecedented access to a large, homogenous population of face cells allowed us to examine in detail single-cell mechanisms for face coding. Experiments with a sequence of cartoon faces rapidly changing along 20 feature dimensions (e.g., face aspect ratio, pupil size) revealed that most cells were tuned to small subsets of facial feature dimensions (3.3 dimensions on average). Tuning to different parameters was independent and usually ramp-shaped, suggesting face coding by dimensions rather than exemplars. On the other hand, experiments with inverted cartoon faces revealed the existence of a latent holistic upright face template. Response latency was highly dependent on face integrity, and degraded faces (low contrast, occluded, or scrambled) elicited slower responses.

Are faces and objects represented by a modular or distributed neural code?

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Visual areas involved in object and face recognition form a ventral processing stream that projects toward the temporal lobe. Lesions to this region of visual cortex often result in difficulties in recognizing, identifying and naming different categories of objects. The view that discrete areas of the human temporal lobe are specialised for different categories of objects is supported by neuroimaging studies. For example, some regions of visual cortex are more responsive to faces than to other complex objects; other regions are more active when viewing inanimate objects or places. However, the neural response to any category of object is not restricted to the area that responds maximally to that particular category. Thus, an unresolved question remains what is the functional significance of neural responses to 'non-preferred' stimuli? To address this issue, we have used the technique of fMR-adaptation (the reduction in fMRI activity that follows the repeated presentation of identical images) to ask how different regions within the ventral processing stream contribute to specific aspects of face and object perception.

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We found a reduction in the activity of face-selective regions to repeated presentations of the same face. However, despite the fact that object- and place-selective regions of visual cortex responded to images of faces, we failed to find adaptation to faces. These findings suggest that information about faces is represented by face-selective modules in visual cortex.

#### Adaptation of eye gaze perception

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Neurophysiological studies with macaques have identified cells in the superior temporal sulcus (STS) that respond selectively to particular directions of gaze. A behavioural adaptation paradigm was used to explore whether a similar functional dissociation underlies gaze perception in humans. Before adaptation, observers were accurate at discerning the direction of seen gaze (5° or 10° left or right, and direct). Adaptation to 25° leftward or rightward gaze produced a powerful illusion that caused participants to mistake gaze directed towards the adapted side as direct. This pattern held despite changes in identity, head orientation, or size between the adapting and test stimuli, demonstrating that the findings do not reflect low-level effects. A similar adaptation paradigm was used with fMRI to show that the superior temporal sulcus contains separate neuronal populations tuned to different gaze directions. Leftward adaptation produced a graded response in the right anterior STS, with left gaze showing the least activation, followed by direct gaze, and right gaze the most; the converse pattern was found following rightward gaze adaptation, with right gaze showing the least activation and left gaze the most. These findings provide evidence of separable coding of different gaze directions in humans and are consistent with neurophysiological recording in non-primates.

#### Normal configural processing of non-face stimuli in prosopagnosia

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It is well established that faces are processed by configural mechanisms. This configural processing could be the product of face-specific mechanisms or general purpose configural processing mechanisms. If they are general purpose, prosopagnosics should show impairments with a wide range of tasks involving configural processing. To determine whether developmental prosopagnosics have problems with face configural processing, they were tested with a task requiring discrimination between faces that differed in either configuration of parts or the face parts themselves. The prosopagnosics showed deficits with face configuration discriminations but also showed comparable deficits with face part discriminations. We then assessed non-face configural processing using three independent measures.

On a task with houses that was parallel to that used with faces, the prosopagnosics performed normally with house configuration and house part discriminations. When tested with a Navon global-local task, the prosopagnosics showed normal levels of global interference on local response times and local interference on global response times. They also showed a normal sized advantage for global response times compared to local response times. Finally the prosopagnosics scored normally on three tests of visual closure, which have been argued to require configural processing. Taken together, these results suggest that developmental prosopagnosics have impairments with content-specific face processing mechanisms. These mechanisms appear to process faces holistically rather than processing facial configuration and facial parts separately.

#### On the development of face processing

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According to Carey (1992), face processing involves an innate system that guides attention to faces and with experience develops into the adult 'expert' system. Despite independent neural mechanisms, the processing of faces and speech appears to follow a common developmental trajectory. For example, infants must be exposed to faces and speech in order for development to proceed normally. Similarly, the perceptual window through which faces and speech are processed during the first year of life appears to narrow with experience; thus, before approximately 9-12 months infants can process non-native speech sounds and nonnative faces on par with their ability to process native speech sounds and native faces. However, after this age infants begin to lose these abilities. Finally, a recent demonstration has revealed that the perceptual window through which speech is processed can be kept open if infants are exposed to non-native languages before the end of the first year (Kuhl et al., 2003). A similar phenomenon with faces has been reported specifically we demonstrate that exposure to monkey faces between 6 and 9 months of age facilitates their discrimination, an ability that is otherwise lost around 9 months of age (Pascalis et al., 2002; Pascalis et al., 2005). Face processing continues however to undergo changes for many years before developing into the adult system.

Carey, S. (1992). Becoming a face expert. *Philosophical Transactions of the Royal Society of London*, 335, 95-103.

Kuhl, P. K., Tsao, F.M. & Liu, H.M. (2003). Foreign-language experience in infancy: Effects of short-term exposure and social interaction on phonetic learning *Proceedings of the National Academy of Science*, USA, 100, 9096-9101  
Pascalis, O., Scott, L.S., Kelly, D. J., Shannon, R.W., Nicholson, E., Coleman M. & Nelson C.A. (2005). Plasticity of Face Processing in Infancy. *Proceedings of the National Academy of Science*, USA, 102, 5297-5300.

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A combined fMRI, MEG and intracranial EEG investigation of audio-visual speech

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Combining information from the different senses can dramatically improve the detection and discrimination of external stimuli and speed responsiveness. Given the ubiquitous nature of crossmodal processing for human experience, knowledge of the underlying neurophysiology seems vital for a complete understanding of human sensory perception. Modern human brain imaging techniques now provide a means of characterising the neural bases of these intersensory interactions. In our laboratory, we have used a combination of imaging techniques including functional magnetic resonance imaging (fMRI), magnetoencephalography (MEG) and electrocorticography (EcoG) to explore these phenomena. By combining the information obtainable from these different methodologies, in some instances in the same subjects and using the same paradigms, we are beginning to elucidate many of the brain areas involved in multisensory integration and the time course of information flow through these emerging networks.

**End of symposium**The N170 for fearful faces: Do eyes make all the difference?

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The N170 is a face sensitive component in the event-related potential (ERP) that is larger in amplitude and often shorter in latency for faces compared to other objects. There is disagreement as to whether the emotional expression of the face affects the N170. While some studies find no influence, those that do often report larger amplitudes for fearful faces compared to other expressions or neutral faces. Since the eye region is known to influence the amplitude of the N170, it is possible that fearful faces can elicit enhanced N170's primarily because of their characteristic widened eyes. To investigate this possibility, we recorded 128-channel ERPs of 18 adults while they viewed images of intact happy and fearful faces as well as composite images where the top (eye region) of the face displayed one expression and the bottom the other. The N170 showed larger amplitudes to faces with fearful eyes, regardless of the expression displayed in the lower half of the face ( $p < 0.05$ ). These results suggest that the enhanced N170 to fearful faces, when found, is due to the salience of the eye region.

Local and global processing biases fail to influence face, object and word recognition

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Three studies investigated whether encouraging people to use either global or local processing influenced their recognition memory for upright and inverted pictures of faces, objects and words. Contrary to the results of Macrae and Lewis (2002), no effect of processing bias was found. In particular, encouraging global processing did not improve the recognition of upright faces whilst encouraging local processing failed to improve the recognition of words. These results suggest that using the Navon task to manipulate people's processing strategy typically does not have a large, consistent effect on recognition memory. Instead, using a Navon task to encourage either global local processing may only be effective under restricted circumstances. Therefore the processing bias effect does not provide researchers with a powerful, reliable tool with which to investigate the relative importance of local versus global, configural processing of visual stimuli.

Macrae, C. N., & Lewis, H. L. (2002). Do I know you? Processing orientation and face recognition. *Psychological Science*, 13, 194-196.

Do we know what we don't know? A comparison of the confidence-accuracy relationship for positive and negative recognition decisions

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In both face recognition and eyewitness identification, different confidence-accuracy relationships have been observed for positive (i.e., old) and negative (i.e., new) recognition decisions. Specifically, negative decisions display poorer resolution than positive decisions. Here, we present one experiment testing an explanation (the information asymmetry hypothesis) of this finding. This explanation holds that superior resolution will be observed when a one-to-one match between the test stimulus and a single item in memory is a possible basis for a confidence judgment. A two-phase semantic memory paradigm was used to compare confidence-accuracy resolution for negative recognition decisions where the correct answer was known with the resolution for negative decisions where the correct answer was not known. In phase 1 participants were presented with a general knowledge question and a single answer. They indicated whether the answer was correct or incorrect, and estimated their confidence in the accuracy of their decision. In phase 2, for all questions to which participants responded "incorrect" in phase 1, they provided the correct answer or responded "don't know". Consistent with the information asymmetry hypothesis, superior resolution was observed for questions where a one-to-one match between the test stimulus and an item in memory was possible.

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A dual-process approach to global environmental context-dependent memory recognition effects

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Global environmental context (EC)-dependent memory effects have been unreliable when free recall is tested and rarely observed when recognition is tested (Smith & Vela, 2001). An experiment was conducted that manipulated global EC and tested recognition memory using a two-step independent remember / know (IRK) procedure including guess as an option (Yonelinas & Jacoby, 1995; Eldridge, Sarfatti & Knowlton, 2002). EC effects were observed with recollection estimates as measured by the two-high threshold index  $P(c)$ . EC effects also were observed with familiarity, as measured by  $d'$ . In light of these findings and other studies, a dual-process explanation which incorporates Bjork and Richardson-Klavehn's (1989) mental reinstatement hypothesis is proposed to explain the apparent unreliability of EC effects.

Bjork, R.A. & Richardson-Klavehn, A. (1989). On the puzzling relationship between environmental context and human memory. In C. Izawa, (ed.), *Current issues in cognitive processes: The Tulane Flowerree Symposium on Cognition*. (pp. 313-344). Hove: Erlbaum.

Eldridge, L.L., Sarfatti, S. & Knowlton, B.J. (2002). The effect of testing procedure on remember-know judgments. *Psychonomic Bulletin & Review*, 9, 139-145.

Smith, S.M. & Vela, E. (2001). Environmental context-dependent memory: A review and meta-analysis. *Psychonomic Bulletin & Review*, 8, 203-220.

Yonelinas, A.P. & Jacoby, L.L. (1995). The relation between remembering and knowing as bases for recognition: Effects of size congruency. *Journal of Memory and Language*, 34, 622-643.

Can instance theory explain the conclusion congruence effect in repetition priming?

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The conclusion congruence effect in repetition priming (Dennis & Schmidt, 2003) was further investigated in a series of experiments using a size comparison task. Participants were required to decide which of a pair of nouns related to the larger object. When words were re-paired between priming trials and test trials responses were faster and more accurate when the conclusion concerning a word (i.e. larger or smaller) was congruent with that on the priming trial than when it was incongruent. Performance was unaffected by congruency between the hand used for responding on priming and test trials or the relative frequency of congruent and incongruent conclusions.

However, the same final size comparison task showed no conclusion congruency effect and less overall priming when the priming task required participants to decide which object is closer in size to a football. The results will be discussed in relation to Instance Theory and Stimulus-Task-Conclusion bindings.

Dennis, I. & Schmidt, K.J. (2003). Associative Processes in repetition priming. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 29, 532-538.

#### The role of reference memory in time judgements

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A central distinction in Scalar Expectancy Theory (SET) is that between reference memory and working memory for duration, with the first storing “standards” needed for the task, and the second storing current duration values. The present research explores the distinction by asking whether time judgements are different when people use reference memory and when they don’t, when the durations compared are physically the same. An experiment used a temporal generalisation method, where a standard tone (400ms) was compared with stimuli longer, shorter or equal. One condition involved reference memory, the other (“pseudo-episodic”) required the same time judgements, but without reference memory involvement. Temporal generalization gradients were steeper, and people appeared to make more conservative decisions, when reference memory was used. The effect was present with only one presentation of the standard. It was also confirmed in a second task where the standard duration changed frequently and in a third when feedback was equated between conditions. Why is behaviour different in the two cases? One possibility is that the memory stores postulated by SET are indeed fundamentally different, but another one is that decision processes change in the different procedures.

#### Working memory, spatial bootstrapping and remembering your PIN number

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Working memory is held to comprise, in addition to a central executive component, a visuo-spatial and a verbal subcomponent each dedicated to the temporary storage of different types of information. If such a model is true, then it should be possible to boost capacity on a verbal task by capitalising on the resources of the visuo-spatial temporary memory system if information is presented in a compatible format. In the reported research we present evidence of just such an effect, which we term ‘spatial bootstrapping’, whereby the addition of additional visuo-spatial cues increased the capacity of working memory. Participants were required to retain a sequence of digits which were presented on a screen either singly, in a horizontal row, or in a keypad – style matrix.

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We found that presenting items in a 2-dimensional visual array facilitated memory performance compared to either single items or horizontal rows, suggesting that additional memory capacity can be brought into use on verbal memory tasks if sufficient additional spatial cues are provided. This effect was stronger for those who specifically reported conscious strategy use. Theoretical and practical aspects of these results will be discussed.

The role of inter-item associations on the encoding and retrieval processes in free recall

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Two groups of 24 participants were presented with eight lists of 32 words for free recall under overt rehearsal conditions. The unrelated group received lists composed of words from 32 different categories, the related group received lists composed of 4 words each from 8 different categories. There was little difference in the total number of words rehearsed in the two groups. In both groups the U-shaped serial position curves were transformed to extended recency curves when the data were re-plotted by when they were last rehearsed. Of critical importance was the finding that the words that were rehearsed were also heavily influenced by the semantic relatedness to the just-presented item and their recency of last rehearsal. The data suggest that there are similarities between the processes of “rehearsal” and “recall” and we speculate that both terms may be underpinned by the same cognitive mechanisms.

**Symposium:** Human reasoning

Organiser: Professor Jonathan St B. T. Evans

The cognitive correlates of myside bias in natural and constrained contexts

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Myside bias has been amply demonstrated in numerous empirical studies. People evaluate evidence, generate evidence, and test hypotheses in a manner biased toward their own prior beliefs, opinions and attitudes. We have examined the cognitive correlates of myside bias in both natural and constrained contexts. Natural myside bias is the tendency to evaluate propositions from within one's own perspective when given no instructions or cues (such as within-subjects conditions) to avoid doing so. Constrained contexts are those which either contain instructions to decouple from one's prior beliefs or else contain strong cues (such as within-subjects conditions) that such decoupling is a task demand. We will report on several experiments indicating that in constrained contexts myside bias is related to both cognitive ability (intelligence) and several thinking dispositions related to epistemic regulation.

In contrast, we have found that the degree of myside bias in natural contexts is relatively independent of intelligence and thinking dispositions. We speculate that ideas from dual-process theory might help to explain why natural myside bias is relatively more dissociated from individual difference variables.

Causal decision making: Choice as intervention

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I propose that people make decisions using a causal model representing mechanisms that support interventions. Choice suspends some of those mechanisms. I report experiments to test the proposal. One type of experiment investigates two-player games with either a Newcomb's paradox or Prisoner's Dilemma payoff structure. Causal structure is manipulated by varying whether participants' choices do or do not affect their opponent's action. The causal model theory predicts that participants will choose the dominant option when their action does not affect their opponent but the non-dominant option when it does. The hypothesis was broadly supported when causal structure was salient and payoffs made causal reasoning worthwhile. Nevertheless, participants did show a propensity to violate simple causal logic by choosing a single box in the Newcomb's case or by cooperating in Prisoner's Dilemma. Further experiments examine two hypotheses to explain these violations: First, I show that people reason by analogy, a noncausal type of reasoning. Second, I examine whether people make choices to signal desirable facts to themselves. This latter factor involves an inference that opposes causal directionality and requires self-deception.

The mental representation of abstract conditional sentences: A study of qualitative individual differences

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Recent studies have shown the existence of two qualitatively distinct groups of people based on how they judge the probability of a conditional statement. The present study was designed to test whether these differences are rooted in distinctive mental representations of conditional statements and whether they are linked to differences in general intelligence. In the study, 120 participants each completed three separate cognitive tasks involving the processing of abstract conditional statements: the probability of conditionals task; the conditional truth table task and the conditional inference task, in addition to completing a test of general intelligence (AH4). The results showed a number of predicted effects: people responding with conditional (rather than conjunctive) probabilities on the first task were higher in cognitive ability, showed

reasoning patterns more consistent with a conditional, rather than a biconditional representation, and a strongly ‘defective’ truth table pattern. Results of a *post hoc* cluster analysis showed that subset of the conditional probability responders (higher in cognitive ability) showed very distinct reasoning patterns on the other two tasks including almost total resistance to the well known matching bias effect. The results include several novel findings and post challenges to contemporary psychological theories of conditionals.

#### Dual task impact on scalar implicatures

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We present a series of studies in which the dual task methodology was used to test opposing psychological processing predictions concerning the nature of implicatures in pragmatic theories and in reasoning theories. Implicatures routinely arise in human communication when hearers interpret utterances pragmatically and go beyond the logical meaning of the terms. The neo-Gricean view (e.g., Levinson, 2000) assumes that implicatures are generated automatically whereas Relevance Theory (Sperber & Wilson, 1996) assumes that implicatures are effortful and not automatic. Participants were presented a sentence verification task with underinformative sentences that have the potential to produce scalar implicatures like *Some oaks are trees*. Depending on the nature of the interpretation of *Some* (logical or pragmatic) the sentence is judged true or false. In a series of experiments, executive cognitive resources were experimentally burdened by the concurrent memorization of complex dot patterns during the interpretation process.

#### Resolving contradictions

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In everyday life, people frequently revise their beliefs and predictions when they encounter unexpected information. Our studies examine how people do so. For example, imagine you believe the following:

If you follow diet A, you will have a good supply of iron.

Mark followed this diet.

How would you explain the situation, if you subsequently discovered that, in fact, Mark did not have a good supply of iron? I will describe studies that examine the nature of people’s explanations and their tendency to focus on a single explanation and use it to update their predictions about related events.

I will also describe studies which examine how people resolve contradictions by revising their autobiographical beliefs. I will discuss the implications for formal theories of belief revision and for our understanding of human learning.

Discussion session: Led by Jonathan St B. T. Evans

### **End of symposium**

#### Remembering faces and knowing voices

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This study used the distinction between 'Remember' and 'Know' (R/K) recognition responses to investigate the retrieval of episodic information during familiar face and voice recognition. The results showed that familiar faces were more likely to be recognised with R responses than voices whereas voices were more likely to be recognised with K responses than faces. The same pattern was observed even when overall levels of recognition were matched between faces and voices by blurring the faces. The results suggest that episodic and semantic information are more readily accessible from familiar faces than from familiar voices. In addition, episodic information about a familiar person was never recalled unless semantic information was also retrieved. This finding suggests that access to episodic memory occurs after information about a familiar person has been retrieved from semantic memory.

#### Affective priming from faces: The influence of spatial frequency, prime duration and amygdala damage

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It has been proposed that facial expressions, particularly those conveying threat, are rapidly and coarsely processed via a subcortical pathway to the amygdala. This pathway may be especially tuned to low spatial frequency information, with increased activation of the superior colliculus, thalamus and amygdala to low, rather than high, spatial frequency fearful faces. This study used an affective priming task to examine the impact of different types of spatial frequency information on affective processing in healthy controls and individuals with temporal lobe epilepsy that may have amygdala damage. Low, high, and broad spatial frequency facial expressions were used as primes to examine whether the spatial frequency of the prime face modulates affective priming. Affective priming was apparent with both low and high spatial frequency prime

faces when they were presented for 200 ms, but not when the prime faces were presented for 17 ms. In addition, affective priming appears to be reduced for individuals with right temporal lobe epilepsy, suggesting that right hemisphere structures may be involved in affective priming from facial expressions.

How important are eyes for face detection? Not very

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Face detection is rather little-studied in psychology, despite being an active research area in engineering. Lewis & Edmunds (2005) have recently demonstrated that luminance reversal slows face detection, but (for example) familiarity has no effect. Here we examine the hypothesis that two eyes horizontally-aligned, are important for face detection. In experiment 1, inverted faces produce a small increase in RTs for a face/object decision. However, a face rotated through 90 degrees (so that eyes are vertically aligned) produces only the same small effect. In experiment 2, profile faces (with only one eye visible) produce only the same decrement as inverted full-face stimuli. In experiment 3, faces scrambled such that eyes are diagonally aligned produce only the same small decrement. We conclude that face detection is not driven by horizontally-aligned eyes, but by lower-level image properties.

Lewis, M.B. & Edmunds, A.J. (2005). Searching for faces in scrambled scenes. *Visual Cognition*, 12, 1309-1336.

Cues to the direction of social attention: The usual capacity limits for face processing?

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We have recently demonstrated capacity limits for face processing in a task requiring subjects to classify a central stimulus, while ignoring a flanker. In this situation, faces do not interfere with faces, despite the fact that target faces can be disrupted by flanking stimuli of other kinds, and flanking faces can interfere with non-face targets (Bindemann, Burton & Jenkins, 2005). Here we examine whether similar processing limits exist for face cues to a person's social attention. Eye-gaze and head orientation are salient face components, capable of inducing rapid responses. Consequently, we reasoned that gaze and head information might elude established face-processing bottlenecks. Experiment 1 employed full-face stimuli with left- and right-averted eye-gaze, and hand comparisons, pointing left or right. Whereas hand flankers interfered with directional decisions to target hands and faces, eye-gaze flankers did not produce these interference effects. Experiment 2 replicated this pattern despite controlling for loss of visual acuity to the peripheral face flankers.

In a further experiment, left- and right-turned head flankers produced reliable interference, independent of target type. These results are discussed in relation to existing research on face perception and visual attention.

Bindemann, M., Burton, A.M., & Jenkins, R. (2005). Capacity limits for face processing. *Cognition*, 98, 177-197.

The structure of 3-D shape representations in human vision revealed by eye movement patterns during single object recognition

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A fundamental question for vision research concerns how the visual system represents the shapes of three-dimensional (3-D) objects for recognition. To examine this issue we measured eye movement patterns during single object identification. While eye movements have been widely studied in a variety of other contexts there is surprisingly little evidence about eye movement patterns in relation to single object recognition. We asked three questions. First, do eye movement patterns show preferences for specific types of shape features? Second, are gaze preferences consistent between stimulus encoding and recognition? Third, are they invariant across changes in 3-D viewpoint and illumination? Eye movements were recorded while Ss attempted to first encode and then recognize the shapes of novel 3-D grayscale objects each composed of distinct volumetric components. An area of interest (AOI) analysis revealed remarkable consistency in the eye movement patterns between the learning and testing phases, and across different viewpoints of the same objects. Surprisingly, these gaze patterns cannot be predicted from current models based on the saliency of local regions of edge, colour and orientation in the image. Rather, the results suggest that fixation patterns during object recognition are driven by higher-level 3-D object representations.

Where do we look when walking down the street?

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We recorded seven videos of street scenes using a head mounted camera, and played these videos, together with six spatiotemporally bandpass filtered versions, to subjects whilst recording their eye movements. Using this large data set (24 million eye movements), we first attempted to characterise the spatial and temporal frequency characteristics of the eye movements generating system. Using a mixture modelling technique, we found the eye movement system to be very broadly tuned, with a peak sensitivity around 7 hertz and 0.5 cycles per degree. We then analysed our data to find evidence for separate motion and spatial channels.

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Despite this being consistent with the physiology, fitting various probabilistic models to the data showed no evidence for separate channels. Strong evidence instead was found that the global determination of fixation not being determined by low level features, with subjects fixating to similar locations when viewing differently filtered videos that shared no common features. They often fixated locations that, whilst behaviourally important, were essentially blank (having no image features). We conclude that whilst low level salience may be important in determining the local localisation characteristics of eye movements, much higher level processes are responsible for the global directing of eye movements.

**Symposium:** Attributional and source judgements in memory

Organisers: Professor Tim Perfect and Dr Michael Verde

When does modality matter? Illusions of recognition memory based on perceptual and conceptual sources of fluency

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Previous research has shown that fluency-based illusions of recognition memory are modulated by the sensory match between the study and test phases of an experiment. For example, enhanced visual fluency of test stimuli, which typically leads to an illusion of recognition when both the study and test are visual, does not affect recognition when the study list is auditory and the recognition test is visual. Additional experimental results have suggested an explanation based on participants' attributions regarding the relevance of fluency to the recognition decision (Westerman et al., 2003). Past research on this topic used a perceptual priming manipulation to enhance the fluency of test words. The current study compared the role of sensory modality in fluency-based memory illusions that are produced by perceptual and conceptual manipulations of processing fluency. The results show that perceptually-based manipulations of fluency lead to illusions of recognition that are sensitive to the sensory modality of the study and test phases. However, illusions of recognition that result from more conceptually-based fluency manipulations are not influenced by the modality of the study and test phases.

Westerman, D.L., Miller, J.K., & Lloyd, M.E. (2003). Change in perceptual form attenuates the use of the fluency heuristic in recognition. *Memory & Cognition*, 31, 619-629.

Emotional or rational? The basis of the identification effect in recognition memory

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Higham and Vokey (2000, 2004) demonstrated that correct identification of a briefly presented word increases the bias to respond “old” when the same word is presented for recognition immediately after the identification attempt. For a variety of reasons, we do not believe that this bias is fluency based like the Jacoby-Whitehouse effect (e.g., R rather than K responses are influenced). However, there are at least two plausible hypotheses that can account for it. The discovery-misattribution hypothesis suggests that there is confusion between the subjective AHA! experience associated with correct identification on the one hand and the feeling of recollection on the other (Dougal & Schooler, 2006). Another is that participants unemotionally observe their own identification performance and use that performance as a heuristic for recognition because it is diagnostic of prior presentation; success is attributed to oldness and failure is attributed to newness (Higham & Vokey, 2000). Experiments will be described that attempt to distinguish between these alternative hypotheses.

Higham, P.A., & Vokey, J.R. (2004). Illusory recollection and dual-process models of recognition memory. *Quarterly Journal of Experimental Psychology*, 57, 714-744.

Higham, P.A., & Vokey, J.R. (2000). Judgment heuristics and recognition memory: Prime identification and target processing fluency. *Memory and Cognition*, 28, 574-584.

Dougal, S., & Schooler, J.W. (2006). Discovery misattribution: When solving is confused with remembering. Manuscript submitted for publication.

Metacognition and SDT models of recognition: The role of information selection

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Recognition memory models based on signal detection theory (SDT) typically adopt a two-stage approach to the judgement process: First, retrieval mechanisms generate evidence. Second, the observer uses a subjective decision rule to interpret this evidence. In SDT models, the role of metacognitive decision-making has largely been relegated to the second stage, the placement of the decision criterion (response bias). I present data from two memory illusion paradigms, the *revelation effect* and the *Jacoby-Whitehouse effect*, that illustrate the influence of metacognition on evidence generation. Specifically, observers may be selective about the type of information (e.g., source vs. familiarity) included in the judgement process, and this can affect accuracy independent of response bias.

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Unconscious plagiarism: How to turn “your ideas” into “my ideas” in four easy steps

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People often misattribute ideas that others have generated as being their own, a phenomenon known as unconscious plagiarism (UP). In a series of laboratory studies we have been exploring the cognitive precursors of such errors, by manipulating the ways in which people think about ideas between generation and criterion test. Contrary to simple strength-based accounts, imagining other’s ideas does not lead to increased rates of UP, relative to control. However, generating improvements to other’s ideas substantially increases UP, whether measured in a recall task, or a source monitoring task. We will present a series of studies designed to understand the why differential rates of UP are seen following, imagination and generation, and relate these to everyday cases of UP.

The influence of conceptual associations on true and false source memory

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I will discuss recent work from my laboratory exploring the impact of associative relationships on source memory decisions. In an associative false memory paradigm, source attributions to false memories are influenced more by the source of high-strength studied associates as opposed to low-strength studied associates. In a standard source memory paradigm, studying some associates (e.g., rocking, table) to a target (e.g., chair) in one source significantly impairs source memory for the studied target when it was presented in a different source. Yet when the source of the associates and the target is the same, the increase in source memory for the target is much weaker. Together, these paradigms help shed light on the effect of conceptual associates on source memory specifically and on the nature of source retrieval in general.

Source memory and the brain: Insights from neuropsychology and neuroimaging

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Several cognitive theories of source memory suggest that recollection can involve the retrieval of many different kinds of information about the context in which an event occurred, including where and when the event took place, as well as our thoughts and feelings at the time. Such theories also indicate that there may be a number of different information processing stages during retrieval, including the specification of retrieval strategies and the recovery and subsequent monitoring of stored information. I will present data from a number of neuropsychological and neuroimaging experiments that have investigated how these processes may be realised in the brain.

The use of analogous methodologies across fMRI and patient experiments enables evidence to be sought about the involvement, and necessity, of different brain regions for successful recollection. These experiments have highlighted important roles for areas of prefrontal cortex, medial temporal lobe and parietal cortex. In particular, I will focus on the involvement of anterior prefrontal cortex, of which lateral and medial regions may support distinct stages of the retrieval process.

### **End of symposium**

#### Part-set cuing impairment of recall from expository texts

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In two experiments we extend the study of part-set cuing to the recall of expository texts. In studies of part-set cuing, some tests are accompanied by a subset of the material that is to be recalled, providing the opportunity for it to cue recall of the remaining material. Surprisingly, for list materials, these cues often impair recall. However, facilitation does occur for serial lists cued with items presented in the original order and no effect of cues is found for some materials such as the placement of pieces in chess games. In Experiment 1, recall of two expository text passages was tested with and without half of the statements from the text passages being presented as part-set cues in the same order as the original text. Unlike serial word recall, the cues strongly impaired recall of the remainder of the passages (Cohen's  $d = 1.2$ ). Experiment 2 repeated Experiment 1 but presented the cues in random order and found a much smaller but still significant impairment from cuing ( $d = 0.3$ ). These results, taken together, are problematic for several existing theoretical explanations of part-set cuing.

#### The impact of recent stimulus-task binding on task-switch costs

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Control of task-set involves a delicate balance between top-down endogenous control and exogenous driving of processing by the stimulus. Stimuli activate not just responses but also task-sets recently associated with them. Waszak, Hommel and Allport (2003) have argued that associative "binding" of task-set to stimulus is a major source of the observed costs of switching tasks, because of the greater vulnerability to competition on switch trials.. We report a task-cueing experiment with careful manipulation of the most recent stimulus-task association. The set of stimuli was either very large, so that each stimulus occurred only twice, or small, so that stimuli were repeatedly associated with both tasks; the cue-stimulus interval was either long enough or too short for task-set preparation. In all cases, recent association with a competing task increased RT and error rate, but no more so on task-switch than on task-repeat trials. Hence stimulus-task associations, although an important determinant of performance, were not a source of task-switch costs.

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Waszak, F., B. Hommel, et al. (2003). Task-switching and long-term priming: Role of episodic stimulus - task bindings in task-shift costs. *Cognitive Psychology*, **46**, 361-413.

Audiovisual attentional capture in sequential search tasks

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The phenomenon of attentional capture has typically been studied in spatial search tasks. Dalton and Lavie (2004) recently demonstrated that auditory attention can also be captured by a singleton item during sequential search tasks. In the experiments reported here, we investigated whether these findings extend crossmodally to sequential search tasks using audiovisual stimuli. Participants searched a stream of centrally-presented audiovisual stimuli for targets defined on a particular dimension (e.g., size) in a particular modality. Task performance was compared in the presence versus absence of a singleton distractor in the irrelevant modality that was unique on an irrelevant dimension (e.g., duration). Irrelevant auditory singletons captured attention during visual search tasks, leading to interference when they coincided with distractors but to facilitation when they coincided with targets. These results are the first to demonstrate audiovisual attentional capture in sequential search tasks.

Dalton, P., & Lavie, N. (2004). Auditory attentional capture: Effects of singleton distractor sounds. *Journal of Experimental Psychology: Human Perception and Performance*, *30*, 180-193.

Saccade planning and covert attention dissociated by an antisaccade task

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The controversial premotor theory proposes that covert attention (i.e. shifts of attention that are independent of gaze direction) is the product of planned but unexecuted eye-movements. Although there is considerable evidence of an anatomical overlap between the neural structures that mediate eye-movements and covert attention, the suggestion planned eye-movements are *necessary* for the orienting of covert attention remains hotly debated. Here we show that a colour singleton can capture attention, thus facilitating the discrimination of a concurrently presented visual probe, without facilitating saccadic latencies to the same location. This result suggests that the improved probe discrimination was not the product of a planned eye-movement, demonstrating that planning a saccadic eye-movement is not a necessary precondition for a covert attention shift. These findings are consistent with data from primate neurophysiology which indicate that saccade planning and visual selection can be dissociated in the frontal eye field, a neural structures known to be involved in both visual attention and saccade planning (Juan, Shorter-Jacobi, & Schall, 2004; Thompson, Biscoe, & Sato, 2005)

Juan, C.H., Shorter-Jacobi, S. M., & Schall, J. D. (2004). Dissociation of spatial attention and saccade preparation. *Proceedings of the National Academy of Sciences of the United States of America*, *101*(43), 15541-15544.

Thompson, K.G., Biscoe, K.L., & Sato, T. T. (2005). Neuronal basis of covert spatial attention in the frontal eye field. *Journal of Neuroscience*, *25*(41), 9479-9487.

Numerical estimation in blind subjects: Evidence of the impact of blindness

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Vision was for a long time considered as playing an important role in the elaboration of the semantic numerical representation. However, the lack of vision since birth or early childhood does not seem to preclude the development, like in sighted people, of a spatial continuum oriented from left to right on which numbers are represented (Castronovo & Seron, in press). Here, we show that blindness and its following experience with magnitudes might finally have a positive impact on numerical representations and abilities. Indeed, congenitally or early blind subjects presented, especially with symbolic numerical inputs, better numerical estimation abilities compared to matched sighted subjects, indicating the development and use, for the numerical range examined, either of multiple semantic numerical representations (e.g., Booth & Siegler, 2006), or of a hybrid semantic numerical representation (e.g., Verguts et al., 2005) or of better mapping abilities between symbolic and non symbolic magnitude representations of numbers. Moreover, as classical effects usually observed in numerical estimation tasks (e.g., Whalen et al., 1999) were replicated in the auditory modality, it strengthens the postulate of the amodal nature of the mental number line.

Castronovo, J., & Seron, X. (in press). Semantic numerical representation in blind subjects: the role of vision in the spatial format of the mental number line. *The Quarterly Journal of Experimental Psychology*, *0000*, *00* (0), 1-19.

Booth, J.L., & Siegler, R.S. (2006). Developmental and individual differences in pure numerical estimation. *Developmental Psychology*, *41* (6), 189-201.

Verguts, T., Fias, W., & Stevens, M. (2005). A model of exact small-number representation. *Psychonomic Bulletin & Review*, *12* (1), 66-80.

Whalen, J., Gallistel, C.R., & Gelman, R. (1999). Nonverbal counting in humans: the psychophysics of number representation. *Psychological Science*, *10*, 130-137.

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How do symbols affect children's strategic reasoning on a reverse-contingency task?

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Strategic reasoning tasks require children to behave in a counterintuitive way, by pointing to a less desirable object to give away in order to obtain a more desirable object for themselves. The problems 3-year-olds experience on tasks of this kind can be alleviated if the desirable objects are represented symbolically, consistent with similar findings in studies of chimpanzees. In Experiment 1 we compared the effects of different kinds of symbol, including analogue, numerical and written verbal representations of the goal objects. All types of symbol helped reduce children's errors. In Experiment 2 we found that children's enhanced performance in symbolic conditions of the task was sustained if they switched to a non-symbolic condition. This contrasts with the pattern observed in studies of chimpanzees, whose performance immediately deteriorated when they switched from symbolic to non-symbolic conditions. We discuss possible explanations for the lasting effect that symbols have on children's task performance, what this tells us about children's developing executive function, and why it is that children behave so differently from chimpanzees.

Linguistic and attentional constraints in the learning of colour and shape terms by three-year-olds

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Four studies investigated the learning of colour and shape terms by three-year-olds, matched on vocabulary age, using either linguistic contrast (It's not X, it's Y), or a context of enhanced perceptual salience of the target. Four training sessions took place over five weeks, and colour / shape knowledge was assessed (naming + comprehension) before, during and after the training period. In the studies using a linguistic manipulation, more learning was found of shapes than of colours, but there was no difference in the amount learned about colours or shapes when the training was attentional. The data suggest that both linguistic and attentional factors constrain colour term learning, but only linguistic factors constrain shape term learning, so shapes are easier to learn. Early acquired expectations about word meanings (e.g. assumptions of mutual exclusivity; the shape bias) impact on the ease with which dimensional terms are learned.

Object feature labelling and movement kinematics in prehension

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It is well known that prior-to-object-contact reach and grasp components of action are affected by extrinsic position and size information respectively. However, there are

few data that have demonstrated the effects of intrinsic object properties such as mass on action. In the data reported here, we report three experiments that assessed reach, grasp, and lift movement kinematics to objects of different size and mass. In the first two experiments, we report results that showed the mass of the object to significantly affect prior-to-contact grasp kinematics. For larger and heavier objects, peak grasp aperture increased and the final finger and thumb placement on the object showed a more secure grasp formation. It seemed that the heavier items were grasped in a better position to prevent slippage and rotation when lifting. In the third experiment, we tested whether labelling objects with intrinsic mass labels would have the same effects as extrinsic size labelling (see for example, Glover & Dixon 2002). We found that both types of feature label (size and mass) had no congruent impact on the action kinematics measured, but we did find that the baseline effects of the intrinsic mass property found in Experiment 1 and 2 were abolished when the objects were labelled with extrinsic size labels. The data are discussed in terms of how physical extrinsic size and intrinsic mass object properties differently affect the reach, grasp and lift components of prehensile movement.

Glover & Dixon 2002. Semantics affect the planning but not control of grasping. *Experimental Brain Research*, 146:3. pp 383-387.

#### When metacognition defies cognition: The case of the spacing effect

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Laboratory data have shown that some cognitive strategies, more than others, are effective for learning. A well-known example of this is the *spacing effect*, where distributing short study sessions over longer periods of time leads to better performance than does massing or cramming study into one long session. Most of the methods resulting in the spacing effect, however, were experimenter-controlled and did not include metacognitive processes. In a series of experiments, I show that when individuals are given their own metacognitively-controlled choices to space or mass, the benefits are large (in agreement with the spacing effect). However, when people's choices are *defied*, and forced to space (when they had wanted to mass), the benefits from the spacing effect become negligible. These data have important implications for teaching in the classroom—it seems not the case that widely-thought-to-be “optimal” cognitive strategies are effective when people's metacognitive decisions are not honored. Uncovering the relation between metacognition and cognition is critical and will put us in a position to devise individually effective interventions in the classroom.

#### Within-event learning in blocking

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Two appetitive Pavlovian conditioning experiments with rats investigated the associative changes that A undergoes in an A-food, AX-food blocking procedure.

Conditioned responding to A was enhanced relative to stimulus B, which had been conditioned in isolation (B-food). This result was interpreted in terms of the formation of a within-event association between A and X. The results of Experiment 2 supported this conclusion by demonstrating that X had associative strength of its own and furthermore, that extinguishing X resulted in a similar level of conditioned responding to A and B. These results will be discussed in terms of cue-competition and cue-comparison theories of learning.

#### Cue-interactions between concurrently trained shapes that indicate a target location in a virtual-environment

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Associative cue-interaction effects have been found in the spatial domain; for example, learning about one landmark can reduce learning about a concurrently trained landmark when both landmarks indicate a target location. However, when continuous geometric structure indicates a target location, human and animal learning is typically unaffected by the presence of other features. The latter findings are consistent with a special status for shape processing in spatial learning. In two experiments using a desktop virtual environment, continuous shapes on the floor of a circular compound predicted the location of an invisible platform. In Experiment 1, a single shape initially predicted the platform location, and a second shape was subsequently compounded with the first, along with two control cues. In a subsequent test phase, learning about the added cue was found to be facilitated by the pretrained cue. In Experiment 2, of similar design, the number of control cues was increased throughout training; assessment of the added shape led to evidence of blocked learning by the initially trained shape. The results suggest that cue-interaction effects apply to shape learning as they do to other forms of spatial learning. The results will be discussed in terms of cue salience.

#### Overshadowing of spatial learning based on geometric cues

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A variety of experiments have shown that discrete landmarks do not overshadow spatial learning based on geometric cues provided by the shape of the environment. Two experiments will be described that examine whether overshadowing can be found between different geometric features created by the shape of an environment. Spatial learning based on the length of the walls of a parallelogram overshadowed learning based on the obtuse-but not the acute-angled corners of this arena. An additional experiment revealed that the colour of the walls of an environment can influence spatial learning based on its shape.

Taken together these results do not support the claim that learning about the shape of the environment is unaffected by learning based on non-geometric cues. Instead, they suggest that cue interaction effects can be found between geometric cues, and between geometric and non-geometric cues when they contribute to the boundary of an environment.

#### Dual processes, training and the selection task

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Cheng, Holyoak, Nisbett & Oliver (1986) conducted a series of studies to investigate the effects of training on abstract and realistic versions of the Wason Selection Task. They reported that training on the logic of the material conditional increased correct performance on both versions of the task. However obligation schema training (Cheng & Holyoak, 1985) improved performance on further deontic tasks but not on abstract tasks, though it did transfer to other problems thought to have been interpreted as obligations. The experiments reported here replicate and extend on Cheng et al.'s original work, controlling for potential experimental confounds. Inconsistent with Cheng et al., logic training failed to transfer to deontic versions of the selection task and obligation schema training resulted in transfer to all other versions. Training using selection task examples (Klaczynski & Laipple, 1993) was then compared to Cheng et al.'s and was found to facilitate reasoning performance far more drastically. It is argued that individual differences in cognitive ability mediate the effects of training. In other words, high ability participants are able to understand and transfer the information that they are taught. These findings are discussed in the context of a dual process framework.

Cheng, P. W., & Holyoak, K. J. (1985). Pragmatic reasoning schemas. *Cognitive Psychology*, 17(4), 391-416.

Cheng, P. W., Holyoak, K. J., Nisbett, R. E., & Oliver, L. M. (1986). Pragmatic versus Syntactic Approaches to Training Deductive Reasoning. *Cognitive Psychology*, 18, 293-328.

Klaczynski, P. A. & Laipple, J. S. (1993). Role of Content Domain, Logic Training, and IQ in Rule Acquisition and Transfer. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 19, 653-672.

#### No moles, no molehills? A test of two probabilistic theories of reasoning

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Two probabilistic theories of conditional reasoning were tested against each other. Both theories place a big emphasize on the role of subjective conditional probabilities for solving conditional reasoning tasks. In their dual process specification, Verschueren et al. (2005) assign a central role to the conditional probability (or likelihood)  $P(q|p)$ . For a

conditional like: “If you can see molehills, then there are moles around” this probability translates into  $P(\text{moles around} | \text{visible molehills})$ . It corresponds to the sufficiency of the conditional statement and thus, according to Verschueren et al., does not only directly affect the believability of the conditional statement, but also supports the acceptance of the inference tasks Modus Ponens and Modus Tollens alike. The probabilistic account of Oaksford and Chater (2001) on the other hand claims that inferences from conditional statements are accepted to the extent of the probability  $P(\text{conclusion} | \text{minor premise})$ . For the Modus Tollens this is- in contrast to Verschueren- the conditional probability of  $P(\text{no visible molehills} | \text{no moles around})$ . A first experiment using a probabilistic truth table task for conditional inferences clearly favoured the approach of Oaksford and Chater. A second experiment was conducted to test whether the superiority of this approach also holds for every day conditionals.

Oaksford, M., Chater, N. (2001) The probabilistic approach to human reasoning. *Trends in Cognitive Sciences*, 5, 349-357.

Verschueren, N., Schaeken, N. (2006), *Denial inferences: Oaksford, Chater & Larkin (2000) on shaky ground*, Proceedings of the Twenty-Seventh Annual Meeting of the Cognitive Science Society, Stresa, Italy. Mahwah: Erlbaum Ass.

Verschueren, N., Schaeken, W., d'Ydewalle, G. (2005) A dual process theory on everyday conditional reasoning. *Thinking and Reasoning*, 11, 239-278.

### A suppositional theory of disjunctions

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The suppositional theory of the conditional maintains that ‘if’ trigger hypothetical thinking: people mentally simulate the antecedent and evaluate the consequent in this context. We present a suppositional theory of disjunctive reasoning that proposes that ‘or’, like ‘if’, triggers hypothetical thinking. However, disjunctions are more complex as they require the reasoner to keep track of two hypotheses at the same time. The heuristic-analytic theory proposes that people produce just one hypothesis or mental model at a time (principle of singularity), making disjunctive reasoning relatively taxing. We adopt a principle from support theory, proposing that one of the disjuncts becomes focal, the other one remaining residual and underrepresented. Hence, the two terms in disjunctions are less well integrated than the consequent and antecedent in conditionals. We compared abstract disjunctions and conditionals in two experiments, a construction task in which participants were asked to fill in a 6x6 grid; and a truth table evaluation task that recorded responses and latencies. Both experiments compared four pairs of linguistic forms which are equivalent in standard extensional logic but should differ under the suppositional account. Both construction and evaluation tasks elicited for disjunctions response patterns that differed markedly from those of the extensionally equivalent conditionals.

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When does ignorance make us smart? Additional factors guiding heuristic inference

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“Fast & frugal” heuristics represent an appealing way of implementing bounded rationality and decision-making under pressure. The recognition heuristic is the simplest and most fundamental of these heuristics. Simulation and experimental studies have shown that this ignorance-driven heuristic inference can prove superior to knowledge based inference (Goldstein & Gigerenzer, 2002) and have shown how the heuristic could develop from ACT-R’s forgetting function (Schooler & Hertwig, 2005). Mathematical analyses also demonstrate that this will always occur under certain conditions (Goldstein & Gigerenzer, 2002). However, further analyses show that these conditions may constitute a special case and that this effect is subject to the moderating influence of the number of options to be considered and the framing of the question. We present an experimental test of these potential moderating factors. Results show that usage of the recognition heuristic is less likely when multiple options are presented and when a “lesser” rather than a “greater” frame is used in magnitude judgments. Implications of these results for “fast & frugal” heuristics will be discussed.

Goldstein, D. G., & Gigerenzer, G. (2002). Models of ecological rationality: The recognition heuristic. *Psychological Review*, *109*, 75-90.

Schooler, L. J., & Hertwig, R. (2005). How forgetting aids heuristic inference. *Psychological Review*, *112*, 610-628.

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Reducing effective IPD allows identification of more differences in images

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A synopter increases pictorial relief by removing convergence and disparity information from nearby objects. We produced 20 'spot the difference' diptychs each containing ten discordances specified by an image map. They were rear-projected for 60s each onto a 2.0m non-depolarizing screen. Four viewing conditions were presented; 'binocular', 'monocular', 'simulated iconoscopic' and 'simulated synoptic' (generated by scaling horizontal image separation by 0.5x and 1.0x IPD). 28 participants wearing polarizing glasses completed the study. Performance in the simulated conditions was dichotomised based on ability to fuse polarised images. A mixed 4\*2 ANOVA found a significant effect of viewing condition [ $F(3,72)=10.855$ ,  $p<.001$ ]. Post hoc tests revealed that in both the iconoscopic and synoptic conditions, fusers made less errors and identified more discordances (syn. mean= $8.56\pm 3.33$ ) than non-fusers (syn. mean= $2.48\pm 1.43$ ). Reducing inter-ocular and vertical disparity appears to substantially enhance ability to notice new features in images.

Self-judged emotion development during adolescence

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Neuroimaging results suggest that 'socio-moral' emotional processing is carried out within an identifiable set of brain structures including the medial prefrontal cortex. Longitudinal and cross-sectional structural imaging studies show that the prefrontal cortex continues to mature throughout adolescence. This development may result in socio-emotional cognitive change during this period of life. We investigated how self-rated emotion changes during adolescence using an emotional appraisal task with 86 female participants aged 9-16 years within a cross-sectional design. Participants were grouped according to pubertal status. Two 'social' emotions (guilt and embarrassment) were compared with the development of two more basic emotions (fear and anger). The results demonstrated a decrease in the judged intensity of the main emotion reported in a given situation across puberty and with age. Embarrassment ratings decreased between pre-, mid- and post-puberty; guilt and fear ratings showed a decline between pre- and post-puberty. No pubertal decrease in rated anger occurred. A decrease in emotion strength was also found with age, irrespective of pubertal status. This occurred without a decrease in the intensity rating of other 'secondary' emotions reported to be felt. Evidence for increased reporting of 'mixed' emotions over puberty was also found. These novel data support the idea that social-moral cognition develops during adolescence.

The surprising benefit of surprise: Unexpected events trigger increased detection of local and non-local changes

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When people watch a video clip they can fail to detect large changes (change blindness). In 3 studies, participants watched a video clip of a card game in which they were asked to follow the queen. The queen was then revealed in either the expected or unexpected location (for different observers). During the clip, some feature changed in either the target card (the queen) or a card peripheral to the task (the jack). Results show that detection rates were significantly improved if the queen appeared in the unexpected location. Interestingly, this was true for both the changes to the queen and to the jack. This "surprise" advantage extended to cases where more than one change was present, for instance when both queen and jack changed suit.

ERP evidence of morphological analysis from orthography: A masked priming study

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There is broad consensus that the visual word recognition system is sensitive to morphological structure (e.g. 'hunter' = 'hunt' + 'er'). In addition, it is generally assumed that the analysis of morphologically complex words (e.g. 'hunter') will only occur if the meaning of the complex form can be derived from the meanings of its constituents (e.g. 'hunt' and 'er'). However, recent behavioural work using masked priming has suggested that morphological analysis can occur at an early, orthographic level, with little influence from semantics. The current study investigated the neurophysiological correlates of masked priming in conditions of a genuine morphological relationship (e.g. 'hunter'- 'HUNT'), an apparent morphological relationship ('corner'- 'CORN') and no morphological relationship ('brothel'- 'BROTH'). Neural priming was indexed by the reduction of the N400 ERP component associated with targets preceded by related primes, as compared to targets preceded by unrelated primes. Robust behavioural and neural priming was found to word pairs with the mere appearance of morphological structure ('corner'- 'CORN'). The magnitude of this priming was similar to that observed in pairs with genuine morphological relationship and greater than that in non-morphological pairs. The results support a purely structural morphemic segmentation procedure which operates in the early stages of visual word perception.

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Verbalisation and working memory aid effects on insight and non-insight problem solving

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The effects of verbalization (V) (i.e., thinking aloud versus not thinking aloud) and working memory aid (WM) (i.e., paper-and-pen use versus no such use) on problem solving performance were investigated. On one hand, non-directed concurrent verbalisation has been widely used in the study of cognitive processes underlying non-insight problems (Ericsson & Simon, 1993). However the efficacy of verbalisation in insight problems has been questioned because of verbal overshadowing (Schooler, Ohlsson, & Brooks, 1993). On the other hand, the role of WM has been well established in non-insight problem solving only. Sixty participants were randomly assigned to four conditions: V & WM, V & no WM, no V & WM, and no V & no WM. Each participant solved four insight and four non-insight problems. Each set of problems was further divided into two verbal and two non-verbal type problems. Solution rates and times were comparable between the four conditions, suggesting that verbal overshadowing did not occur for both verbal and non-verbal insight and non-insight problems, and also that working memory aid was redundant. The results suggest that verbalisation is a valid tool in investigating insight and the absence of verbal overshadowing further supports the similarity of insight and non-insight processes.

Ericsson, K. A., & Simon, H. A. (1984). *Protocol analysis: Verbal reports as data*. Cambridge, MA: MIT Press.

Schooler, J. W., Ohlsson, S., & Brooks, K. (1993). Thoughts beyond words: When language overshadows insight. *Journal of Experimental Psychology: General*, 122, 166-183.

Target familiarity in retrieval practice and multi-trial learning contexts

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The effects of target familiarity on delayed recall performance are examined in two experiments. In both experiments, familiar targets were better learned than unfamiliar ones when the scheduling of encounters with the pairs was controlled. However, unfamiliar targets with well-scheduled practice were as well recalled as familiar targets without practice. In Experiment 1, participants used retrieval practice to study English-Latin pairs where some Latin words were familiar (e.g., bookcase-librarium) and some were not (e.g., sheep-ovis). The optimal practice schedule varied depending on the level of target familiarity. Surprisingly, performance following learner-paced of the practice events did not differ from fixed-pacing and did not interact with

target familiarity. In Experiment 2, participants studied symbols paired with either English words or similar non-words (ostensibly from an ancient language) in a more traditional multi-trial learning paradigm. Whether feedback was immediate or occurred at the end of each trial made no significant difference, but both were more effective than without feedback. The scheduling of feedback did not interact with target familiarity. Learning a pair involves learning to recognize the cue, recall the association and produce the target; the familiarity of the target influences the last two of these steps.

Decomposing top-down and bottom-up deficits in conflict adaptation after frontal lobe damage

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Numerous neuroimaging studies have shown strong correlations between Adaptation Effects (reduced congruency subsequent to congruent relative incongruent trials) and activation in regions of frontal cortex (dACC and DLPC). According to the prominent Conflict Monitoring Model (e.g. Botvinick et al., 2001) these two areas constitute the neural substrates of cognitive control. Here we present a lesion study where patients including damage in DLPC, ACC, or both, showed the same Adaptation Effects as a group of age matched participants, in the context of a spatial version of the Stroop task. Subsequently, we re-analysed the data pulling apart sequences where feature dimensions repeated from those where all dimensions alternated, to dissociate the influence of (bottom-up) feature integration processes (Hommel et al. 2004), from genuine (top-down) control on adaptation effects. We found that frontal patients showed a deficit in conflict adaptation for complete alternations (a large cost in performance for incongruent trials preceded by another incongruent trial), together with an abnormally large adaptation effect for sequences including feature repetitions. This pattern of results reveals that frontal patients indeed have a deficit in top-down adaptation to conflict, along with abnormally strong reliance on bottom-up processes. We suggest that DLPC and ACC are relevant for top-down conflict monitoring but also to regulate bottom-up influences based on feature-integration across consecutive trials.

Botvinick, M., Braver, T.S., Barch, D.M., Carter, C.S., & Cohen, J.D. (2001). Conflict monitoring and cognitive control. *Psychological Review*, 108, 624-652.

Hommel, B., Proctor, R.W., & Vu, K.P.L. (2004). A feature-integration account of sequential effects in the Simon tasks. *Psychological Research*, 68, 1-17.

The conditionality of the affect-behavior link: Arm-flexion and extension responses depend on the intentional processing of valence but not on the situational meaning

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Evidence that affective information automatically elicits approach and avoidance has recently been questioned by Rotteveel and Phaf (2004) who showed that only when valent stimuli were intentionally processed, activation of the corresponding actions occurred. The present studies investigated whether the link between stimulus valence and approach-avoidance depends on the intention to evaluate a stimulus and on the situational meaning of pulling/pushing actions. Participants performed an evaluative decision task using lever responses. The present findings showed faster affectively congruent lever-responses to valent targets,  $F(1, 39) = 5.16$ ,  $MSE = 1764.8$ ,  $p = .029$  but not to valent primes,  $F(1, 39) = .07$ ,  $p = n.s.$ , indicating that intentional affective processing is necessary to elicit corresponding approach and avoidance actions. In addition, this link is independent of the situational meaning of pulling and pushing actions,  $F(1, 39) = 2.75$ ,  $p = n.s.$

Rotteveel, H., & Phaf, R. H. (2004). Automatic affective evaluation does not automatically predispose for arm flexion and extension. *Emotion*, 4, 156-172.

Crossmodal integration: An event-related potential (ERP) study of motion-specific auditory-visual interaction processes

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Rapid integration of signals across modalities is essential for an accurate representation of the environment. Here we investigated motion-specific auditory-visual neural integration mechanisms by comparing auditory-visual interactions for moving and stationary stimuli. We collected ERPs from one group of participants who performed a reaction-time task, responding to the direction of a moving stimulus. A separate group of participants performed a reaction-time task, responding to a target stationary stimulus. The modality of the stimulus was either unimodal (visual or auditory), or bimodal. We found significant non-linear reaction-time facilitation for the bimodal condition in both groups. Dynamic stimuli produce patterns of ERP interaction effects similar to stationary stimuli at very early processing stages up to 140 ms, but that differ from stationary interaction patterns from 140-160 ms, 170 - 190 ms, and 220 - 280 ms post-stimulus. Both behavioural and ERP results therefore suggest motion-specific early sensory interactions between auditory and visual signals.

Plausibility of property explanations

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Research on explanation in philosophy and psychology has primarily focused on event explanations, that is, explanations about why a particular event happened (Heider, 1958; Hempel & Oppenheim, 1948; Kelley, 1967; Salmon, 1984). However, in everyday life we often wonder about the properties of particular entities. How do we explain properties as opposed to events? In a qualitative study we found that when people

explained a property of an entity, they regularly referred to another property to provide an explanation. For example 'why axes are dangerous' was explained in terms of their property of being sharp. In the present study we wanted to know what affects the relative plausibility of such explanations. A set of 146 explanations of the form 'x has p because it has q' were judged for plausibility. Measures of counterfactual relations between the two properties (i.e. likelihood of having p without q), co-occurrence and mutability of p and q, as well as a measure of conceptual coherence based on network diagrams (Sloman, 1998) were used in a regression analysis to predict plausibility. Conceptual coherence followed by counterfactual relations were the strongest predictors of plausibility in a model explaining almost 75% of the variance in plausibility judgments of property explanations.

Heider, F. (1958, reprinted 1983). *The psychology of interpersonal relations*. NJ, US: Lawrence Erlbaum Associates.

Hempel, C., & Oppenheim, P. (1948). *Studies in the logic of explanation*. *Philosophy of Science*, 15, 135–175.

Kelley, H. H. (1967). *Attribution theory in social psychology*. In D. Levine (Ed.), *Nebraska symposium on motivation* (Vol. 15, p. 192-238). Lincoln: University of Nebraska Press.

Salmon, W. C. (1984). *Scientific explanation and the causal structure of the world*. Princeton, N.J.: Princeton University Press.

Sloman, S. A., Love, B. C., & Ahn, W.-k. (1998). *Feature centrality and conceptual coherence*. *Cognitive Science*, 22(2), 189–228.

#### The impact of individual features upon face recognition

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Insight into the perceptual operations which enable face recognition may be provided by examining the timings and sequence by which individual features are perceived. We investigated the effects of removing individual features from famous faces in order to examine whether the absence of any feature in particular, significantly affected reaction times for face recognition. Participants viewed faces either without eyes, nose, mouth or external features (hair and ears). Images were presented for 160ms and reaction times for face identification were recorded. A significant increase in reaction times was observed where faces were viewed without hair and ears compared to control conditions. This significance level remained congruent when age, race and gender were partialled out. This result has potential implications for the revision of pre-established tests for prosopagnosia where cues other than internal features may be available to participants in order to assess recognition abilities. Furthermore, this result compounds the importance of the impact of external features in the face recognition process when applied to eyewitness identification of perpetrators.

Ageing dexterity: Speed or selection?

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There is a large amount of evidence to show that upper limb manual dexterity decreases with increased age. Most of these measures have been taken using the manual dexterity Box and Block (Cromwell, 1965) or Purdue Pegboard (Tiffin & Asher, 1948) tests. While these data have consistently reported an increased time needed to complete the tests with age, it is not clear whether the effect is one of decreased speed or a longer time to select objects for response. In the research proposed here, we aim to test a large sample of aged participants on a number of manual dexterity tests using motion tracking methods. The aim of the poster presentation is to gain feedback on our research design and screening test protocol.

Cromwell, F. S. (1965). Occupational Therapists Manual for Basic Skills Assessment: Primary Prevocational Evaluation. Pasadena, CA: Fair Oaks Printing.

Tiffin, J. & Asher, E. J. (1948). The Purdue pegboard: Norms and studies of reliability and validity. *J Appl Psychol* 32, 234-247.

The effects of homophonous and phonologically related primes in object naming tasks

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Using a gaze-contingent display change paradigm, Morgan and Meyer (2005) found that participants were faster to retrieve the name of an object after extrafoveal preview of the same object or an object with a homophonous name (e.g., animal/baseball bat) than after preview of an unrelated object. This implies that speakers begin to retrieve the name of an object they are about to mention before fixating upon it. In the present study we examined whether a preview benefit would also be obtained from preview objects that had similar, rather than homophonous, names to the targets (e.g., *bed-bell* or *mat-cat*). We replicated the preview effect from identical objects, but did not find a difference in the effects of phonologically related vs. unrelated preview stimuli. These results contrast with recent findings (Meyer & Damian, in press) showing that phonologically related and homophonous distractors had quite similar facilitatory effects in picture-picture interference experiments, where both stimuli were presented simultaneously and in the same location. The implications of these findings for theories concerning the representation of homophones and the time course of lexical access and for theories of visual memory will be discussed.

Morgan, J.L., & Meyer, A.S. (2005). Processing of extrafoveal objects during multiple object naming. *Journal of Experimental Psychology: Language, Memory, and Cognition*, 31, 428-442.

Meyer, A.S., & Damian, M. (in press). Activation of distracter names in the picture-picture interference paradigm. *Memory & Cognition*.

Necessary and possible inference: The role of counter-example search

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In everyday reasoning, it is important to be able to make inferences about what is necessary *and* what is possible. Recently researchers have begun to examine this distinction. For example, Evans, Handley, Harper and Johnson-Laird (1999) showed that people were more willing to endorse conclusions as possible than as necessary, a finding which suggests that the instruction to make necessary conclusions cues a search for counterexamples. Importantly they also showed that certain possible conclusions (possible strong) were endorsed at very high rates whilst others (possible weak) were endorsed at very low rates. In this paper we examine the time course of reasoning on these problems as a test of the counter-example search hypothesis. The implications of the findings for the mental model theory of syllogistic reasoning are discussed.

Evans, J. St. B.T., Handley, S.J., Harper, C.N.J., & Johnson-Laird, P.N. (1999). Reasoning about Necessity and Possibility: A Test of the Mental Model Theory of Deduction. *Journal of Experimental Psychology: Learning, Memory, and Cognition*. 25(6), 1495-1513

Semantic interference in visual search – Effects of age and frontal lobe damage

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Belke et al. (subm.) showed that performance by college aged participants in a visual search task was affected by the presence of semantically related competitors. When the participants had to decide whether or not a target object was present in a four-object array, their reactions were slower and target objects less likely to be fixated after display onset when one of the distractors was categorically or associatively related to the target than when all distractors were unrelated (see also Moores et al., 2003). In the present study, we aimed to replicate these semantic interference effects and examine whether they would be exacerbated in older persons and patients with frontal-lobe lesions.

The older adults were slower to respond than the younger adults, but the size of the semantic interference effects on response latencies, and the likelihood of fixating upon targets or distractors did not differ between groups. The patients were slower to react than age-matched control participants and made more errors. They made more errors in the presence than absence of a semantically related distractor, which was not the case for the control participants. The implications of these findings for theories of visual attention and aging will be discussed.

Belke, E., Humphreys, G.W., Watson, D., & Meyer, A.S. (subm.). Effects of top-down semantic knowledge in visual search are modulated by cognitive but not perceptual load.

Moore, E., Laiti, L. & Chelazzi, L. (2003). Associative knowledge controls deployment of visual selective attention. *Nature Neuroscience*, 6, 182-189.

### What can macrocephaly tell us about autism?

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Although a strong genetic component is thought to be involved in autism spectrum disorder (ASD), neurobiological markers of the disorder have yet to be identified. The most consistent neurobiological finding is macrocephaly (increased head/brain size/weight). It has been suggested that this may result from an excess of feedback connections in the brain, making them inefficient. This might lead to good exemplar-based processing but poor generalisation, reminiscent of the cognitive processing style of 'weak central coherence' documented in ASD in a number of studies. 54 high-functioning 7-12 year olds with ASD were compared to 27 control children in their performance on a Navon task, designed to tap into global and local processing and therefore relevant to the weak central coherence hypothesis. Head circumference was also measured. While overall no differences were found between the ASD and control groups either in their performance on the Navon task or in their head circumference, a difference was seen on the Navon task when those children with macrocephaly were compared to those without. The children with macrocephaly showed a greater processing cost when switching into global processing, as mediated by weak central coherence. Macrocephaly may be a biological marker of weak central coherence.

## PLYMOUTH INFORMATION

### College Accommodation

Accommodation has been reserved for the nights of 9<sup>th</sup>, 10<sup>th</sup> and 11<sup>th</sup> July at Radnor Hall of Residence, on campus. All rooms at Radnor Hall are single and en-suite. The rate for single occupancy is £35.50. Accommodation keys are available from Hospitality / Summer Village Reception in Gibbon Street. The Reception is open from 8.00am to 10.00pm, 7 days a week. Anyone arriving after 10.00pm should please inform the reception in advance on 08717 007134. Delegates are recommended to book rooms at Radnor Hall rather than elsewhere. Links to alternative accommodation are shown below and should be booked directly with the hotel or guest house. Reservations for University accommodation and/or the conference dinner can be made on the enclosed booking form, which should be returned to Professor Jonathan Evans, before **23<sup>rd</sup> June**, 2006.

Cheques must be made payable to “University of Plymouth” and sent to:  
“Professor Jonathan Evans, EPS Meeting, School of Psychology, University of Plymouth,  
Plymouth. PL4 8AA.”

### Hotels and Guest Houses close to campus

Plymouth has many hotels around the city centre, ranging in expense. For those requiring four star accommodation, the Copthorne Hotel\* is conveniently close to both the campus and railway station. A number of inexpensive private hotels and guest houses are situated close to the north edge of the university campus in North Road East and adjoining streets. There are also a number of small hotels in the Hoe and Barbican areas close to the sea and about one mile from campus. Plymouth hotels and guest houses can be found at the following website: <http://www.a1tourism.com/uk/plymouth.html>.

Early booking is strongly recommended if you wish to use alternative accommodation to Radnor Hall.

\*Website:

[http://www.millenniumhotels.com/MCIL.nsf/lu\\_hoteldoc/47\\$\\$hotelDescription?open document](http://www.millenniumhotels.com/MCIL.nsf/lu_hoteldoc/47$$hotelDescription?open document)

### Travel

For information on travel to Plymouth please see the website:  
<http://www.plymouthcity.co.uk/travel.html>.

A map of the Plymouth campus is available in pdf format at:  
<http://www.plymouth.ac.uk/pages/static.asp?page=maps>

Plymouth railway station is located at the top right hand corner of the map. Radnor Hall is at the bottom left (29) a short walk from the main conference site in the Portland Square Building (26). The conference dinner will be held in the top floor of Babbage (1).

## PLYMOUTH INFORMATION

### By Air

Direct flights to Plymouth City Airport (<http://www.plymouthairport.com/>) are available from London Gatwick, Bristol and Manchester.

### By Rail

Rail is convenient as the station is situated within half a mile of Radnor Hall with the campus inbetween. Taxis are available at the station.

### By Coach

National Express coach services run to Plymouth:  
<http://www.nationalexpress.com/destinations/index.cfm>

### By Car

Plymouth is reached from the East by the A38 from Exeter which links directly with the M5 motorway.

### Parking

For those wishing to drive, there is parking available in Regent Street car park, close to the halls of residence. A car pass must be purchased from Hospitality Services/Summer Village reception in Gibbon Street to obtain the special concessionary rate of £3 per day. Note the car park is secured at night, and opening hours are: car park Opens Mon - Sat 0700 Closes 2145, but no entry after 1800. Sun/Bank Hol Opens 0915 Closes 1815 again no entry after 1800. Spaces are available on a first come first served basis, they cannot be reserved in advance.

### *Eating and Drinking*

#### **Lunch:**

This can be booked on campus close to the conference venue at a cost of £8.15. ***Delegates are strongly advised to book this*** as there is insufficient time in the lunch break to visit off-campus restaurants.

#### **Evening meal: Restaurants in Plymouth**

Plymouth has many good restaurants. Closest to Radnor Hall is the ***Wah Tin*** (<http://www.wahtin.co.uk/>, 01752-660660), an excellent Chinese restaurant which is just a short walk up North Hill, the main road crossed from Radnor Hall to access the Portland Square Building. Also within walking distance (5-10 minutes) and recommended is the ***Positano Italian Restaurant*** on Mayflower Street (01752-661290). Advanced booking for either of these restaurants is advised.

## PLYMOUTH INFORMATION

A large choice of restaurants can be found in the Barbican area of the city and the adjoining east end of Notte Street. There are seafood restaurants and others serving Greek, Chinese, Italian and number of other ethnic varieties of cuisine. This area is about one mile from the Hall, close to the sea and the old Elizabethan port. It is a most attractive area to visit on a summer evening. There are also two restaurants situated directly beneath Plymouth Hoe on the sea front, with outside tables available: the *Wet Wok* (Chinese, 01752-664456) and the *Waterfront* (American-Mexican, 01752-226326).

A list of Plymouth restaurants can be found at  
[http://www.plymouthcity.co.uk/restaurants\\_in\\_the\\_plymouth\\_area.htm](http://www.plymouthcity.co.uk/restaurants_in_the_plymouth_area.htm).

### Conference Dinner

This will be on campus at the Babbage Building on the evening of 11<sup>th</sup> July at 8pm. The refectory is on the fourth floor with views over Plymouth and Cornwall. The cost for four courses including wine will be £25 per head. Please book, and indicate any dietary requirements, on the enclosed form which should be returned to “Professor Jonathan Evans, EPS Meeting, School of Psychology, University of Plymouth, Plymouth. PL4 8AA” before **23<sup>rd</sup> June** 2006.

### Places of Interest

Within the city of Plymouth, the most attractive areas lie along the sea front from Plymouth Hoe on the west side, the views over Plymouth sound and Cornwall, to the Sutton Harbour and the Barbican area on the east (Devon) side, which includes the Mayflower steps and a number of Elizabethan buildings. A passenger ferry may be taken across Sutton Harbour to Mountbatten where a large pub serves food and drink and to access the National Marine Aquarium.

East of the Hoe, a passenger ferry runs from Cremyll (<http://www.tamarcruising.com/cremyll.htm>) across the Tamar to Mount Edgcumbe House and Park on the Cornish side. This is a large park area with attractive walks around the Cornish coastal section of Plymouth Sound.

Outside of the city, coastal areas of Devon and Cornwall and Dartmoor National Park can be visited by car. The world famous Eden Project\* which includes two huge domes with tropical and Mediterranean plants is located near St Austell in Cornwall about 30 miles west of Plymouth.

<http://www.edenproject.com> /\*

## NOTES