

EPS

Experimental
Psychology
Society

LONDON MEETING

4-5 JANUARY 2007

A scientific meeting will be held at the Department of Psychology, University College London on 4/5 January, 2007. The local organiser is Robin Murphy.

EPS Prize Lecture

Thursday 4 January 5.30pm – 6.30pm

Making connections between learning to read and reading to learn

Professor Kate Nation, (Department of Experimental Psychology, University of Oxford)

Symposium

Thursday 4 January 2pm – 5pm

Using eye-movement paradigms to investigate human comprehension

Organisers: Dr Courtenay Norbury and Professor Gerry Altmann

Poster Session

This will be held in conjunction with the coffee break on Thursday 4 January, 11am – 12 noon in Room 305 (Third Floor Seminar Room) and the Third Floor Common Room. Delegates may put up posters from 7.00am and should take them down by the end of the day.

Platform Presentations

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

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

There will be a drinks reception on Thursday evening at 6.30pm in Room 308. The conference dinner will be at 8.00pm at Pescatori, 57 Charlotte Street, London. W1T 4PD – (020-75803289). A booking form is enclosed.

START OF PARALLEL SESSIONS

Session A**Ground Floor Lecture Theatre**

- 9.30 **Chloe Marshall*, Franck Ramus*, Stuart Rosen* and Heather van der Lely** (Centre for Developmental Language Disorders and Cognitive Neuroscience, University College London, Laboratoire des Sciences Cognitives et Psycholinguistique, EHESS CNRS ENS, France, and Department of Phonetics and Linguistics, University College London)
Phonological skills in children with SLI and dyslexia: A heterogeneous picture
- 10.00 **Heather K. J. van der Lely and Elisabeth Fonteneau*** (Centre for Developmental Language Disorders & Cognitive Neuroscience, UCL and Goldsmiths College, University of London)
ERP signatures for syntactic and semantic processing in language-impaired children
- 10.30 **Friedemann Pulvermüller and Yury Shtyrov*** (MRC Cognition and Brain Sciences Unit, Cambridge)
Spatiotemporal signatures of psycholinguistic information access in the brain as revealed by MEG
- 11.00 Coffee and poster session (Room 305 third floor seminar room and the third floor common room)
- 12.00 **Karin Landerl*** (University of Tuebingen, Germany) (Sponsored by Uta Frith)
Dyslexia and Dyscalculia: Two learning disorders with different cognitive profiles
- 12.30 **Franck Ramus*, Gayaneh Szenkovits*, and Emmanuel Dupoux*** (Laboratoire de Sciences Cognitives et Psycholinguistique, Paris) (Sponsored by Uta Frith)
Investigating naming difficulties in developmental dyslexia
- 1-2 LUNCH

START OF PARALLEL SESSIONS

Session B

Lower Ground Floor Lecture Theatre

- 9.30 **Carmel Mevorach*, Lilach Shalev*, Harriet A. Allen*, and Glyn W. Humphreys**
(University of Birmingham and The Open University, Israel)
The left inferior parietal lobe modulates the selection of low salient stimuli
- 10.00 **Duncan Astle*, Georgina Jackson, and Rachel Swainson**
(University of Nottingham)
Dissociating neural markers of cognitive control in task-switching: An ERP study
- 10.30 **Lucy Cragg* and Kate Nation** (University of Oxford)
The development of response inhibition during mid-childhood: More no-go than go
- 11.00 Coffee and poster session (Room 305 third floor seminar room and the third floor common room)
- 12.00 **Louise Humphreys* and Geoffrey Underwood** (University of Nottingham)
Enhanced memory for emotional pictures: A product of eye movements?
- 12.30 **Michelle de Haan*** (Institute of Child Health, UCL) (Sponsored by Uta Frith)
The N170 for fearful faces: Do eyes make all the difference?
- 1-2 LUNCH

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

Symposium: Using eye-movement paradigms to investigate human comprehension
Organisers: Dr Courtenay Norbury and Professor Gerry Altmann

- 2.00 **Simon P. Liversedge** (University of Southampton)
Binocular coordination in adults and children
- 2.30 **Louise Shackleton***, **Antje S. Meyer**, and **Andrew Olson** (University of Birmingham)
Reading in deaf and hearing adults: Results of an eye tracking study
- 3.00 **Jon Brock and Kate Nation** (University of Oxford)
Contextual suppression in spoken language comprehension: Evidence from eye-tracking
- 3.30 TEA (Room 308)
- 4.00 **Gerry T. M. Altmann and Yuki Kamide*** (University of York and University of Dundee)
Mapping between language and the visual world: Dissociations between the visual world and its mental representation
- 4.30 **Courtenay Norbury, Kate Nation, and Jon Brock** (University of Oxford)
Social visual pursuit: Tracking the links to language

End of Symposium

- 5.00 Annual General Meeting (Lower Ground Floor Lecture Theatre)
(Members only)
- 5.30 **EPS Prize Lecture – K Nation** (University of Oxford)
Making connections between learning to read and reading to learn
(Ground Floor Lecture Theatre)
- 6.30 DRINKS RECEPTION (Room 308)
- 8.00 CONFERENCE DINNER, PESCATORI

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

- 2.00 **Rebecca Lawson, Marco Bertamini, and Dan Liu*** (University of Liverpool and Shaanxi Normal University, China)
People cannot perceive images on mirrors and windows
- 2.30 **Greg Goodson* and John H. Wearden** (Keele University)
How long do things seem to last? Subjective shortening and temporal consolidation in the judgement of short durations
- 3.00 **Ellen Poliakoff, Alexis Makin*, Joy Chen* and Andrew Stewart** (University of Manchester)
Faster and slower: The effect of previously viewed velocities on current velocity estimates
- 3.30 TEA (Room 308)
- 4.00 **Edward de Haan, Martine van Zandvoort* and Tanja Nijboer***(Utrecht University and Medical School (UMC), The Netherlands)
Developmental colour agnosia
- 4.30 **Patrick Rabbitt, Oemetse Mogape*, Dan Lunn*, John Bithell*, Athena Tsouderou*, Christine Lowe, and Andrew Mayes** (University of Oxford and University of Manchester)
In old age memory is mediated by speed but independently by losses of hippocampal volume
- 5.00 Annual General Meeting (Lower Ground Floor Lecture Theatre)
(Members only)
- 5.30 **EPS Prize Lecture – K Nation** (University of Oxford)
Making connections between learning to read and reading to learn
(Ground Floor Lecture Theatre)
- 6.30 DRINKS RECEPTION (Room 308)
- 8.00 CONFERENCE DINNER, PESCATORI

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

- 10.00 **Satoru Saito, Alan D. Baddeley, and Yota Kimura*** (Kyoto University, Japan and University of York)
Effects of finger tapping and articulatory suppression on immediate serial recall of temporary grouped lists
- 10.30 **Klaus Oberauer*** (University of Bristol) (Sponsored by Christopher Jarrold)
Interference between storage and processing in the complex span paradigm: Is it similarity based?
- 11.00 **Simon Farrell* and Klaus Oberauer*** (University of Bristol) (Sponsored by Christopher Jarrold)
Effects of similarity at encoding and retrieval in short-term order memory
- 11.30 Coffee (Room 308)
- 12.00 **Carlo De Lillo, Roshan Rai*, and Leah Storer*** (University of Leicester)
A developmental analysis of spatial working memory capacity for structured and unstructured Corsi sequences
- 12.30 **Robert H. Logie** (University of Edinburgh)
Dissociating processing and storage in working memory span: The Edinburgh BBC study
- 1-2 LUNCH

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

- 10.00 **Gaston J. Madrid***, **Nilli Lavie** and **Michal Lavidor** (University of Hull and University College London)
Asymmetrical perceptual load in lateralized word recognition
- 10.30 **Patrick Haggard**, **Andrea Serino***, **Giulia Giovagnoli***, and **Frederique de Vignemont*** (Institute of Cognitive Neuroscience, University College London, Bologna University, Italy, and Institut des Sciences Cognitives, Lyon, France)
Is there a tactile field?
- 11.00 **Manos Tsakiris*** and **Patrick Haggard** (University College London)
Is this my hand I see before me? Multisensory perception and the sense of body-ownership
- 11.30 Coffee (Room 308)
- 12.00 **Angeliki Salamoura***, **Helen E. Moss**, **Billi Randall***, and **Lorraine K. Tyler** (Centre for Speech, Language and the Brain, University of Cambridge)
The role of feature distinctiveness and correlation in the conceptual structure of verbs
- 12.30 **Hannah Nash*** and **Margaret Snowling** (University of York)
Using the cross-modal picture-word task with children: Semantic interference or semantic priming
- 1-2 LUNCH

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

- 2.00 **Daisy Powell*, Rhona Stainthorp*, Morag Stuart, Holly Garwood*, and Philip Quinlan** (Institute of Education, University of London, Institute of Education, University of Reading, and Birkbeck College, University of London)
Do Rapid Automatized Naming (RAN) deficits lead to difficulties forming orthographic lexical representations?
- 2.30 **Holly Joseph*, Hazel Blythe*, Sarah White* and Simon Liversedge** (University of Durham, University of Southampton, and University of Leicester)
Word length effects in children and adults: Evidence from eye movements
- 3.00 **Hazel Blythe*, Holly Joseph*, John Findlay, and Simon Liversedge** (University of Southampton and University of Durham)
The visual system's tolerance of disparity when reading
- 3.30 TEA (Room 308)
- 4.00 **Geoffrey Underwood and Jonathan Stirk*** (University of Nottingham)
Visual saliency does not predict change detection: Congruency and conspicuity in the perception of real-world scenes
- 4.30 **Richard Charles Dewhurst* and David Crundall** (University of Nottingham)
Training eye-movements: Integrating top down and bottom up influences in visual search
- 5.00 **Tom Foulsham* and Geoffrey Underwood** (University of Nottingham)
Locations of eye fixations in natural scenes: Saliency or repetitive scanpaths?

END OF PARALLEL SESSIONS

End of meeting

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

- 2.00 **Elizabeth Pellicano, Linda Jeffery*, and Gillian Rhodes***
(University College, Oxford and University of Western Australia, Australia)
Face perception in autism: Is identity coded relative to a norm?
- 2.30 **Tiffany Fu*, Wilma Koutstaal, Lucia Poon*, and Anthony J. Cleare*** (University of Reading, Institute of Psychiatry, King's College, University of London, and University of Minnesota, Minneapolis, USA, and National Affective Disorders Unit, Bethlem Royal Hospital, Kent)
Depression, dysphoria and decision-making: Evidence against depressive realism
- 3.00 **Michelle Cowley*** (University of Southampton) (Sponsored by Rebecca Lawson)
Reasoning with criminal evidence: Are people logical or probabilistic thinkers?
- 3.30 TEA (Room 308)
- 4.00 **Teresa McCormack and Christoph Hoerl*** (Queen's University Belfast and University of Warwick)
Young children's reasoning about the order of past events
- 4.30 **Josef Perner and Bibiane Rendl*** (University of Salzburg)
Children understanding identity statements
- 5.00 **Baudouin Forgeot d'Arc* and Franck Ramus*** (Laboratoire de Sciences Cognitives et Psycholinguistique (EHESS/CNRS/DEC-ENS) and Service de Psychopathologie de l'Enfant et de l'Adolescent, Hôpital Robert Debré, APHP) (Sponsored by John Morton)
Tracking implicit cues of false belief detection in animated cartoons

END OF PARALLEL SESSIONS

End of meeting

1. **Michael J. Banissy* and Jamie Ward** (University College London)
Mirror-touch synaesthesia and empathy
2. **Lee de-Wit*, Charles Fernyhough*, and Simon Jones*** (University of Durham) (Sponsored by David Milner)
Generating the illusion of conscious will: Investigating the role of mentalistic reasoning
3. **Susanna Flett*, Holly Branigan*, and Martin Pickering** (University of Oxford and University of Edinburgh)
Comparing sentence production in first and second language speakers
4. **Peter Jones*, Marko Nardini*, and Oliver Braddick** (University of Oxford)
Interactions between landmark and self-motion cues for navigation in adults and children
5. **David Lagnado*, Nigel Harvey, Miral Patel* and Nusrat Uddin*** (University College London)
The impact of discredited evidence on inference
6. **Jasna Martinovic*, Thomas Gruber*, Kathrin Ohla*, and Matthias M. Mueller** (University of Leipzig, Germany and University of Liverpool)
Induced GBA elicited by task-irrelevant visual objects reflects automatic processing of representations under low but not high perceptual load
7. **Petroula Mousikou*, Max Coltheart and Matthew Finkbeiner*** (Macquarie Centre for Cognitive Science (MACCS), Macquarie University, Australia)
The masked onset priming effect and reading aloud: Effects of position of prime-target overlap and of prime duration
8. **Sukhvinder Obhi*** (Wilfrid Laurier University, Canada) (Sponsored by Patrick Haggard)
Intention costs in action generation
9. **David Pitcher*, Andy Ellis, and Vincent Walsh** (University College London and University of York)
Know we this face or no? Perceptual expertise and the own-race bias effect. A divided visual field study
10. **Friedemann Pulvermüller and Ramin Assadollahi*** (MRC Cognition and Brain Sciences Unit, Cambridge and Psychology Department, University of Konstanz)
Probability mapping of discrete combinatorial systems?: Lessons learnt from brain physiology about the brain's grammar
11. **Elizabeth D. Ray* and Anne Schlottmann*** (University College London) (Sponsored by Robin Murphy)
Do 6-months-olds see motion without contact as causal?

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- 12. Elizabeth D. Ray* and Anne Schlottmann*** (University College London)
(Sponsored by Robin Murphy)
The role of self-initiated motion, orientation changes, and non-rigid motion in 6-months-olds perception of goal-directed animated action
- 13. Stian Reimers*** (University College London) (Sponsored by Nigel Harvey)
Fractionating masculinity: Male-typical cognition and temperament in the Ultimatum Game
- 14. Eamonn Walsh* and Patrick Haggard** (Institute of Cognitive Neuroscience, University College London)
Time-course of the dismantling of a motor command as revealed by a tactile detection task
- 15. Gillian Waters* and Sarah Beck** (University of Birmingham)
The influence of information access on young children's understanding of sources of knowledge
- 16. Sarah White*, Elisabeth Hill, and Uta Frith** (Institute of Cognitive Neuroscience, University College London and Goldsmiths College, University of London)
Revisiting the strange stories: A test of understanding mental and physical states for children with autism

Phonological skills in children with SLI and dyslexia: a heterogeneous picture

Chloe Marshall¹, Franck Ramus², Stuart Rosen³ and Heather van der Lely¹

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2. Laboratoire des Sciences Cognitives et Psycholinguistique, EHESS CNRS ENS, France

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Controversy surrounds the nature of specific language impairment (SLI) and Dyslexia, the extent of their overlap and whether they reflect a common underlying deficit. In some models SLI is a severe form of Dyslexia, while in others they are separate deficits that commonly co-occur. Deficits in phonology are core to many of these models. However, the nature of the phonological deficit in the two disorders, and whether it is identical in both, is not well understood. We investigate phonological skills at the segmental level in children with SLI+Dyslexia, SLI-only and Dyslexia-only, and no deficit. We investigate: (1) The nature of phonological deficits in SLI/Dyslexia, and whether they affect input/output processing, lexical/sublexical representations (2) Whether all children with SLI/Dyslexia have phonological deficits, (3) The relationship between phonological, language and literacy deficits. We show that the SLI and dyslexic populations are heterogeneous with regards to segmental phonological abilities. Many children are impaired on tasks requiring sublexical representations (non-word repetition and perception) compared to lexical ones. However, a significant proportion of children have no impairment on these tasks. There is a high and significant correlation between segmental deficits and inflectional morphology, but not between segmental deficits and syntactic tasks. Our findings suggest that children with SLI and dyslexia do not have one single common underlying phonological deficit.

ERP signatures for syntactic and semantic processing in language-impaired children

Heather K. J. van der Lely¹ and Elisabeth Fonteneau²

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Considerable controversy surrounds whether G-SLI is caused by a domain-general deficit in auditory processing speed or capacity (Bishop, 1997; Joanisse & Seidenbert, 1998), or whether the impairment is to a domain-specific system devoted to grammar itself (van der Lely, 2005). More generally, the nature of G-SLI can elucidate whether neural circuitry subserving grammar is common to human cognition or unique. We found evidence from electrical brain responses (ERPs) for a selective impairment to grammatical processing in G-SLI. We presented participants with G-SLI, age, and younger language control groups and adults with questions containing syntactic violations and sentences containing semantic violations.

We found that the brain's automatic detection response to syntactic violations, reflected electrically as the ELAN, was elicited in all control groups and adults, but not the G-SLI group. In contrast the G-SLI participants exhibited an N400 to the syntactic violations, indicating that they were compensating for their syntactic deficit semantically. However, the G-SLI group, like the control and adult groups, exhibited a normal P600 to the syntactic violations and an N400 to semantic violations. These data provide an objective measure for a developmental, domain-specific grammatical deficit. The findings indicate that grammatical neural circuitry is a developmentally unique system in the functional architecture of the human brain.

Bishop, D. V. M. Uncommon understanding: Comprehension in specific language impairment (Psychology Press, Hove, 1997).

Joanisse, M. & Seidenberg, M. Specific language impairment: a deficit in grammar or processing? Trends in Cognitive Sciences 2, 240-247 (1998).

van der Lely, H. K. J. Domain-specific cognitive systems: Insight from Grammatical specific language impairment. Trends in Cognitive Sciences 9, 53-59 (2005).

Spatiotemporal signatures of psycholinguistic information access in the brain as revealed by MEG

Friedemann Pulvermüller and Yury Shtyrov
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We report here a new brain signature of memory trace activation in the human brain revealed by magnetoencephalography and distributed source localization. Memory circuits distributed over distant cortical areas can activate these areas in a fine-grained temporal order. These spatio-temporal patterns can be picked up in the source images underlying magnetic brain responses. We found that acoustic signals perceived as speech sounds elicited a well-defined spatio-temporal pattern of sequential activation of superior temporal and inferior frontal cortex, whereas the same identical stimuli, when perceived as noise, sparked the same areas without a significant difference in activation delays. The strength of local cortical sources reflected additional lexical, semantic and syntactic features of speech. We suggest that spatio-temporal patterns, especially cortical activation latencies in the millisecond range, represent a brain code of memory circuits.

Dyslexia and Dyscalculia: Two learning disorders with different cognitive profiles

Karin Landerl
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It is often assumed that the well established phonological deficits in dyslexic children also cause comorbid problems in arithmetic development. A study will be presented that is in contrast to this view. In four groups of 8- to 10-year old children (42

control children, 21 dyslexic children with adequate arithmetic skills, 20 dyscalculic children with adequate reading skills and 26 children with dyslexia and dyscalculia) phonological awareness as well as basic number processing skills were assessed. A phonological awareness deficit was found for both dyslexic groups, irrespective of additional arithmetic deficits. In contrast, deficits in basic number processing were observed in both groups of dyscalculic children, irrespective of additional reading problems. These findings suggest that dyslexia and dyscalculia are not causally related, but are caused by two different neurocognitive deficits, namely a phonological deficit in the case of dyslexia and a basic number processing deficit in dyscalculia.

Investigating naming difficulties in developmental dyslexia

Franck Ramus, Gayaneh Szenkovits, and Emmanuel Dupoux
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It is widely accepted that dyslexic individuals present with a phonological deficit. In this series of experiments, we attempt to test more specifically the output phonological pathway. First, using a delayed naming task, we tested whether dyslexics' difficulties on Rapid Automatic Naming tasks stem from a deficit in lexical retrieval, or in the output phonological buffer. Results suggest a deficit at the stage of lexical retrieval, with an intact output phonological buffer. Second, we tested the respective contributions of the retrieval of the semantic form of the word from that of its phonological form, using a picture naming task while hearing an interfering word. The results lead us to conclude that, during lexical retrieval, dyslexics present normal semantic access but altered access to the phonological word form.

The left inferior parietal lobe modulates the selection of low salient stimuli

Carmel Mevorach¹, Lilach Shalev², Harriet A. Allen¹, and Glyn W. Humphreys¹
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The posterior parietal cortex is implicated in attentional selection. In the present study we used fMRI to examine the role of posterior parietal cortex in selection based on the saliency of target and distractor information. Hierarchical stimuli were presented to participants and the task (respond to local or global) was crossed with the saliency of the target level (local salient, global salient). We found unique activation in the left posterior parietal cortex and the left lateral occipital complex for conditions where the less salient level had to be selected irrespective if this was the local or the global stimulus. In addition, ROI analysis revealed a positive correlation between the differences in BOLD signal change in left posterior parietal cortex for responses to low, relative to high, saliency targets and RT cost for low salient targets in reaction times.

The highest percent signal change was in the left inferior parietal region for those conditions in which the less salient target level had to be selected. In contrast, there was no evidence for lateralised activity for selection based on the level of processing. The data suggest a specific role for the left inferior parietal lobule in salience-based selection.

Dissociating neural markers of cognitive control in task-switching: An ERP study

Duncan Astle, Georgina Jackson, and Rachel Swainson
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Task-switching has been used to establish both behavioural and neural markers of cognitive control. However, this technique has yet to fully explain how cognitive control is employed in order to bring about a change in 'task-set': Are there a number of processes? If so, what are they? We have supposed that the way in which we respond to a task might influence the way in which we switch between tasks, given that there is a dissociation within the neuropsychology literature between being able to change intentions, but not actions (e.g. Husain et al., 2003), that we have previously dissociated those control processes (in terms of ERPs) occurring following response selection from those following a 'no-go' (Astle et al., In press), and that imaging data distinguishes those brain areas involved in the changing meaning of responses across tasks by comparison to retrieving consistently learnt response meanings (Crone et al., 2006). We compared Event Related Potentials (ERPs) within a precue-target interval for tasks that required either an overt response or a covert response, and those which used either shared response meanings or independent response meanings. On this basis we established three dissociable components: one common to all three, one which primarily dissociates overt and covert responding, and one which primarily dissociates bivalent and univalent responding. The possible functional identity of these will be discussed. Interestingly, there was no evidence of residual switch-costs, with subjects apparently fully preparing in advance of target onset - possible explanations for this will also be discussed.

Astle, D., Jackson, G. M., Swainson, R., In press. Dissociating neural indices of dynamic cognitive control in advance task-set preparation: An ERP study of task-switching. *Brain Research*

Crone, E.A., Wendelken, C., Donohue, S.E., Bunge, S.A. (2006) Neural evidence for dissociable components of task-switching. *Cerebral Cortex*, 16, 475-486.

Husain, M., Parton, A., Hodgson, T.L., Mort, D., Rees, G. (2003) Self-control during response-conflict by human supplementary eye field. *Nature Neuroscience*, 6, 117-118.

The development of response inhibition during mid-childhood: More no-go than go

Lucy Cragg and Kate Nation
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The development of response inhibition in 5- to 11-year-olds was investigated using a modified version of a go/no-go paradigm. In the standard version of the task, participants are required to respond to trials where a 'go' stimulus is presented, but inhibit responses to a 'no-go' stimulus, presented on approximately 25% of trials. In our version of the task a more sensitive measure was included so that responses that were inhibited after they had been initiated could also be recorded. The performance of 30 5-7-year-olds on the task was compared to that of 30 9- to 11-year-olds. While the older children were less likely to respond on no-go trials, they were also more accurate on go trials, suggesting that their superior performance was not solely due to better inhibitory skills. There was no difference between the two age groups in the number of trials on which the response was inhibited after it had been initiated. Overall, the results suggest that developmental change in response inhibition during mid-childhood is limited, however current investigations are looking at possible development in the neurophysiological underpinnings of the task using event-related potentials (ERPs).

Enhanced memory for emotional pictures: A product of eye movements?

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A series of experiments was carried out to investigate whether enhanced memory for emotional pictures can be explained in terms of attentional biases to such pictures. All experiments included a study phase in which participants were presented with emotional pictures paired with neutral pictures as well as neutral plus neutral pairs. In experiment 1 participants passively viewed the pictures; in experiment 2 they had to judge which picture they preferred; and in experiment 3 they had to judge which picture contained more colour. Participants' eye movements were recorded whilst they viewed the photographs. The study phase was followed by a recognition test of memory, in which participants were presented with the study pictures as well new pictures. All experiments showed a memory advantage for pictures with negative emotional content relative to neutral pictures, although this was less strong in the preference task, and experiments 1 and 3 showed a memory advantage for positive pictures. It is argued that the different pattern of memory results in the preference task might be due to a different pattern of eye movements.

The N170 for fearful faces: Do eyes make all the difference?

Michelle de Haan
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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.

Symposium: Using eye-movement paradigms to investigate human comprehension
Organisers: Dr Courtenay Norbury and Professor Gerry Altmann

Binocular coordination in adults and children

Simon P. Liversedge
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While a substantial amount of research has been conducted to investigate eye movement behaviour during reading, the vast majority of this work has involved the measurement of just one of the two eyes. Very little research has been carried out to examine binocular coordination during reading. In this paper I will discuss data from a series of studies in which we carefully measured binocular eye movements that adults and children made during reading. We obtained a number of basic descriptive findings - at both the start and at the end of fixation: 1) All participants had, on average, disparities between the positions of the two eyes with magnitudes significantly greater than 1 character space. 2) Children's fixation disparity magnitudes were significantly greater than those of adults. 3) Within the unaligned fixations, all participants were more likely to make uncrossed than crossed fixations. However, children made a significantly higher proportion of crossed fixations than adults. 4) When the eyes made vergence movements during a fixation, convergence was more likely than divergence for all participants. Additionally, in one experiment we incorporated a dichoptic presentation manipulation to investigate whether saccade metrics are computed on the basis of a unified visual signal from both eyes, or separate visual signals from each eye. Specifically, in our sentences we included a compound target word, each half of which was presented to a different eye. Data from this manipulation showed that saccade metrics are computed on the basis of a single fused visual percept created by unification of the separate inputs from each eye.

Reading in deaf and hearing adults: Results of an eye tracking study

Louise Shackleton, Antje S. Meyer, and Andrew Olson
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We recorded eye movements of five deaf and 20 hearing adults reading short sentences. The reading age of the deaf readers ranged between 9.5 years and 15+ years (age appropriate). The experimental sentences included a pseudoword or a high or low familiarity control word (e.g. "The rivic/shirt/scarf is in the wardrobe with the trousers"). The participants read the materials in two sessions, first without specific instructions and then with the instruction to infer the meaning of the pseudowords from the context. Analyses including only the sentences featuring control words revealed no qualitative differences in the eye gaze patterns of the two groups. The deaf participants read the sentences more slowly than the hearing participants, with their reading speed being related to their reading age. The difference in reading time arose because the deaf readers showed longer gaze durations to the words and were more likely to re-read them than the hearing readers. There was no difference between the groups in the mean first fixation durations to the words. Comparing pseudoword and control sentences showed that both groups used context to help them understand the meaning of the pseudowords, particularly in the second session. We will describe the similarities between deaf and hearing participants as well as some of the individual differences within the deaf group. The theoretical, methodological and practical implications of the findings will be discussed.

Contextual suppression in spoken language comprehension: Evidence from eye-tracking

Jon Brock and Kate Nation
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Models of word identification typically assume that all possible interpretations of a word or word fragment are initially activated, regardless of whether or not they are contextually appropriate. In the current study, adults and 8-11-year-old children were required to monitor sentences for a word that matched one of four pictures on a computer display. The target word (e.g., 'hamster') was presented after either a neutral verb (e.g., 'chose') or a constraining verb (e.g., 'stroked'). Consistent with previous studies, on target present trials, adults and children were quicker to look towards the target when it was preceded by a constraining verb. Moreover, when the target was replaced by a cohort competitor (e.g., a hammer), participants were more likely to look towards the competitor than towards unrelated distracters. Crucially, however, this effect was mediated by sentence context. Adults but not children showed a significant reduction in looks towards the competitor when it was contextually inappropriate. These findings indicate that sentence context can in fact have an immediate effect on lexical processing but that context-related suppression may be a late-developing capacity.

Mapping between language and the visual world: Dissociations between the visual world and its mental representation

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The goal of much psycholinguistic research is to understand the processes by which linguistic input is mapped onto a hearer's mental representation of his or her world. In a range of studies, with adults and (one) with children, we have explored these processes by recording eye movements around a visual scene as participants hear a sentence that describes an event that involves the objects depicted in the scene. Typically, the eyes look towards named objects, or towards objects that are about to be referred to (e.g. during the verb in “the boy will eat..”, the eyes move towards edible objects). If the scene is removed before the sentence is heard, the eyes move to where those objects had been. And if the sentence describes an event in which one of the objects is moved to a new location, then the eyes take into account this new location (even though the object was never seen in that location). The data demonstrate the feasibility of using eye movements to track the mapping of language onto mental representations, both in adults and in children.

Social visual pursuit: Tracking the links to language

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Klin et al (2002) investigated spontaneous social attention in adolescents with autism as they watched dynamic scenes of social interaction. Relative to typically developing peers, the teenagers with autism spent considerably less time looking at the eyes of scene protagonists and significantly more time fixating on characters' mouths, as well as irrelevant aspects of the scene. Klin and colleagues hypothesized that looks to the mouth might represent a language-based strategy to compensate for poor understanding of social cues. We tested this hypothesis by contrasting the viewing patterns of teenagers with autism who had normal range language comprehension to teenagers with autism who had impaired language abilities, as well as typically developing peers. In contrast to Klin et al (2002), we found no overall group differences in fixation time to eyes or mouths. A greater number of individuals with autism showed a preference for looking at mouths; however, this preference did not pattern with language profile. We consider these findings in relation to symptom severity and the need for developmentally and culturally appropriate stimuli.

Klin, A., Jones, W., Schultz, R.T., Volkmar, F.R., & Cohen, D.J. (2002). Visual Fixation Patterns During Viewing of Naturalistic Social Situations as Predictors of Social Competence in Individuals with Autism. *Archives of General Psychiatry*, 59: 809-816.

End of symposium

EPS Prize LectureMaking connections between learning to read and reading to learn

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The fundamental task facing young children as they begin to learn to read is to learn how to decode and recognise words. It is well-accepted that the development of decoding is supported by children's phonological skills – their ability to segment and manipulate the sounds of spoken language. However, much less is understood about how children acquire a visual word recognition system that is able to support fast and efficient lexical processing of the type that (a) characterises skilled visual word recognition and (b) can provide the basis for reading comprehension. This talk will consider the role that meaning may play in reading development, both in terms of shaping the development of orthographic knowledge and in underpinning the process of reading comprehension.

People cannot perceive images on mirrors and windows

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Three studies investigated the task of judging the size of images of objects on the glass surface of a mirror or of a window. We tried different ways of explaining the task to overcome the difficulty that people have in understanding what an image is, and we varied the distance of the observer to the mirror or window. We compared results for this image estimation task to the task of judging the physical size of the object that produced the image. For both mirrors and windows, observers could judge the physical size of objects but they greatly overestimated image size. Image size was judged to be around 60% greater than the true size of the image. People were also questioned verbally about their knowledge of image size relative to physical size and the effect on image size of the observer moving away from the mirror or the window. Similar errors were produced for these conceptual questions as were found in the perceptual estimation tasks. Together these results suggest that images on mirrors and windows are treated in the same way, and that observers cannot perceive such images as distal objects.

How long do things seem to last? Subjective shortening and temporal consolidation in the judgement of short durations

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When the duration of a stimulus is retained in memory, it often appears to shorten with increasing retention interval (subjective shortening). For example, if two identical short tones are presented with a gap of from 1 to 10 s between them, participants

increasingly tend to judge that the second is longer as the gap increases. Two experiments illustrate this phenomenon with filled and unfilled auditory and visual intervals. But what happens when the gap between the two stimuli is very short, e.g. 250 ms or less? One possibility is that a rapid switch of attention between the stimuli will adversely affect processing of the second one, making it appear shorter. In fact, the opposite effect was found in two experiments. One interpretation is that this results from the perturbation of a "temporal consolidation" process for the first stimulus, a process which is abandoned when the second stimulus is presented. Such a consolidation-like process has been previously proposed by theorists, but has never before been observed.

Faster and slower: The effect of previously viewed velocities on current velocity estimates

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Previous research has shown that humans can store representations of the velocity of moving objects. Moreover, smooth pursuit eye movement experiments have shown that previously encoded representations may interfere with subsequent velocity processing. We explored these past history effects using a motion extrapolation paradigm. Participants observed a single moving target disappear behind an occluder and were required to respond at the exact time they thought the target should reappear. In Experiment 1, velocity judgements were systematically influenced by the velocity of the previous trial; when the previous trial was slow, they responded as if the current trial was slower, and vice versa. In Experiment 2, the size of the occluder was manipulated such that targets of different velocities were occluded for the same duration. A similar, but smaller past history effect was obtained. In Experiment 3, conditions were interleaved in which the distance travelled by the target and the duration of presentation was matched across different velocities. Both conditions yielded past history effects, suggesting that these effects cannot be attributed entirely to either the spatial characteristics or temporal characteristics of the previous trial. This provides evidence that previously viewed velocities systematically interfere with subsequent velocity representations.

Developmental colour agnosia

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Colour agnosia concerns a selective neuropsychological condition in which colour perception is intact, while the identification and naming of colour is disrupted. In this presentation, I will report a man who has had this condition all his life, suggesting that he suffers from a developmental deficit in the recognition of colours. Subsequently, I will describe a number of experiments that we have carried out in order to provide a more detailed description of his impairment in terms of covert processing and the effect that his colour recognition deficit has on his object recognition.

Finally, I will focus on the possibility of familial determination. There is now good evidence that familial factors play a role in the development of certain selective cognitive deficits, such as dyslexia and prosopagnosia. To that end, we have recently investigated the colour processing abilities of his mother and his two daughters.

In old age memory is mediated by speed but independently by losses of hippocampal volume

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In healthy old people individual differences in information speed account for between 70% and 100% of that proportion of the variance between them on all memory tasks that is associated with differences in their ages. Individual differences in age-associated losses in gross brain volume account for 100% of individual differences in information processing speed and the effects of losses of brain volume on memory are entirely accounted for by these volume-associated losses in speed. However about 13% of healthy individuals, as they grow old experience rates of loss of memory that are 1.5 sd or greater than their rates of loss of intelligence, speed or other cognitive performance indices. Their condition is not a risk factor for dementia, mortality or other pathology and they do not fit the diagnostic criteria for Mild Cognitive Impairment. MRI scans show that these memory impaired individuals have significantly smaller R and L hippocampi than controls individually matched for age, sex and level and rate of decline in fluid intelligence. We conclude that losses in gross brain volume and hippocampal shrinkage affect memory in functionally different ways.

Effects of finger tapping and articulatory suppression on immediate serial recall of temporary grouped lists

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We investigated a beneficial effect of temporal grouping, in which nine-digit lists are clustered into threes, on immediate serial recall of visually presented lists. A primary variable in this study was item presentation timing: Constant regular-rate or grouped timing. Furthermore, we manipulated temporal structures of secondary tasks, i.e., finger tapping and articulatory suppression. In Experiment 1, participants performed these memory tasks under three tapping conditions: no-tapping control, regular-rate tapping, and grouped tapping, in which timing of tapping was the same as that of grouped presentation. Results showed a significant facilitative effect of grouped presentation in the grouped tapping condition, but not in the regular-rate tapping condition.

In Experiment 2, procedures were essentially the same as for the first experiment except that tapping was always accompanied by articulatory suppression synchronized to the tapping; thus, three dual-task conditions were no-suppression control, regular-rate suppression, and grouped suppression. Although recall levels declined dramatically, we observed a reliable grouping presentation effect again in the grouped suppression, but not in the regular-rate suppression condition. We assume that articulatory suppression removes the temporal grouping effect for visually presented materials by distracting coding of timing information but not by preventing phonological coding.

Interference between storage and processing in the complex span paradigm: Is it similarity based?

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In the complex span paradigm participants alternate between encoding list items for serial recall and working on a distractor task. Barrouillet, Bernardin, and Camos (2004) have argued that the distractor task affects recall accuracy by introducing delays in which memory representations decay while rehearsal is prevented. The adverse effect of the distractor task, however, is largest when memory and distractor task use the same category of stimuli (e.g., numbers vs. words, see Conlin, Gathercole, & Adams, 2005). I will present a series of experiments testing the effects of similarity within a category (i.e., words). Neither phonological similarity nor semantic similarity between memory words and words to be read aloud as distractor task affected recall. Memory performance was better when distractor words had to be read at a slower rate. These results question the hypothesis of similarity-based interference between memory items and representations used in the distractor task. They are consistent with the prediction of Barrouillet et al. (2004) that memory depends on the rate and not the duration of the distractor activity.

Barrouillet, P., Bernardin, S., & Camos, V. (2004). Time constraints and resource sharing in adults' working memory spans. *Journal of Experimental Psychology: General*, *133*, 83-100.

Conlin, J. A., Gathercole, S. E., & Adams, J. W. (2005). Stimulus similarity decrements in children's working memory span. *Quarterly Journal of Experimental Psychology*, *58A*, 1434-1446.

Effects of similarity at encoding and retrieval in short-term order memory

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Some models of short-term serial recall hold that phonological similarity has an effect only on discrimination of items at retrieval (e.g., the Start-End Model: SEM; Henson, 1998). Other models predict that similarity affects encoding as well. For example, the Serial-Order-in-a-Box model (SOB; Farrell, in press; Farrell &

Lewandowsky, 2002) assumes that items similar to current memory contents are given less encoding weight, and thus predicts an increasing effect of similarity across input position. Additionally, while most models hold that items are suppressed after recall, SOB uniquely assumes that this response suppression will generalise to other, similar, items, predicting an increasing effect of similarity across output position. These predictions were tested in a position probed-recall paradigm allowing for the dissociation of input and output effects. Data and model fitting provide support for the input mechanism of SOB, but suggest response suppression acts on localist, not distributed, representations.

Henson, R.N.A. (1998). Short-term memory for serial order: The Start-End Model. *Cognitive Psychology*, 36, 73-137.

Farrell, S. & Lewandowsky, S. (2002). An endogenous distributed model of ordering in serial recall. *Psychonomic Bulletin & Review*, 9, 59-79.

Farrell, S. (in press). Mixed-list phonological similarity effects in delayed serial recall. *Journal of Memory and Language*.

A developmental analysis of spatial working memory capacity for structured and unstructured Corsi sequences

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We report the results of four experiments where pre-school and primary school children reproduced structured and non-structured spatial sequences in variants of the Corsi tapping test. Experiment 1 shows that structured sequences produce a better serial recall from the age of three. Experiment 2 shows that if temporal pauses are incongruent with spatial chunking the benefits of structuring are reduced, suggesting that hierarchical encoding is the principle supporting performance. The results of Experiment 3, where structured sequences followed a linear organisation, indicate that the benefits of structuring are not confined to grouping by spatial proximity. Finally, some parallels between spatial clustering and grouping by semantic verbal categories were found in experiment 4, indicating a possible involvement of long term memory in structuring immediate recall. These results support the hypothesis that the ability to detect and encode the structure of the material to be remembered is a determinant of cognitive change in working memory.

Dissociating processing and storage in working memory span: The Edinburgh BBC study

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One view of the system supporting working memory (WM) span performance is that processing and storage draw on a common resource with the implication that greater

demands on storage will result in less resource for processing and vice versa. A second view is that the processing elements of the task prevent rehearsal of the memory items, thereby leading to forgetting. A third view is that both processing efficiency and memory capacity are determined by general mental ability. A fourth possibility is that processing efficiency and memory capacity are largely independent components of a WM system. This paper will report a study carried out in collaboration with the BBC involving Web-based data collection on WM span in which sentence verification time was measured as well as span for recall of sentence-final words. Analysis on a sample of 24,000 participants indicated that processing time was highly reliable on test-retest but yielded a small positive correlation with WM span. These results were not modified by level of education, taken as a proxy for mental ability. Results are consistent with the independent component view.

Asymmetrical perceptual load in lateralized word recognition

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To operate efficiently, systems need to be fed with relevant information. Processing of unnecessary information can have a detrimental effect on performance, hence relevant and irrelevant information are normally subject to a selection process. According to the perceptual load model (Lavie, 2005), processing of irrelevant information is a function of the load involved in the relevant task. Typically, performance in high load tasks will be less affected by irrelevant distractors than in low load tasks. We used a divided visual field paradigm to test how hemispheric asymmetries in word recognition affect information selection. We presented letter strings to the right or left visual field (RVF or LVF, respectively) and measured the response competition effect of irrelevant distractors. We found that words projected to the RVF but not LVF were significantly affected by the irrelevant distractor, suggesting that word recognition task load was lower in RVF compared to LVF. This might indicate that task performance in the RVF was influenced by the left hemisphere expertise for language (Lavidor & Ellis, 2002).

Lavidor, M., Ellis, A.W. (2002) Word length and orthographic neighbourhood size effects in the left and right cerebral hemispheres. *Brain and Language*, 80 (1),45-62.

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

Is there a tactile field?

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The visual field is a cardinal concept of psychology. 'Field' refers to a space given by the anatomy of the perceptual system itself. Perceptual contents are attached to locations in the field, and thus have metric spatial properties and relations. Recently, Martin (1992) suggested that touch lacks this spatial organisation. We therefore investigated whether two simultaneous brief flanker touches on the palm influenced perception of a subsequent target touch in a spatially-dependent way. We found that judgments of target intensity depended on flanker intensity. This influence was stronger when the target lay on the line joining the flankers than when the target was distant from this line. Perception of the target was fused with flankers when all stimuli formed a tactile line. We suggest that: a tactile spatial organisation exists; it supports the relation of collinearity; it is automatically activated by touch; it groups spatially coherent perceptual contents. In subsequent experiments, subjects judged whether a target was collinear with two flankers. The tactile field extended to 15 cm. The field evolved gradually after flanker touches, suggesting secondary tactile processing. Finally, we report the extent of the tactile field across body parts, and its relation to neural body representation.

Martin, M (1992). "Sight and Touch" in *The Contents of Experience*, ed. Tim Crane. Cambridge: Cambridge University Press.

Gallace A, Tan HZ & Spence C (2006). Numerosity judgements for tactile stimuli distributed over the body surface. *Perception*, 35, 247-66.

Is this my hand I see before me? Multisensory perception and the sense of body-ownership

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Recent research has focused on how multisensory percepts are processed by the brain to generate the sense of body-ownership, that is, the sense that bodily sensations are unique to one's self. We studied how body-ownership arises by controlling whether an external object was accepted as part of the body or not. Watching a rubber hand being touched in synchrony with one's own unseen hand gives the experience that the rubber hand is part of one's body. In a series of psychophysical studies, we show that the Rubber Hand Illusion involves an interaction between current multisensory perception and top-down influences from more permanent representations of body structure. Visuo-tactile correlation is a necessary but not a sufficient condition for body-ownership. In two recent experiments, we have investigated how correlated sensory stimuli may be assimilated to a pre-existing reference representation of the body.

First, we present evidence that the right temporo-parietal junction maintains this reference representation of one's own body. Second, we will suggest that the subjective feeling of body-ownership is correlated with activity in the right posterior insula. These structures may form a network that plays a fundamental role in linking current sensory stimuli to one's own body, and thus also in self-consciousness.

The role of feature distinctiveness and correlation in the conceptual structure of verbs

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Two important determinants of conceptual structure are the distinctiveness of semantic features (true of few or many concepts) and their correlation (co-occurring with few or many other features, e.g. McRae et al, 1997; Durrant-Peatfield et al, 1998; Tyler & Moss, 2001; Randall et al., 2004). However, these determinants arise mainly from the study of concrete nouns. Here, we examine the role of distinctiveness and correlation in verbs. A property norm study where participants listed features for 137 verbs showed that distinctive features are more weakly correlated than shared features. Conceptual models, such as the Conceptual Structure Account (Tyler & Moss, 2001), assume that strongly correlated shared features are activated faster due to mutual activation. If this principle generalises to verbs, their distinctive features should present a processing disadvantage. This prediction was upheld using speeded feature verification where participants were significantly faster to decide whether highly correlated shared features (uses voice) were true of a concept (sing) than weakly correlated distinctive features, suggesting that verbs follow the same organizational principles as nouns with similar implications for on-line processing - disadvantaging weakly correlated features. These findings suggest that conceptual structure accounts may serve as general accounts rather than being specific to nouns.

Durrant-Peatfield, M. R., Tyler, L. K., Moss, H. E., & Levy, J. P. (1997). The distinctiveness of form and function in category structure: A connectionist model. In M. G. Shafto & P. Langley (Eds.), *Proceedings of the 19th annual conference of the cognitive science society*. Mahwah, NJ: Erlbaum.

McRae, K., De Sa, V. R., & Seidenberg, M. S. (1997). On the nature and scope of featural representations of word meaning. *Journal of Experimental Psychology: General*, 126(2), 99-130.

Randall, B., Moss, H. E., Rodd, J. M., Greer, M., & Tyler, L. (2004). Distinctiveness and correlation in conceptual structure: Behavioral and computational studies. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 30(2), 393-406.

Tyler, L. K., & Moss, H. E. (2001). Towards a distributed account of conceptual knowledge. *Trends In Cognitive Sciences*, 5(6), 244-252.

Using the cross-modal picture-word task with children: Semantic interference or semantic priming

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Jerger, Martin and Damian (2002) demonstrated semantic interference in children when the onset of a semantically related, spoken word preceded the onset of a picture by 150ms. However, Hanauer and Brooks (2005, experiment 2) failed to find semantic interference in a similar task with an ISI of 500ms. In fact the data were more consistent with semantic priming. The current experiments were designed to investigate whether semantic priming could be obtained in this task, and if so, under what conditions. Two groups of typically developing children (7-8 years and 9-10 years) took part. ISI (1000ms and 250ms), type of semantic relation (categorical and functional) and associative strength (high or low) were manipulated. The older children showed priming only for associated pairs (categorical and functional) at both ISIs. At 1000ms, the younger children showed priming for associated category co-ordinates. At 250ms, they showed priming for category co-ordinates, regardless of associative strength, and for non-associated functionally related pairs. It is hypothesised that expectancy effects are operating at both ISIs in the older group but only at the longer ISI in the younger group, with the priming effects at the shorter ISI reflecting automatic semantic processing in this group.

Hanauer, J. B., & Brooks, P. J. (2005). Contributions of response set and semantic relatedness to cross-modal Stroop-like picture-word interference in children and adults. *Journal of Experimental Child Psychology*, 90, 21-47.

Jerger, S; Marin, R. C & Damian, M. F. (2002). Semantic and phonological influences on picture naming by children and teenagers. *Journal of Memory and Language*, 47, 229-249.

Do Rapid Automatized Naming (RAN) deficits lead to difficulties forming orthographic lexical representations?

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Children's performance on tasks known as Rapid Automatized Naming (RAN) tasks is known to be strongly related to their progress in learning to read, though the mechanisms underlying this relationship are not fully understood. A set of experiments using the Reicher-Wheeler paradigm was carried to investigate whether deficits in performance on Rapid Automatized Naming (RAN) tasks is associated with difficulties forming orthographic lexical representations. The performance of a group of 8 to 10 year-

old children who performed poorly on RAN tasks was compared to that of controls matched on phonological awareness, age and cognitive abilities. Specifically, the extent to which the low-RAN and Control groups showed word and pseudoword superiority effects, taken as a measure of the quality of lexical representations, was examined. Subtle performance differences were found between low-RAN and Control children, suggesting that the Control children had more finely-differentiated orthographic representations.

Word length effects in children and adults: Evidence from eye movements

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Although word length effects are well-established in adult readers in the eye-movement literature, there has been very little research looking at children's eye movements in relation to word length. We conducted an eye-movement experiment to investigate word length effects in child readers. Twenty children and twenty adults read sentences containing long and short words while their eye movements were monitored. Results showed that both adults and children were more likely to skip short than long words, to refixate long than short words, and to make longer gaze durations on long words than short words, though this effect was only reliable for children. Distributions of initial fixation positions were similar for children and adults. However, refixation distributions for adults were tight and targeted towards ends of words whereas for children they were far more diffuse indicating that refixation behaviour in adults is governed by word length and landing position to a greater degree than for children. The results show that while children and adults are generally alike in their processing of long and short words, adults' increased processing efficiency is reflected in the fact they are better able to target refixations that are necessary for lexical identification and subsequent linguistic processing.

The visual system's tolerance of disparity when reading

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Research has demonstrated that adults' eyes are unaligned during reading, and the mechanism for coping with disparities is fusion as opposed to suppression (Liversedge et al., 2006a; 2006b). Further, children's eyes are disparate to a greater degree than are adults' (Blythe et al., 2006). The aim of this research was to establish 1) if children also fuse disparate stimuli, and 2) the range of disparity over which readers can fuse stimuli, i.e. Panum's area. We monitored adults' and children's binocular eye movements when reading single words that did or did not contain a single-letter misspelling, and making a decision as to whether they were correctly spelled. The words were presented dichoptically, using CRS shutter-goggles, so the word presented to one eye could be

varied in its horizontal position on the screen relative to that presented to the other eye. Participants made more, longer fixations, slower responses, and more errors in detecting misspellings at greater disparities. The direction of the disparity did not affect these measures, only the magnitude. Increased response times, in combination with overall high response accuracy, are evidence of participants' fusion of the stimuli. Effects in all measures across disparities indicate the range of Panum's area in reading.

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Visual saliency does not predict change detection: Congruency and conspicuity in the perception of real-world scenes

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Is change detection facilitated by visual saliency? In two experiments with photographs of real-world scenes the task was to say whether two pictures were identical or not, and when there was a difference one object had been replaced. In one experiment the two pictures appeared in the same location one after the other until a response was made (the flicker paradigm used in demonstrations of "change blindness") and in the second experiment the two pictures were viewed side by side (comparative visual search). The changed object was of either high or low visual saliency (brightness, colour, and orientation variations), and it was either congruous with the scene (eg, a spoon on a kitchen work surface) or it was incongruous in that the object would not ordinarily appear in that particular scene (eg, a spanner on a kitchen work surface). In both experiments changes were detected more effectively when the object was incongruous, but the conspicuity of the changed object did not influence detection. The results provide a further limitation on the predictive power of saliency models in the capture of attention, and indicate that the detection of change relies more upon scene semantics than upon low-level conspicuity.

Training eye-movements: Integrating top down and bottom up influences in visual search

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A central focus of vision research in recent decades has been to identify what visual search strategies people use in different contexts. Recent models of visual attention

and eye movements have been primarily concerned with the bottom up influences of stimuli, via saliency maps, upon the decision to fixate a stimulus or to make a saccade to another stimulus. It is less clear however, how goal directed strategies effect saccade generation via top down control. This is the focus of the research to be presented. Using Findlay and Walker's (1999) Model of saccadic eye-movements as a basis, specific strategies to enhance the efficiency of participants' visual search have been developed. These "training" principles are purposefully implemented to reduce response times to target stimuli via two routes in Findlay and Walkers Model. It will be argued that top down control strategies can differentially affect the WHERE and WHEN pathways of Findlay and Walker's Model, and that training can be directed to these pathways either independently or in concert, with different consequences. This research is particularly relevant to training the eye-movements of novice practitioners of complex tasks (e.g. learner drivers), where there has been mixed success in the literature to date.

Findlay, J.M. & Walker, R. (1999) A model of saccade generation based on parallel processing and competitive inhibition. *Behavioral and Brain Science*, 22(4), 661-721.

Locations of eye fixations in natural scenes: Saliency or repetitive scanpaths?

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Fixation locations in natural scenes and the order in which they are selected (the scanpath) may be controlled by a bottom-up saliency map (Itti and Koch, 2000). Is bottom-up allocation a significant factor, even when previously encoded stimuli are being viewed a second time? An alternative view of scanpath generation, proposed by scanpath theory (Noton and Stark, 1971), suggests that fixation sequences are encoded and then re-invoked at recognition. This theory predicts that scanpaths will be similar across viewings. Fixations were recorded in a group of subjects viewing photographs in preparation for a memory test and when recognising them later. Analyses suggested that the saliency model was predictive at both encoding and at test; a significant proportion of all fixations landed on the most salient regions identified by the map, and model-predicted saliency was higher than chance at fixation locations. A string-editing algorithm designed to quantify scanpath similarity showed that individual's scanpaths at encoding and test were more similar than chance, and that this similarity could not be accounted for by purely task or subject patterns. It is concluded that saliency is of interest in natural scenes and could be helpful in explaining repetitive scanpaths.

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Noton, D., & Stark, L. (1971). Scanpaths in saccadic eye movements while viewing and recognizing patterns. *Vision Research*, 11(9), 929-42.

Face perception in autism: Is identity coded relative to a norm?

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Recent work highlights perceptual abnormalities in autism. Plaisted (2000) argues that these reflect poor processing of features held in common across stimuli, predicting a reduced ability to form and use 'norms'. We investigate this claim using a face identity after-effect paradigm (Leopold et al., 2001; Rhodes & Jeffery, 2006). Adapting to a face biases adults to perceive the opposite identity: after adapting to anti-Dan, the computational opposite of Dan, they identify the average face as Dan. This identity aftereffect suggests that identity is coded relative to the average (norm). We measured the identity aftereffect in children with autism (n = 15) and typically developing children (n = 16), matched in terms of chronological age and nonverbal ability. Typically developing children showed a clear identity aftereffect: following adaptation to a face, they perceived an average face as having opposite identity. Children with autism did not, suggesting impaired norm-based coding of identity.

Leopold, D. A., O'Toole, A. J., Vetter, T., & Blanz, V. (2001). Prototype-referenced shape encoding revealed by high-level aftereffects. *Nature Neuroscience*, 4, 89-94.

Plaisted, K. C. (2000). Aspects of autism that theory of mind cannot easily explain. In S. Baron-Cohen, H. Tager-Flusberg, & D. J. Cohen (Eds.). *Understanding Other Minds: Perspectives from Autism and Cognitive Neuroscience* (pp. 222-250) Second Edition. Oxford, UK: Oxford University Press.

Rhodes, G., & Jeffery, L. (2006). Adaptive norm-based coding of facial identity. *Vision Research*, 46, 2977-2987.

Depression, dysphoria and decision-making: Evidence against depressive realism

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This project aims to test two competing hypotheses regarding how cognitive biases in depression affect the way an individual views their environment -- depressive realism vs. selective information-processing -- by investigating the relationship between different mood states and accuracy of confidence assessments. A clinically depressed patient group (n=20), a non-depressed patient group with chronic fatigue syndrome (n=22), and demographically-matched healthy controls (n=32) participated in a novel experimental paradigm, involving recognition memory for self-relevant adjectives, in which healthy individuals (n=45) were previously found to display both under- and over-confidence in their judgments depending on how confidence was assessed (under-

confidence on an aggregate post-test performance measure but overconfidence on item-by-item confidence judgments). On the post-test performance estimate measure, both the depressed and non-depressed chronic fatigue patients showed significant under-confidence whereas the healthy control group was essentially realistic on this measure. Furthermore, the item-by-item confidence of the CFS patients was significantly lower than that of healthy controls, even though their actual performance accuracy significantly exceeded that of the controls. This study found no evidence supporting depressive realism. The parallel pattern of significant under-confidence in the depressed and non-depressed chronic fatigue patient groups compared with healthy controls may point to an important cognitive commonality of selective information-processing in these two patient groups.

Reasoning with criminal evidence: Are people logical or probabilistic thinkers?

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An important question for reasoning theories is whether people reason with evidence rationally. Knowledge of previous convictions is a type of criminal evidence that may bias a jury. Previous convictions are logically unrelated to the facts of a present case, but do people understand this logical distinction? An experiment examined how participants reasoned with evidence in a real life case in which a child died. The accused had similar previous convictions. Participants reasoned about the case in one of three conditions: the case without knowledge of previous convictions; the case with knowledge of one previous conviction; the case with knowledge of two previous convictions. Participants were asked to: (i) conclude whether they thought the man was "guilty", "not guilty", or "cannot decide", and (ii) rate on a scale of 1 to 10 how guilty they thought the man was. The results showed that participants chose "cannot decide" regardless of the number of previous convictions ($p < .0005$), but their guilt ratings increased with the number of previous convictions disclosed ($p < .0005$). This result suggests that people understand guilt is logically unrelated to previous convictions, but likelihood ratings of guilt were biased. One theoretical implication is that people may reason probabilistically towards logical conclusions.

Young children's reasoning about the order of past events

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Some recent studies have suggested that children below 5 years may have difficulties exploiting information about event order in their reasoning about the world (McCormack & Hoerl, 2005; Povinelli et al., 1999). Findings are reported from studies assessing children's ability to use temporal order information in their reasoning. A novel task was used which placed minimal working memory demands on children. Participants initially learned the order in which two dolls carried out activities in a toy house.

Then, out of sight of the child, the dolls went into the bathroom and, one at a time, retrieved a hairbrush, brushed their hair, and placed the brush in one of two cupboards. At test, children were required to locate the hairbrush. They were provided with information about which cupboard each doll had placed the brush in; thus locating the brush simply involved taking into account the order in which each of the two dolls had acted. Across three experiments, 4-year-olds were unable to use this order information to guide their search, although 5-year-olds could do so. The findings of an additional study with 3-year-olds suggested that 4-year-olds' difficulties lie in reasoning about the temporal order in which unseen events have occurred.

McCormack, T. & Hoerl, C. (2005). Children's reasoning about the causal significance of the temporal order of events. *Developmental Psychology*, 41, 54-63.

Povinelli, D. J., Landry, A. M., Theall, L. A., Clark, B. R., & Castille, C. M. (1999). Development of young children's understanding that the recent past is causally bound to the present. *Developmental Psychology*, 35, 1426-1439.

Children understanding identity statements

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This is the first study investigating when children can make sense of identity statements. Fifty-five children (3.5 - 4.6 years) were told two stories, e.g., they were shown two female figures one of which was clearly identifiable as a nurse. They were then told that a bracelet was found that belongs to Susie's mother. A confederate volunteered the information: "Susie's mom is the nurse." Children were asked to hand back the lost bracelet to one of the female figures. Only 40% of children were able to make the inference from the ring belonging to Susie's mother, and Susie's mother being the nurse, to the ring belonging to the nurse. In two control stories, e.g., a dog collar belonging to Fido was found. The confederate informs that Fido belongs to the nurse, and children were asked to hand back the collar. An estimated 78% of children were able to make the inference from the collar belonging to Fido, and Fido belonging to the nurse, to the collar belonging to the nurse. We suggest that understanding identity statements requires meta-representational abilities, which explains why it is mastered at the same time as other tasks like the false belief task.

Tracking implicit cues of false belief detection in animated cartoons

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The false belief paradigm has been widely used for the study and the assessment of social cognition in normal and pathological conditions. However, available false belief tasks present many limitations, such as the lack of individual quantitative data and of well matched control measures. Moreover, the high requirements of these tasks in terms of language abilities and executive functions such as inhibition and working memory can confuse the interpretation of performance, particularly in young or disabled subjects. We propose a new false belief task, based on silent animated cartoons featuring a set of stories, aimed to match different belief and intention attribution conditions with non-mentalistic conditions. Eye-tracking is being processed during stimuli presentation, in order to detect implicit cues of scene processing. We will present the first results of a pilot study on 10 healthy adults. Perspectives include normal and autistic child testing as well as adaptation for functional neuroimaging.

Mirror-touch synaesthesia and empathy

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Previous studies have indicated evidence of a tactile mirror-system in which actual and observed touch results in activity in similar areas of primary and secondary somatosensory cortices. Moreover, in some individuals (mirror-touch synaesthesia) observed touch is experienced as tactile stimulation in a somatotopic location on the observer's body (Blakemore et al, 2005). This group study investigated behavioural correlates of mirror-touch synaesthesia by using two spatial congruity paradigms in which participants were requested to detect the site of actual touch while ignoring observed touch (and the synaesthetic touch induced from it). Mirror-touch synaesthetes were significantly faster at identifying a site touched on their own face or hands when observed touch to another person was congruent with their synaesthesia compared to incongruent trials. No significant differences were observed for control participants. Furthermore, the relationship between mirror-touch synaesthesia and empathy was investigated. Mirror-touch synaesthetes showed significantly higher scores on the emotional reactivity subscale of the empathy quotient compared to controls. These findings were partially consistent with the notion that we understand and empathise with others by a process of simulation.

Blakemore, S. J., Bristow, D., Bird, G., Frith, C., & Ward, J. (2005). Somatosensory activations during the observation of touch and a case of vision-touch synaesthesia. *Brain*, 128, 1571-1583.

Generating the illusion of conscious will: Investigating the role of mentalistic reasoning

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Wegner (2002) argues that our experience of conscious will is an illusion because it is based upon an interpretation of the likely role of our thoughts and intentions in causing our actions rather than direct introspection. Two studies (Wegner and Wheatley 1999, Aarts, Custer and Wegner 2005) have highlighted the interpretive nature of our experience of conscious will, showing that participants can be biased into believing that thoughts (that they were primed to generate) were critical to causing actions (that they did not in fact cause). Individual variability in these two tasks was explored in order to assess the role of mentalistic reasoning in this interpretive process. The results failed to provide a straightforward replication of Wegner and Wheatly or Aarts et al. However, individual variability in both tasks correlated with performance on a mentalistic reasoning task in which participants made anthropomorphic judgements about simple displays. The propensity to anthropomorphise in this task is thought to reflect the attribution of a mentalistic cause to an observed event. These data suggest that the processes involved in attributing mental causes to physical events are also critical to interpreting the role of mental states in causing one's own behaviour.

Aarts, H., Custer, R. and Wegner, D. (2005) On the inference of personal authorship: Enhancing experienced agency by priming effect information. *Consciousness and Cognition*, 14, 439-456.

Wegner, D. M. (2002) *The illusion of conscious will*. Bradford Books, MIT Press. London.

Wegner, D. M. & Wheatley, T. P. (1999) Apparent mental causation: Sources of the experience of will. *American Psychologist* 54(7), 480-92.

Comparing sentence production in first and second language speakers

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Are there differences in how syntactic representations are processed by second language (L2) learners and people who learned the language as a child? Is this influenced by the learner's native language (L1)? We investigated this in three experiments using syntactic priming (Bock, 1986), which is the tendency people have to repeat the syntactic structure of a preceding, unrelated sentence. Experiments 1 and 2 demonstrated priming for Spanish active and passive structures in L1 and intermediate- and higher proficiency L2 speakers. Although all three groups showed a comparable increase in priming when the verb was repeated, L2 speakers showed a stronger overall priming effect, irrespective of proficiency. Experiment 3 primed the English dative alternation in L1 speakers, and L2 speakers whose L1 either allowed the dative alternation (German) or did not (Spanish). All three groups displayed comparable priming. We argue that these results provide evidence that similar syntactic representations and processes are used in L1 and L2 sentence production and that L2 speakers' syntactic behaviour is not influenced by preferences from their L1. However, L2 speakers' incomplete acquisition of restrictions on the use of particular structures may leave them more susceptible to priming of structures that L1 speakers strongly disfavour.

Bock, J. K. (1986). Syntactic persistence in language production. *Cognitive Psychology*, 18, 355-387.

Interactions between landmark and self-motion cues for navigation in adults and children

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This study investigated how human navigation integrates spatial information from external visual cues, and internal self-generated cues (path integration) in adults. A second study, in progress, is examining how this interaction develops in childhood. Participants were tested in a completely dark circular arena with illuminated landmarks around its periphery. On each trial participants walked along a two-segment path and then attempted to return to the starting point. Conflict between internal and external cues was introduced by rotating the peripheral landmarks before the return leg of the journey.

Adults significantly followed the landmark rotations in their return paths. Moreover, participants relied more on the landmarks when they executed larger turns before returning, consistent with a shift away from path integration under conditions of greater cumulative error. Interestingly, participants were more led by the landmarks in later trials, despite subsequently reporting having noticed the landmarks' instability. Sex differences were also observed: females underestimated distance while males judged it more accurately. These data provide interesting insights into how spatial information is integrated in adults, and afford a baseline for comparing the performance of children in a study in progress, results from which will also be reported.

The impact of discredited evidence on inference

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How do people revise their beliefs once an item of evidence is discredited? For example, when the testimony of a key witness in a criminal trial is shown to be fabricated, how does this affect judgments about the credibility of other witnesses, or even unrelated forensic evidence? In two studies we gave mock jurors simplified criminal cases, and asked them to judge the probability that a target suspect was guilty on the basis of sequentially presented evidence. We manipulated the degree of relatedness between the items of evidence and the order of presentation. The main findings were: (1) when the discrediting information was presented last, participants over-generalized this to other items of evidence, both related and unrelated; (2) when discrediting information was presented earlier, participants only generalized to related evidence. These results have implications for psychological models of belief revision, and for how evidence is presented to decision makers in the court room.

Induced GBA elicited by task-irrelevant visual objects reflects automatic processing of representations under low but not high perceptual load

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Induced gamma-band activity (GBA; not time or phase-locked to stimulus onset) in the electroencephalogram (EEG) is thought to be a neural marker of object representation. An outstanding question on the role of induced GBA in object recognition focuses on the extent to which its elicitation is automatic. In other words, is attention a necessary prerequisite for object-related enhancements in gamma activity? The present EEG study investigated induced GBA using tasks of low or high perceptual load at fixation, co-presented with task-irrelevant line drawings of familiar or novel objects in the surround. To ensure that attention was always focused at fixation, perceptual load varied from trial to trial. Significant induced GBA for familiar object presentations was observed when perceptual load was low; no difference from baseline was detected when

the load was high. It is possible to conclude that object-related enhancements in induced GBA have a perceptual basis because they show evidence of automatic processing of objects when the load was low. However, the absence of above-baseline induced GBA at high load implies that in cluttered or complex scenes attentional selection is likely to play a more significant role in representation.

The masked onset priming effect and reading aloud: effects of position of prime-target overlap and of prime duration

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The masked onset priming effect in naming refers to the benefit in naming latency due to graphemic and/or phonemic onset overlap between a masked prime and a target. In a nonword naming task, Kinoshita (2000) found that when the overlap between the prime and the target was initial, one-letter overlap (suf-SIB) was not significantly different from two-letter overlap (sif-SIB). However, both prime conditions invoked faster responses when compared to an all-letter different prime condition (mof-SIB). On the other hand, in a word and nonword naming task, Masson and Isaak (1999) found a masked orthographic priming effect for nonwords when an orthographic prime (nurp-NUMP) was compared to a one-letter overlap prime (nalk-NUMP). Experiment 1 aimed to investigate the inconsistency of the data in the above mentioned studies. My findings replicate Kinoshita's (2000) results: at a prime duration of 56 ms no other letter/phoneme of the prime beyond the first had any influence on the target. Experiment 2 aimed to investigate at what prime duration the second letter/phoneme of the prime might have an effect on the target. Results indicated that even at prime durations as long as 90 ms, only the first, and not the second, letter/phoneme of the prime affected the response to the target.

Kinoshita, S. (2000). The left-to-right nature of the masked onset priming effect in naming. *Psychonomic Bulletin & Review*, 7 (1), 133-141.

Masson, M.E.J., & Isaak, M.I. (1999). Masked priming of words and nonwords in a naming task: Further evidence for a nonlexical basis for priming. *Memory & Cognition*, 27, 399-412.

Intention costs in action generation

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In the present experiment, subjects were asked to intentionally prepare to make a movement when an on-screen scrolling set of numbers reached "3". On some trials, subjects' intentional preparation was interrupted by an auditory stimulus in response to which they had to make the same action that they were preparing, as quickly as possible. The auditory stimulus was presented at various times between the start of the trial and the

appearance of the "3". For interruption times ranging from 200 to 2500 ms, there was a significant reaction time cost of intention. However, for actions made in response to auditory stimuli occurring after 2500 ms (i.e., approximately 500 ms before the "3"), the cost was reversed and responses became faster than baseline SRT levels. It is tentatively suggested that, when preparing to make a movement at a specific time, a process of active inhibition occurs and is released approximately 500 ms prior to movement production. External stimuli instructing the same action and occurring within the period of inhibition produce large reaction time costs, whereas those occurring after inhibition is released do not.

Know we this face or no? Perceptual expertise and the own-race bias effect. A divided visual field study

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The own-race bias (ORB) effect in face recognition is characterised by greater accuracy when identifying faces from within one's own racial group relative to faces from a cross-race group. Enhanced recognition of own-race faces is believed to result from perceptual expertise, a cognitive process predominantly lateralised in the right cerebral hemisphere. This hypothesis was tested in two groups of participants (British and Chinese, N = 40 in each group) who performed a divided visual field, delayed match to sample face recognition task using Caucasian and Chinese faces. British participants demonstrated a stronger ORB effect in the left visual field (LVF) compared to the right visual field (RVF), and this was interpreted as supporting the hypothesis of right hemisphere lateralisation of ORB. Chinese participants demonstrated a strong LVF advantage for faces but did not exhibit an ORB effect; this was believed to reflect comparatively greater experience with cross-race faces resulting from extended residence in the United Kingdom. The results are considered within broader models of face recognition.

Probability mapping or discrete combinatorial systems?: Lessons learnt from brain physiology about the brain's grammar

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When word strings violate grammatical rules, they elicit neurophysiological brain responses commonly attributed to a specifically human language processor or grammar module. However, an ungrammatical string of words is always also a very rare sequence of events and it is, therefore, not always evident whether specifically linguistic processes are at work when neurophysiological indices of grammar are being reported. We here investigate the magnetic Mismatch Negativity to ungrammatical word strings, to very rare grammatical strings, and to common grammatical phrases. In this design, serial order

mechanism mapping the sequential probability of words should neurophysiologically dissociate frequent grammatical phrases from both ungrammatical and rare grammatical strings. However, if syntax as a discrete combinatorial system is reflected, the prediction is that the rare, correctly combined items group with the highly frequent grammatical strings and stand out against ungrammatical strings. Using magnetoencephalography as a measure of human brain activity, we replicated the previously reported syntactic Mismatch Negativity (sMMN), which distinguishes highly unfamiliar ungrammatical word sequences from common grammatical strings. Crucially, a significant interaction demonstrated that the sMMN specifically distinguished syntactic violations from common grammatical strings, but not uncommon from common grammatical word strings. This significant interaction argues in favor of a genuinely grammatical origin of the sMMN and provides direct neurophysiological evidence for a discrete combinatorial system for word and morpheme sequences in the human brain. The data are more difficult to explain in the context of serial order models that map co-occurrence probabilities of words.

Do 6-months-olds see motion without contact as causal?

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Infants see events in which a moving shape pushes or chases another as causal ("launch/entraining" or "reaction" events), while delayed motion appears non-causal. The status of "gap" motion remains unclear: Large gaps do not destroy adults' impressions of physical causality in launching-at-a-distance (Michotte, 1963) or of social causality in reaction/chase events (Kanizsa & Vicario, 1968). The infant literature nevertheless assumes that gap motion is non-causal. To test this, we used Oakes and Cohen's (1990) categorisation paradigm. Thirty-six 6-months-olds were habituated to Gap or Reaction or Delay+Gap events, then tested on all three. Infants did not group Gap with non-causal Delay events (differing only temporally), but rather with causal Reaction events (differing temporally and spatially). In Experiment 2, we habituated 37 6-months-olds on Gap, social Reaction or physical Entraining events. Grouping of Entraining and Reaction events would imply infants contrast causal with non-causal Gap motion. Grouping of Entraining and Gap events implies they contrast physical with social Reaction causality. Neither pattern appeared, so our results leave open whether Gap events appear causal or merely temporally continuous. More importantly, however, our data converge with adult work in finding no support for the popular view that Gap motion appears non-causal to infants.

Kanizsa, G. & Vicario, G. (1968). The perception of intentional reaction. In G. Kanizsa & G. Vicario (Eds.) *Experimental research on perception*. (pp. 71-126) Trieste: University of Trieste.

Michotte, A. E. (1963). *The perception of causality*. (Tr. by T. R. Miles & E. Miles.) London: Methuen.

Oakes, L. M. & Cohen, L. B. (1990). Infant perception of a causal event. *Cognitive Development*, 5, 193-207.

The role of self-initiated motion, orientation changes, and non-rigid motion in 6-months-olds perception of goal-directed animated action

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Infants habituated to a hand reaching for a toy react more when the hand reaches for a new toy at the old location than for the old toy at a new location (Woodward, 1998). This shows that infants understand the action as goal-directed, but leaves open whether their goal attribution extends beyond familiar reaching actions. To test this, we implemented a minimal, computer-animated version of the paradigm. Six-months-olds were habituated to a square moving towards one of two circles. Then we switched circle locations, showing movement towards the old goal at the new location, and movement towards the new goal at the old location. Ninety-one infants participated in 4 conditions. In the first, the square turned to face one circle, then moved in a non-rigid, apparently animate motion (Michotte, 1963). Infants looked longer at goal changes. The other conditions tested whether the cues involved - self-initiated motion, orientation change, non-rigid motion - suffice for goal attribution when considered separately. Infants did not look longer at goal changes, so this is not the case. Our findings converge with others, suggesting that the activation of an early domain-specific system of perception-reasoning may require strong animacy cues, but not human agents.

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Woodward, A.L. (1998). Infants selectively encode the goal object of an actor's reach. *Cognition*, 69, 1-34.

Fractionating masculinity: Male-typical cognition and temperament in the Ultimatum Game

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At a population level, sex differences are found in much of human behaviour. Cognitively, males are stronger at systemizing - interacting with and predicting complex deterministic systems - whereas women are stronger at empathizing - understanding the mental states of others and responding appropriately. Temperamentally, males report higher libido and higher levels of social dominance. We directly test whether degrees of 'cognitive' and 'temperamental' masculinity can dissociate behaviourally. We used a classic decision making task, the Ultimatum Game, in which Player 1 splits a sum of money between self and Player 2 (the ultimatum); Player 2 accepts the ultimatum, or rejects it - meaning both players receive no money. Cognitive masculinity associates with economically rational acceptance of small offers, as objectively 'better than nothing'. Conversely, temperamental masculinity predicts rejection of small offers, to punish violations of status.

A study with 48,000 male British web respondents revealed systemising-empathising quotient (cognitive maleness) was associated with increased acceptance of small offers; but high sex drive (temperamental maleness) was associated with decreased acceptance of small offers. These results suggest that gender-typical behaviour may be a more complex notion than previously accepted.

Time-course of the dismantling of a motor command as revealed by a tactile detection task

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An important aspect of everyday behaviour is the ability to cancel a prepared movement. In one condition, participants received a verbal instruction at the start of each trial to move or not to move their right index finger in response to a subsequent visual signal. In another condition, participants prepared a response, and then either executed it in response to a subsequent Go signal, or cancelled the movement if a NoGo signal occurred. Participants had to detect weak shocks which were delivered after the signals on some trials. We found that detection on move trials was lower than on non-move trials confirming previous reports of sensory suppression of movement (Williams, Shenasa & Chapman, 1999). Furthermore, we found that there was no difference between conditions in detection for move trials. However, detection rates for non-move trials were significantly lower in the Go-NoGo compared with the prior instruction condition. In Experiment 2, the delay between the NoGo signal and the shock was varied. Detection rates improved monotonically as the interval between the NoGo signal and the shock increased from 0 up to 200ms. The recovery from sensory suppression offers a new way of measuring the processes triggered by a NoGo signal. Our results suggest that dismantling a prepared motor command takes approximately 200ms.

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The influence of information access on young children's understanding of sources of knowledge

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Five-year-old children are able to choose the correct action to find a target from hidden objects that either feel the same but look different (or vice versa) (O'Neill & Gopnik, 1991). The information children are given about the objects, prior to them being hidden, varies substantially in similar tasks (e.g. O'Neill, Astington & Flavell, 1992; Pillow, 1993). The current study investigated how different types of information access might affect children's performance. Seventy-two 6-year-olds (mean 6;4) had to decide whether to look or feel to determine a target ball from two that were hidden.

They were allocated to one of four information access type conditions: No access; verbal description; direct experience; verbal description and direct experience. Children who had only direct experience, performed significantly better than would be expected by chance, $\chi^2(1, N=18)=4, p<.05$, and were significantly more successful than those only given a verbal description ($M = -.81, SE = .267, p<.05$). We suggest that when involved in active decision making, children may be more likely to effectively process information gained directly, than information that has been told to them. We discuss how the varying of information access could influence children's performance in such tasks, and how future research could benefit from such considerations.

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Pillow, B. H. (1993). Preschool children's understanding of the relationship between modality of perceptual access and knowledge of perceptual properties. *British Journal of Developmental Psychology*, 11, 371-389.

Revisiting the strange stories: A test of understanding mental and physical states for children with autism

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An advanced test of theory of mind, the Strange Stories (Happé, 1994), has previously revealed a deficit in the understanding of mental states by high-functioning individuals with autism, lending support to the mentalising impairments in autism. Individuals with autism also seem to find some non-mental state stories difficult to understand but the reason for these difficulties is unclear. Children with and without autism were presented with mentalising stories, physical stories involving humans, animals and nature and passages of unlinked sentences, and were subsequently questioned about their content. The autism group were less accurate than controls on the mentalising, human and animal story sets. However, individual profiles revealed that only a small proportion of children were performing poorly. When the autism group was split by performance on an independent mentalising test, only the poor mentalising group differed from the controls on the mental, human and animal stories. However, a linear interaction was found between these groups across the different story types, indicating that the autism group found the mentalising stories most challenging, followed by the other 4 sets with decreasing difficulty. Mentalising impairments appear to have more widespread effects on the understanding of biological agents in general.

Happé F (1994). An advanced test of theory of mind ability: understanding of story characters' thoughts and feelings by able autistics, mentally handicapped and normal children and adults. *Journal of Autism and Developmental Disorders* 24:129-154.