

CogDev 2013

Joint Annual Conference of the
BPS Cognitive and Developmental Sections
University of Reading
4-6 Sept 2013

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Welcome from the Section Chairs

Hello! As respective Chairs of the British Psychological Society's Developmental Psychology Section and Cognitive Psychology Section we are both delighted to welcome you to the joint Cognitive and Developmental Annual Conference 2013. As you probably know, this is the first time these Sections have joined forces for their conferences. And it is clear both from the level of interest and the quality of the research that this has proved to be a very successful venture. Together, the conference will certainly be more than the sum of its parts. We have a lively and fascinating scientific programme and we are confident that the shared focus of the conference will foster high quality discussions about the links between cognitive and developmental psychology. We also hope that the conference will make possible the further cross-fertilisation of ideas from the different sub-disciplines. Of course, we know there is also a great deal of excellent research from other areas of developmental psychology such as educational, social and clinical research, and likewise from other areas of cognitive psychology, including adult memory and reasoning processes, cognitive neuroscience and cognitive neuropsychology. So while we collaborate, we can be sure that we will retain our distinct identities and intellectual foci as core areas of psychological research.

The success of this conference is, almost in its entirety, the outcome of the hard work, creativity, and organisation of Graham, Carmel, and the team here in Reading. In fact, having observed the process for a little time, we have to say that what we have seen is close to being an object lesson in how to organise a fantastic conference. This careful planning has given us a truly international conference, in a superb location that enhances the opportunities for networking and contact. We have the highest quality keynote speakers, and the usual session formats including symposia, posters, and individual papers. There are some new things too: if you don't like to ask (or be asked) questions, there is the new "No-Questions-Asked" format... and if you do, you can come along to the "Meet the Experts" lunch. We are also eagerly anticipating an imaginative set of social events to keep everyone busy well into the night.

Next year the two Sections will again hold separate conferences. But we are sure that the ideas and inspiration generated in Reading will create new avenues of research, new collaborations, fond memories, and some new friendships into the future. In the end it is the chance to immerse ourselves in ideas (some new, some old, some strange...) that makes conferences such a vital part of the academic calendar!

Patrick Leman

Chair, BPS Developmental Psychology Section

Linden J Ball

Chair, BPS Cognitive Psychology Section

Wednesday 4th September at a glance

09:00 - 09:50	Registration – Palmer Foyer
09:50 - 10:00	Welcome (Room A) Keynote Address: Mark Seidenberg (Room A)
10:00 - 11:00	Keynote Address: Mark Seidenberg (Room A) 'The science of reading & its educational implications'
11:00 - 11:20	Coffee – Palmer foyer and mezzanine
11:20 - 13:00	Symposia/Oral Papers - Session Wed 1 A Brysbaert Understanding reading: Insights from eye movements I B Reid Advances in understanding social development C Shinsky Picture-mediated learning D Oral papers Hearing, speech, pragmatics E Tenenbaum Young people's reasoning about biology and physics F Messer Executive functioning and developmental impairments G Gaskell Consolidation processes in cognition and development
13:00 - 14:00	Lunch in 3Sixty (Section Committee Meetings in parallel)
14:00 - 15:40	Symposia/Oral Papers - Session Wed 2 A Nation Understanding reading: Insights from eye movements II B Oral papers Language in ASD/ Down Syndrome C Oral papers Cognitive control D Reddy Understanding actions in infancy E Hoicka Development of creativity, innovation and exploration F Georgiou Early social development G Botting Memory in children with atypical communication
15:40 - 16:10	Tea - Palmer foyer and mezzanine
16:10 - 17:10	Keynote Address: Mike Tomasello (Room A) 'Human collaboration'
17:10 - 19:10	Posters – Palmer Ground Floor (NB parallel scheduling!)
17:20 – 18:00	Margaret Donaldson Award Winner: Andy Bremner
18:00 - 19:10	Wine Reception
19:30 - 21:00	Dinner: Self Service at Park Eat

Thursday 5th September at a glance

09:00 - 10:40	Symposia/Oral Papers - Session Thu 1
A Scott/Alcock	Links between motor and language abilities
B Ward	Recent advances in immediate memory I
C Leman	Children's identities & intergroup attitudes in a social context
D Oral papers	Literacy strategies and school achievement
E St Clair-Thompson	Mental toughness: Its correlates and cognitive underpinnings
F Harris	Literacy attainment in deaf children
G Mareschal	Emerging use of multi-sensory information
10:40 - 11:10	Coffee - Palmer foyer and mezzanine
10:40 - 12:50	Posters - Palmer Ground Floor (NB parallel scheduling!)
11:10 - 11:50	Cognitive Section Award Winner : Padraic Monahan
11:50 - 12:50	Section AGMs (Rooms A & G)
12:50 - 13:50	Lunch in 3Sixty ('EPS Meet the Experts' lunch in Blandfords)
13:50 - 15:30	Symposia/Oral Papers - Session Thu 2
A Charman	Neurocognitive approaches to understanding development
B Ward	Recent advances in immediate memory 2
C Oakhill	Discourse-level comprehension: Development and difficulties
D Bremner	Development of body representations for perception & action
E Waterman	Investigating cognitive and motor development in children
F James	Evidence-based parenting interventions
G Oral papers	Phonological awareness and reading
15:30 - 16:00	Tea - Palmer foyer and mezzanine
16:00 - 17:20	No-Questions-Asked/Oral Papers - Session Thu 3
A Oral papers	Empathy
B Oral papers	Memory (STM and DRM paradigm)
C Oral papers	Individual differences (Clinical)
D NQAs	Social development; Parenting; Face perception
E NQAs	Language; Reading; Maths; Executive Function
F Oral papers	Motor control
G Oral papers	Categorisation and learning
17:30 - 18:30	Keynote Address : Faraneh Vargha-Khadem 'Hypoxia-ischaemia, hippocampal damage, and memory impairment: A causal sequence?'
19:00 - 22:00	Conference Dinner in the Meadow Suite
22:00 - 01:00	Evening of English Entertainment in 3Sixty

Friday 6th September at a glance

09:00 - 10:40	Symposia/Oral Papers - Session Fri 1
A Murray	Development of mirror neuron system
B Oral papers	Attention in developmental disorders
C Oral papers	Syntax and grammar
D Oral papers	Visual attention
E Horne	Fruit and veg are cool, Eat them home and school!
F Oral papers	Reasoning
G Ricketts	Approaches to understanding the mechanisms of reading
10:40 - 11:10	Coffee - Palmer foyer and mezzanine
11:10 - 12:30	No-Questions-Asked/Oral Papers - Session Fri 2
A Oral papers	Theory of Mind and language
B NQAs	Theory of Mind; Autism; Emotional development
C Oral papers	Face recognition and prosopagnosia
D NQAs	Memory; Visual processing; Scientific understanding
E Oral papers	Neural underpinnings of typical and atypical cognition
F Oral papers	Parent-child interactions
G Oral papers	Memory (Eye-witness testimony)
12:30 - 13:20	Lunch in 3Sixty (50 mins!) (‘EPS Meet the Experts’ lunch in Blandfords)
13:20 - 14:20	Keynote Address: Susan Gathercole ‘Working memory and learning: Disorders and remediation’ (Broadbent Lecture)
14:30 - 16:10	Symposia/Oral Papers - Session Fri 3
A Apperley	Theory of Mind grows up
B Shephard	Cognition in atypical development
C Connelly	Influences on the writing processes of children who struggle
D Riddell	Component skills in language and literacy
E Oral papers	Maths and number awareness
F Beaman	Judgement and decision-making across the lifespan
G Scerif	Interactions btw developmental & adult cognitive psychology
16:10 - 16:30	Tea - Palmer foyer and mezzanine
16:10 - 17:50	Posters - Palmer Ground Floor (NB parallel scheduling!)
16:30 - 17:10	Neil O’Connor Award Winner: Mayada Elsabbagh
17:10 - 17:50	Discussion: ‘Emergent themes: Opportunities in cognition and development’
17:50 - 18:00	Closing remarks

Cognitive Section Committee

Chair Professor Linden Ball

Secretary Dr Sue Sherman

Treasurer Dr Laurie Butler

Ordinary Members

Dr Andrew Dunn (2014 Conference)

Dr George Georgiou (Web Manager)

Dr Duncan Guest (2014 Conference)

Professor Bob Johnston (2015 Conference)

Dr Allan McNeill (BPS Standing Conference Committee Representative).

Dr Catriona Morrison

Dr Michael Pilling (Assistant Web Manager)

Samantha Reeves (PsyPAG)

Dr Graham Schafer (2013 Conference)

Dr Helen St Clair-Thompson

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Dr Emily Mather (Newsletter)

Dr Sinead Rhodes (Conference advisor 2012-13)

Katie Rix (PsyPAG)

Dr Graham Schafer (2013 Conference)

Dr Yvonne Skipper

The CogDev 2013 Committee

CogDev 2013 is the BPS joint Cognitive and Developmental Sections Annual Conference. It is hosted by the School of Psychology and Clinical Language Sciences at the University of Reading. The international standing of the School is based on a world class contribution to psychology and neuroscience in a number of areas, with the bridge between neuroscience and clinical disorders being a common theme to much of its work.

The Department of Psychology has a long-standing reputation for excellence in experimental psychology, perception, learning, memory and skilled performance. In more recent years, research has strengthened in the field of developmental psychology, neuroscience, ageing, virtual reality and behaviour change.

The Department of Clinical Language Sciences focuses on research and teaching in the area of typical and atypical speech and language acquisition and in acquired speech and language disorders. The emphasis on clinical research is enhanced by on-site NHS clinic facilities.

The School has grown rapidly in the last few years, establishing the Centre for Integrative Neuroscience and Neurodynamics (CINN) in 2008, which is now a leading centre for interdisciplinary neuroscience. In addition, the award-winning Charlie Waller Institute which leads research, training and evaluation of evidence-based psychological treatments of clinical disorders has just celebrated its fifth birthday. Finally, the School is playing a leading role in the new Centre for Literacy and Multilingualism which provides a hub for research into linguistic, psychological, clinical and educational aspects of multilingualism and literacy.

For more information see www.reading.ac.uk/PCLS.

The CogDev 2013 Committee is:

Phil Beaman

Bhisma Chakrabarti

Judi Ellis

Anna Horwood

Carmel Houston-Price

Dan Lamport

Beth Law

Theo Marinis

Daisy Powell

Jessie Ricketts

Tricia Riddell

Graham Schafer

Vesna Stojanovik

Conference information

Registration

Please register at the desk in the foyer of the Palmer building, on the Whiteknights campus, University of Reading. Satnav for the vehicular entrance to the campus is RG6 6UR. Maps can be found at <http://www.reading.ac.uk/about/find/about-findmap.aspx>.

Registration will open at 9am on Wednesday the 4th of September. The registration desk will be staffed by members of the conference committee and student volunteers and will be open throughout the conference, Wednesday-Friday, from 9am until 5pm.

Location of Oral and Poster Presentations

All academic activities take place in the Palmer building. For ease of understanding the main programme, we have designated rooms by letter. Keynotes will be given in the main Palmer Lecture Theatre, G.10 (designated 'A' in the programme), which is accessible at both ground and (especially for latecomers) mezzanine level.

Oral presentations will take place in Palmer G.10 Lecture Theatre ('A'), and on the first (mezzanine) floor: Rooms 1.02 ('B'), 1.03 ('C'), 1.04 ('D'), 1.05 ('E'), 1.07 ('F') and 1.09 ('G').

Poster sessions will take place in rooms G.01-G.05 which are opened into a single space on the ground floor of the Palmer Building.

Presenter Information

All **oral presenters** should ensure that they have uploaded their PowerPoint presentation onto the computer in the location of their talk in the break before their session. This will help to ensure the smooth running of sessions. Symposia Chairs should ensure that PowerPoint presentations are all uploaded prior to any symposia beginning. IT support will be available in the event of technical difficulties, and student volunteers or committee members will also be available to help. The time allowed for talks is **15 minutes** with **5 minutes** allocated for questions.

All **poster presenters** should put their posters up on the poster boards in Palmer on the morning of their poster session. Velcro will be provided for presenters to use to fix their posters to the poster boards. Poster presenters are asked to stand by their poster for the full poster session as indicated in the programme. Please remove posters by 7pm.
MAXIMUM POSTER SIZE IS 1m X 1m.

Hearing loops

Induction loop systems are fitted in Palmer G.10 ('Room A') and 1.09 ('Room G').

No Smoking Policy

Smoking is not allowed inside or within 10 meters of any building. Thank you in advance for your assistance with this matter. Please use the ash bins provided for cigarette butts.

Accommodation

Delegates who have booked accommodation on campus should proceed directly to the Park Group Accommodation Reception, situated on the ground floor of Windsor Hall, to pick up their keys. You will be able to book in from 2pm on the day of your arrival and the Windsor Hall reception desk is open between 7:30am to 11:00pm. If you have difficulties, or are delayed in transit, please contact the Accommodation Reception on 0118 378 8800. All university accommodation is on campus and is less than a 5-minute walk from the conference venue. When leaving, please ensure you vacate your room before 9am.

Bag Drop and Lost Property

On arrival. There is a cloakroom behind the conference registration desk in the Palmer building where luggage can be left—please consult a member of the desk staff. Space is limited and we may not be able to guarantee space at the busier times (i.e., Wednesday and Friday afternoons). If possible, if you arrive after 2pm we would be grateful if you could take your luggage to your accommodation. Although the Palmer building cloakroom is reasonably secure, the University of Reading cannot be held responsible for personal property left in this location. This cloakroom will also be used for lost property, and will be open when the desk is open i.e., Wednesday-Friday, 9am-5pm.

On departure on Friday, you can leave bags in secure storage near to your room, at Park Play (next to Park Eat – ask at Park Group Accommodation Reception).

Car Parking

Free car parking is available in Car Park 2 for delegates attending during the day and for residential guests at the Park Group accommodation. There is limited space in Car Park 2 so please use other means of transport where possible. No permit is required.

Cash

There is a Barclays cash machine on Whiteknights Campus, next to Campus Central (between the Student Union and the Library).

Catering Information

If you have any special dietary requirements please let the conference organisers know at least one week before the conference. Refreshment breaks will be served from catering points on the ground floor foyer area of the Palmer Building and in Palmer 1.06 (on the mezzanine between Rooms E and F). There is additional seating available in Palmer 1.08. Lunch will be in the 3Sixty (Students' Union) building, two minutes' walk from the conference venue. Breakfasts on Wednesday, Thursday and Friday, and dinner on Wednesday evening, will be served in Park Eat, near the accommodation. (There is no dinner provided on Thursday night unless you have booked the Conference Dinner).

Coffee and light snacks are also available for purchase during the day at Dolche Vita in the Palmer Building. Park House Bar is open to both conference delegates and the general public from 6pm to 11pm throughout the conference.

There will be a late bar on Wednesday night at Park Eat and on Thursday night in 3Sixty.

Opening Wine Reception 6.00–7:10pm on Wednesday

All delegates are invited to our official welcome wine reception which will be held in the Palmer Building and will coincide with our first poster session.

Conference Dinner and Entertainment

For those with tickets, the Conference Dinner and Entertainment will be held on the evening of Thursday 5th September, between 7pm and 1am. The theme is 'Traditional English Entertainment'.

The evening will start with canapés and English alcoholic or non-alcoholic drinks in the Meadow Suite, which is just behind Park House (or in 3Sixty—the Students' Union—if the weather is bad). There will be a display of Morris dancing from local Morris side 'Customs and Exiles', who perform both Men's Border and Mixed North West Morris. The display will take place on the terrace at the back of the Students' Union building, and will be viewable from the decking of the Meadow Suite, or the grass below it (in 3Sixty if wet).

A buffet barbeque dinner of locally-sourced foods will then be served in the Meadow Suite. The meal will be accompanied by a choice of wine, cider, or beer, or fruit juice.

After the meal, we will move to 3Sixty for coffee, and there will be some traditional English domestic entertainments, provided by Alva (featuring Giles Lewin of the Carnival Band), followed by dancing to the highly-respected Country and Ceilidh band Diatonics.

A cash bar will be available throughout.

Those without tickets are most welcome to join us to view the Morris dancing, and to come to the Country Dancing (from about 10pm) until it closes at 1am.

Facebook/Twitter

CogDev 2013 is on Twitter (@cogdev2013). Follow us for updates.

Internet

There is a computer room (G.09) on the ground floor of the Palmer Building, which will be open to delegates throughout the conference. To log on to machines in the computer lab, please pick up a guest username and password from the conference registration desk.

For those with laptops, there are two options for connecting to the University of Reading Wi-Fi system. If you have a student or staff username and password for any University in the UK you can access the University of Reading Wi-Fi system by logging on to Eduroam.

If you do not have a UK University username or password, you can access the Wi-Fi system using the UoR guest connection. To log on, please pick up a guest username and password from the conference registration desk.

Eating and drinking near the campus

We hope you will be joining fellow delegates in Eat at the Square for dinner on Wednesday evening, at 3Sixty (the Students' Union building) for lunch and, for those who have booked, in the Meadow Suite for our Conference Dinner. For those who are looking to find food and drink beyond the campus, our local staff have made suggestions of good places to eat, and you will find these in your conference pack. (Views are those of individuals, not the University of Reading!)

Getting into town

Reading town centre is about 1.6 miles northwest of the campus. It is about 45 minutes' walk to the railway station from the Palmer building. There are frequent buses which charge £1.80 each way (exact money only). Numbers 20 and 21 run from the campus into town, and No 9 buses go into town from Shinfield Road. For more details visit <http://www.reading-buses.co.uk/routes/>.

A taxi into town will cost about £8.

Shopping

Campus Central is the Students' Union's retail outlet (8:30am-5:30pm), only 50 meters from the entrance to the Palmer Building. It is one of the largest students' union shops in the UK.

Blackwell's Bookshop (9am-6pm) is in the Students' Union Building, Whiteknights.

Off-campus, the Oracle in the town centre is one of the larger shopping plazas in the UK.

Reading and the University

Reading and the University

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Useful links

University campus maps
www.reading.ac.uk/maps

Route Information

AA Route Planner
www.theaa.com/travelwatch
RAC Route Planner
www.route-rac.co.uk

Rail Information

National Rail
www.nationalrail.co.uk

Local Bus Information

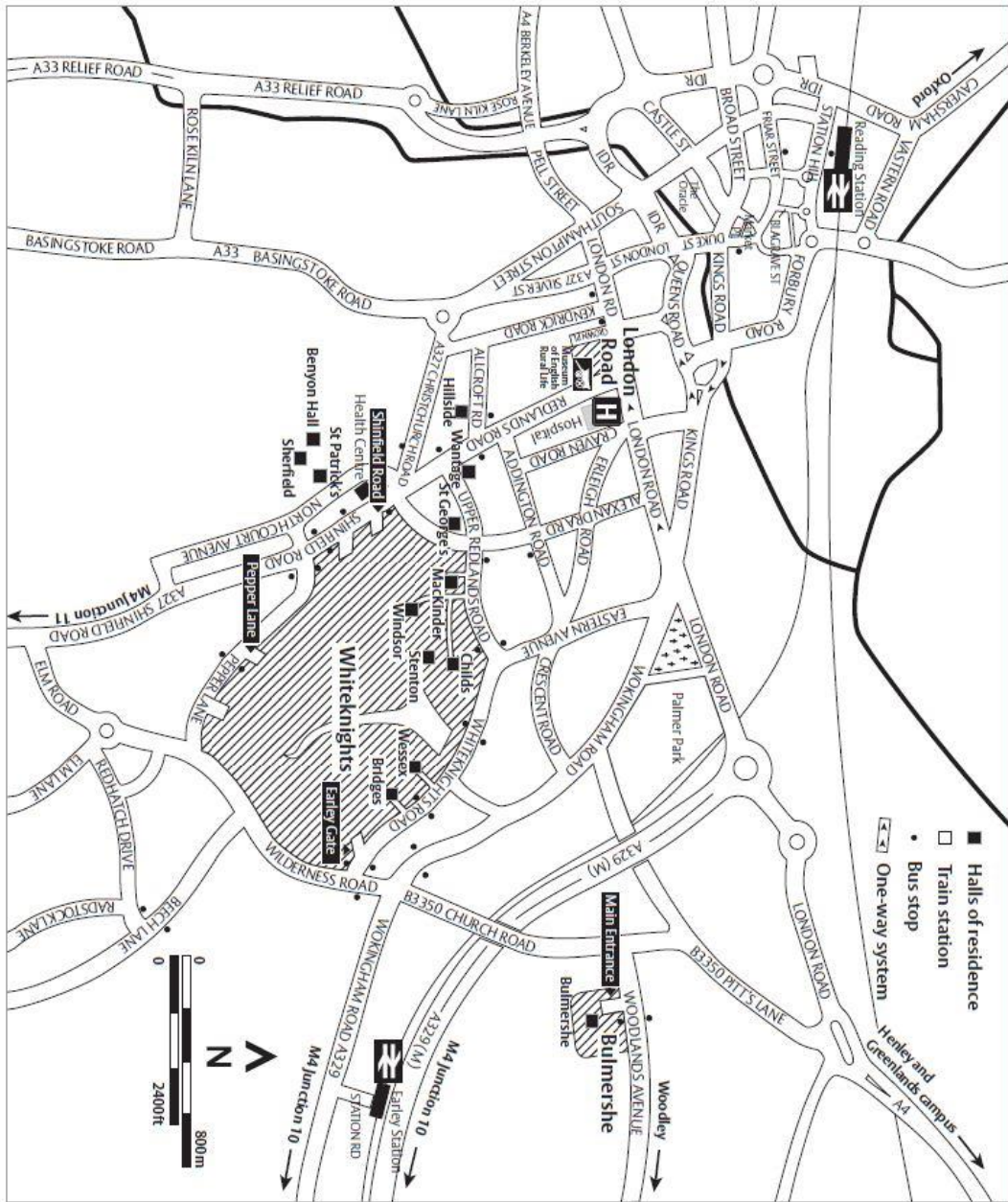
Reading Buses
www.reading-buses.co.uk/university

Airport Information

Heathrow Airport
www.heathrowairport.com
Gatwick Airport
www.gatwickairport.com

Sat nav postcodes

Whiteknights campus
Shinfield Road and Pepper Lane entrances
RG6 5UR
Earley Gate entrance
RG6 7BE
London Road campus
RG6 5AQ
Greenlands campus
RG9 3AU



The University of Reading Whiteknights Campus

In your conference pack you will find a suggested walk to help you discover some of the fine views and trees of Whiteknights Park, which has been in existence since the Norman Conquest. In 1798 the estate was acquired by the Marquess of Blandford who spent vast sums on elaborate gardens which included many specimen trees. However by 1817 the Marquess, then the fifth Duke of Marlborough, was deeply in debt, and in 1819 the estate was dispersed. Eventually, six large Victorian houses were built on the resulting parcels of land.

Some of these houses remain as part of the University: Foxhill House, Old Whiteknights House, Blandford Lodge, and Park House are all in multiple use (Park House is home to a bar which is open during the conference). Foxhill House is a fine Victorian house built for his own use by the architect Alfred Waterhouse, whose work includes the Natural History Museum in London and Caius College in Cambridge. The occultist Aleister Crowley is rumoured to have lived here.

The University of Reading acquired Whiteknights Park in 1947. Since that time, the University has maintained the natural beauty of the campus and preserved the lake, trees, woodland and open spaces that give Whiteknights its unique character.

The Reading area

From its Saxon beginnings as Reddingas ('Town of the people of Redda') to today's high-tech municipality, Reading has always been diverse and vibrant. It is situated on the banks of the Thames with easy access to both London and some of the loveliest countryside in the Home Counties. The Museum of Reading (in the Town Hall) tells the story of Reading through the ages. The University itself has three museums open to the public, including the Museum of English Rural Life.

Historic Reading includes the ruins of Reading Abbey, a medieval monastery with strong royal connections. In the previous century, the town was famed for its commercial Three Bs of Beer (Simonds Brewery), Biscuits (Huntley & Palmer's - with close connections to the university), and Bulbs (eventually Sutton's Seeds).

Reading's contribution to the arts is similarly diverse, from the 'Reading Rota' - one of the earliest melodic counterpoint manuscripts ('Summer is A-Coming In, Loud Sing Cuckoo!'), to the Hexagon, and the BBC. The celebrated playwright Oscar Wilde was infamously imprisoned in the prison next to the Abbey ruins—where he wrote *The Ballad of Reading Gaol*, and movingly related his experiences in the autobiographical work *De Profundis*.

Reading is a hub for successful international companies and has one of the highest concentrations of IT firms, confirming its status as Europe's 'Silicon Valley'. It is home to 13 of the world's top 30 global brands. Many of the University's alumni continue to live and work in Reading once they have graduated, making a valuable contribution to the local economy.

Reading is a retail shopping destination, with the Oracle a major shopping centre. The town is also world-famous for its music, theatre and sports. The Reading Festival attracts 80,000 fans every August to enjoy headline acts from around the world.

Our exhibitors and sponsors

The pens in your packs have been generously donated by Wiley. The Experimental Psychology Society (EPS) has generously supported our 'Meet the Experts' Lunches for Junior Scientists.

Acuity ETS Ltd

Acuity ETS and Acuity Intelligence are specialists in technology for both academic and clinical research, with over 450 clients in a wide array of fields including many of the top Universities both in the UK and overseas. Our experience covers every branch of psychology and this wealth of knowledge allows us to provide valuable, honest and impartial advice to our clients. We offer market leading eye tracking solutions, laboratory design, biometric and physiological measuring equipment, motion capture solutions and an extensive range of bespoke training, programming and consultancy services.

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Brain Vision UK Ltd was formed in 2004 to offer unique and advanced brain research technologies and solutions. We launched with the prestigious Brain Products range of research EEG systems (Brain Products GmbH www.brainproducts.com) and growing organically, we have added other quality and compatible product lines such as the MEDOC family of thermal stimulators (MEDOC Israel www.medoc-web.com) for pain research as well as solutions for digital stimulus presentation inside the MRI scanner (Resonance Technology, Inc. www.mrvideo.com).

Cambridge University Press

Cambridge University Press is a not-for-profit organization that advances learning, knowledge and research worldwide. It is an integral part of the University of Cambridge and for centuries has extended its research and teaching activities through a remarkable range of academic and educational books, journals, and examination papers. Come and visit our stand for 20% off all titles on display.

McGraw-Hill Education

McGraw-Hill Higher Education publishes leading undergraduate and postgraduate textbooks across a range of disciplines. Our flourishing European publishing programme has produced best sellers up and down the curriculum through both the McGraw-Hill and Open University imprints. We are committed to developing cutting edge learning solutions to support teaching and learning in all forms, as currently exhibited by our Connect and LearnSmart products.

Palgrave MacMillan

Palgrave Macmillan Higher Education offers a wide range of authoritative undergraduate and postgraduate textbooks in all areas of psychology. Our books are distinguished by their academic rigour, practicality, and innovation. We also distribute psychology titles from Worth Publishers, A Macmillan Higher Education Company and Sinauer Associates, Inc.

Pearson Assessment

Pearson Assessment is the UK's leading publisher of standardised assessments for psychologists and health professionals.

Our portfolio features assessments by leading authors including Dorothy Bishop (CCC-2) and the gold-standard measures WAIS-IVUK and WISC-IVUK. Responding to calls for digital innovation, visit our stand to see how Q-interactive uses tablet technology to facilitate the administration and scoring of some of our leading assessments.

COGMED, the new evidence based software program to improve working memory, will also be available to view.

For more information please visit our stand or go to:

Website: www.pearsonclinical.co.uk

Tel: 0845 630 8888

Email: info@pearsonclinical.co.uk

Twitter: @PsychCorpUK

Psychology Press/Routledge

Please visit the Psychology Press / Routledge stand to browse a wide selection of books and journals, and to discuss with us any book proposals you might have. We publish in all areas of behavioural science, including cognitive psychology, neuropsychology, developmental psychology, family studies, gerontology, and behavioural neuroscience. The books on display are available to order from our stand at a 20% discount.

SR Research

SR Research provides flexible hardware and software for highly precise and accurate measurement of eye movements, across all areas of cognitive science including human development. Tracking of infants to the elderly to patients in MRI/MEG/EEG/NIRS environments are all feasible with reliable data being the foremost concern. Use the EyeLink Arm Mount for easy positioning of hardware in front of your participant, and use Experiment Builder with an automated HABIT module, Preferential and Anticipatory Looking paradigms and more... Watch for our announcements of new Remote eye tracking modes with high precision and large trackable ranges.

Tracksys

Tracksys is the UK's foremost supplier of behavioural research tools for:

- Video analysis with The Observer XT; incorporating behavioural, physiological, eyetracking, mood data and other external measures.
- Eyetracking in any situation; on a PC screen, a TV, a laptop, or in the real world using SMI revolutionary Glasses.
- Design, supply, installation and support of fixed / portable laboratories and observation suites.
- Automatic mood detection using FaceReader
- Pattern detection in complex behavioural data using Theme.

Wiley

The Wiley range of psychology books and journals is both authoritative and comprehensive. On the books side it includes our BPS imprints, the result of a unique partnership with the British Psychological Society, that deliver essential materials,

approved by the BPS, for those seeking information on the latest practices, research and methodology.

Our psychology journals program comprises of 115 core psychology journals, complemented by many more interdisciplinary titles. We are proud to be working with the BPS to publish the Journals of The British Psychological Society, which are at the heart of the psychology community helping to advance and disseminate psychological knowledge in line with the Society's mission.

EPS ‘Meet the Experts’ Lunches for Junior Scientists

Generously supported by the Experimental Psychology Society, we are able to offer a lunch for graduate students and junior researchers to meet a senior scientist for an informal discussion on either Thursday or Friday.

Lunches take place in Blandfords Restaurant in Park House, and will be at no additional charge. If you are interested in participating in the lunches please email cogdev2013@reading.ac.uk and indicate which of the following Experts you might be interested in meeting. We will do our best to match you up with your preferred Expert. Places will be allocated on a first-come, first-served basis, and allocations will be posted on the noticeboard by the registration desk in Palmer.

Thursday

Professor Tony Charman (King’s College, London)
Professor Padraic Monaghan (Lancaster)
Professor Kate Nation (Oxford)
Professor Vasudevi Reddy (Portsmouth)
Dr Gaia Scerif (Oxford)
Professor Faraneh Vargha-Khadem (University College, London)

Friday

Dr Mayada Elsabbagh (McGill)
Professor Susan Gathercole (Cambridge)
Professor Jane Oakhill (Sussex)
Dr Vincent Reid (Lancaster)
Professor Mark Seidenberg (Wisconsin-Madison)
Professor Geoff Ward (Essex)

Discussion: Emergent themes

On the afternoon of the last day of the conference (Friday 6th Sept), we will hold a panel discussion on “Emergent themes: Opportunities in cognition and development”. A panel comprising the two Section Chairs - Professors Linden Ball and Patrick Leman - and other leading academics, including Professor Sue Gathercole, Professor Denis Mareschal and Professor Mark Seidenberg, will close the conference. The panel will take questions from the floor on the possibilities for research in areas addressed during the meeting. We hope that all delegates will join us for what promises to be a stimulating discussion and debate.

Keynote addresses

The science of reading and its educational implications

Professor Mark Seidenberg

Wednesday 4th Sept at 10:00am

Palmer G10 (Room A)



Abstract

Research in cognitive science and neuroscience has made enormous progress toward understanding skilled reading, the acquisition of reading skill, the brain bases of reading, the causes of developmental reading impairments and how such impairments can be treated. My question is: if the science is so good, why do so many people read so poorly? I will mainly focus on the United States, where the reading levels of about 25-30% of the population are low by standard metrics, with an eye on comparisons to other countries. I will consider three possible contributing factors: the fact that English has a deep alphabetic orthography; how reading is taught; and the impact of linguistic variability as manifested in the US by the Black-White “achievement gap”. I conclude that there are opportunities to increase literacy levels by making better use of what we have learned about reading and language, but also institutional obstacles and understudied issues for which more evidence is badly needed.

Mark Seidenberg: biography

Mark S. Seidenberg is Hildale and Donald O. Hebb Professor in the psychology department at the University of Wisconsin, Madison. He has conducted research on many topics related to reading and language since the disco era. His reading research addresses the nature of skilled reading, how children learn to read, dyslexia, and the brain bases of reading, using the tools of modern cognitive neuroscience: behavioral experiments, computational models, and neuroimaging. His current research focuses on the causes of chronically low reading performance among poor and minority children, particularly the effects of language background on learning to read. He is among the most highly cited researchers in the fields of psychology and psychiatry and is working hard but slowly on a general audience book about connecting reading science and reading achievement.

Human collaboration

Professor Michael Tomasello

Wednesday 4th Sept at 4:10pm

Palmer G10 (Room A)

Abstract

Although great apes collaborate for some purposes, recent studies comparing chimpanzees and human children suggest that human collaboration is unique both cognitively and motivationally. In particular humans seem adapted for collaborative foraging, as even young children display numerous relevant mechanisms, from special ways of coordinating and communicating to special ways of sharing food to special forms of social evaluation. The Shared Intentionality hypothesis specifies the ontogeny of these underlying mechanisms and their consequences for both human cognition and human social life.

Michael Tomasello: biography

PhD in Psychology in 1980 from University of Georgia (USA); taught at Emory University and worked at Yerkes Primate Center (USA) from 1980 to 1998; since 1998, Co-Director, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany. Research interests focus on processes of social cognition, cooperation, and communication in human children and great apes. Books include *Primate Cognition* (Oxford University Press, 1997); *The Cultural Origins of Human Cognition* (Harvard University Press, 1999); *Constructing a Language: A Usage-Based Theory of Language Acquisition* (Harvard U. Press, 2003); *Origins of Human Communication* (MIT Press, 2008); and *Why We Cooperate* (MIT Press, 2009). Due out in autumn, 2013: *A Natural History of Human Thinking* (Harvard University Press).

Hypoxia-ischaemia, hippocampal damage, and memory impairment: A causal sequence?

Professor Faraneh Vargha-Khadem

Thursday 5th Sept at 5:30pm

Palmer G10 (Room A)



Abstract

In this presentation I will describe the features of developmental amnesia and explain how this selective form of memory impairment presents in the clinical setting. I will also highlight the three dissociations in cognitive memory that are characteristic of the syndrome of developmental amnesia. Neuropsychological and neuroimaging data from large cohorts of children, adolescents and adult patients will be presented to provide evidence of a causal sequence starting from neonatal exposure to hypoxia-ischaemia leading to bilateral hippocampal pathology, and, consequently, to selective deficits in episodic memory, and the processes of recall and recollection.

Faraneh Vargha-Khadem: biography

Professor Vargha-Khadem studies the effects of early brain injury on cognition and behaviour. Her work is focused on developmental amnesia, brain and speech abnormalities associated with the mutation of FOXP2, and reorganization of function after neurosurgery for epilepsy. She holds a chair in Developmental Cognitive Neuroscience at the UCL Institute of Child Health, and is head of her department. Professor Vargha-Khadem is also Director of the UCL Centre for Developmental Cognitive Neuroscience. She is a Fellow of the Academy of Medical Sciences, and has received a number of awards, including the 2006 Jean Louis Signoret Prize for her contributions to genetics of behaviour.

Broadbent Lecture

Working memory and learning: Disorders and remediation

Professor Susan Gathercole

Friday 6th Sept at 1:20pm

Palmer G10 (Room A)



Abstract

Working memory (WM) provides the capacity to store information for brief periods that is vital for everyday complex activities such as following instructions, reasoning, and learning. Deficits in WM during childhood are common in specific learning difficulties such as ADHD and language impairments, and children identified on the basis of poor performance on WM tests alone without any other diagnosed difficulties have a very high risk of poor academic progress in reading and maths. This lecture will focus on three features of a range of developmental groups with WM deficits. First, the cognitive origins of the deficits will be considered and compared using profiles of scores on a range of possible contributory factors both within and beyond WM. Second, the consequences of WM problems for performance on several broader cognitive activities will be considered, including maintaining goals over extended periods and listening to complex spoken messages under challenging auditory conditions. The responsiveness of groups with WM deficits with different aetiologies to intensive WM training will also be discussed.

Susan Gathercole: biography

Susan Gathercole is a cognitive psychologist with particular interests in memory and learning, both in typically-developing children and children with developmental disorders of learning. During the past 30 years she has held academic posts in universities at Oxford, Lancaster, Bristol, Durham and York, and has directed research programmes on children with memory, attentional, language, and reading problems. Susan has been the Director of the MRC Cognition and Brain Sciences Unit at Cambridge since 2011, and is currently engaged in research on the cognitive and neural underpinnings of developmental problems of working memory and language, and the use of cognitive methods to overcome them.

Margaret Donaldson Award Winner

The multisensory milieu in early life: How infants and children construct multisensory representations of their bodies and the world

Dr Andy Bremner

Wednesday 4th Sept 5:20pm

Palmer G10 (Room A)



Abstract

Our various sense organs develop according to widely varying timetables across pre- and post-natal life. Each sense organ provides information in largely different neural codes (vision codes space in retinotopic coordinates, touch in somatotopic coordinates and so on), and according to different schedules of environmental and sensory transduction. To further complicate matters, the spatial relationships between the senses vary substantially with movements of the body, like when the eyes move in their sockets or when the body changes shape as it grows during development. I will describe our current research which addresses how infants and children manage to combine these multiple signals into unified functional representations of the world and themselves, focussing especially on the development of an ability to appropriately combine visual, tactile, and proprioceptive cues to hand position. Whilst the current dominant theories concerning multisensory development agree that infants are able to encode “amodal” spatial aspects of the multisensory environment relatively independently of sensory experience, I will argue that the evidence in support of this view has important limitations, and that our abilities to perceive multisensory spatial and temporal aspects of one’s body and the world have extended developmental trajectories which depend on sensorimotor experience.

Andy Bremner: biography

Andy Bremner is a Reader in Psychology at Goldsmiths, University of London, where he has established the Goldsmiths InfantLab. He was an undergraduate at the University of Oxford and went on to a DPhil with Peter Bryant. Before taking up a post at Goldsmiths in 2005, Andy also worked as a post-doc with Denis Mareschal and Axel Cleeremans. Andy uses a range of behavioural and physiological methods to investigate the developmental origins of perceptual and cognitive abilities in infants and children, and across different cultures, focusing on object perception and knowledge, tactile perception, visual attention, cognitive control, spatial representations. More recently he has focussed on the development of multisensory processes, particularly those underlying body representations. Andy is an Associate Editor of the British Journal of Developmental Psychology, and an Academic Editor of PLoS ONE. He is leading a five-year research project funded by the European Research Council investigating “Human Embodied Multisensory Development”, and in 2012 co-edited the book *Multisensory Development* (Oxford University Press) with David Lewkowicz and Charles Spence.

Cognitive Section Award Winner

The arbitrariness of the sign:
Computational, behavioural and
corpus analyses of sound-meaning
mappings in language

Professor Padraic Monaghan

Cognitive Section Prize Winner

Thursday 5th Sept 11:10am

Palmer G10 (Room A)



Abstract

It is a convention in linguistics that the relationship between the sound of a word and its meaning is arbitrary. Arbitrariness is a puzzle from a computational perspective because all previous word learning cannot then help in learning a new word in the language. So, why is language structured like this? In a series of computational and behavioural studies using artificial languages, we show the conditions under which arbitrariness is advantageous for learning and communicative efficiency, providing a potential explanation for why language is arbitrary. However, there is a growing body of work uncovering aspects of language that appear to show systematicities in form-meaning mappings, such as sound symbolism, or inheritance into speech from iconicity in sign language. In a corpus analysis of English, we demonstrate that systematicity is more prevalent in early language acquisition, but arbitrariness becomes dominant in the mature vocabulary, meeting the dual challenges of promoting language acquisition and maximising communicative efficiency.

Padraic Monaghan: biography

Padraic Monaghan read Mathematics and Philosophy at Manchester University before gradually converging on psychology via a MSc and PhD in Cognitive Science at Edinburgh University. He worked as a postdoc at Edinburgh and Warwick Universities, before taking a lectureship in 2003 at the University of York. He was appointed Professor of Cognition at Lancaster University in 2007. Padraic first published in 1979 in WH Smith "Children as Writers", and, after a long hiatus, has since published work in reasoning and problem solving, attention, reading and dyslexia, and language acquisition.

Neil O'Connor Award Winner

Getting answers from babies about
Autism

Dr Mayada Elsabbagh

Friday 6th Sept 4:30pm

Palmer G10 (Room A)



Abstract

A rapidly growing area of research falls at the crossroads of two exciting disciplines: infancy and autism. This emerging research draws on innovative basic science, which has in the last decade succeeded in getting answers from very young babies about their development, cognition, and communication. These advances are now being used for the long-term goal of helping clinicians to detect autism much earlier than currently possible. Findings suggest that before the onset of full symptoms around three years, less obvious brain and cognitive differences appear to be present in infants at-risk for autism. Moreover, characteristics of brain function very early in life map onto variable outcomes in toddlerhood. Translation of these discoveries into personalized health applications will rely on engagement of a wide range of stakeholders in order to address complex scientific, social and ethical issues.

Mayada Elsabbagh: biography

Mayada Elsabbagh, Ph.D. is Assistant Professor in Psychiatry at McGill University. Her research, in the area of early infancy and developmental disorders, is focused on understanding the brain basis of behavioural genetic disorders. Prior to returning to Canada from the UK in 2011, Mayada supported the successful launch of collaborative research networks in autism including BASIS, aimed at accelerating the pace of discovery in early autism. Mayada is active in the area of knowledge translation locally and internationally. She was the recipient of the 2010 UK Economic and Social Research Council Neville Butler Memorial Prize for Longitudinal Research awarded in recognition of the public value and social relevance of her research.

Wednesday: The programme in detail

Wednesday 4 September 11:20 - 13:00

Chair		Symposium Wed 1A	Room A
Marc Brysbaert		Understanding reading: Insights from eye movements across the lifespan, Part I	
<p>Much has been learned about reading from experiments investigating in detail where and when the eyes move when reading. Most of the existing literature focuses on skilled readers reading English. In this two-part symposium, we add to this body of work, with a particular focus on individual differences. Symposium I considers reading behaviour in a number of different languages. It also explores various levels of reading behaviour, from lexical-level to discourse-level processing. Symposium II (see session chaired by Nation) continues these themes and addresses reading behaviour across the lifespan, in typical and atypical development.</p>			
First author		Title	
Filik	R	Using eye-tracking to test theories of irony processing	
Zang	C	The effect of visual complexity and word frequency on eye movements during Chinese reading	
Hermena	E	Disambiguating Arabic homographic verbs during reading	
Cop	U	Reading a novel in your second language: A comprehensive eye tracking study	
Schroeder	S	Interindividual differences in shallow processing of connectives – An eye-tracking study	

Chair		Symposium Wed 1B	Room B
Vincent Reid		Advances in understanding social development via a cognitive neuroscience perspective	
<p>This symposium showcases the use of cognitive neuroscience methods in the understanding of social development. This symposium will bring together some of the leading experts in the use of EEG and eye tracking with infant populations. The focus is on a broad array of social-cognitive skills, ranging from category formation through to the use of eye gaze and joint attention. The intention is to demonstrate the validity of the approaches that are being taken, and to show how techniques can be applied in such a way as to shed new light on social information processing capacities in early development.</p>			
First author		Title	
Westermann	G	Infants' sensitivity to the congruence of others' emotions and actions	
Parise	E	Labels refer to object categories in adults and 9-month-old infants: An EEG study	
Quadrelli	E	Infants' neural correlates of human action sounds: an event related potential study	
Reid	V	Live social interaction influences infants' oscillatory brain activity	
Michel	C	Understanding observed gaze towards objects by 4-month-old infants: An EEG oscillation study	

Wednesday 4 September 11:20 - 13:00

Chair	Symposium Wed 1C		Room C
Jeanne Shinskey	Picture-mediated learning: From associative to symbolic understanding in the first 5 years		
<p>This symposium integrates research on developments in picture-mediated learning about objects, from 5-month-olds' associative processing to 5-year-olds' symbolic understanding. First, we address how colour-object associations develop from 5 to 8 months (Clifford et al.). Second, we test 9-month-olds' representation of an object after familiarisation with its picture (Shinskey). Third, we explore how pairing music with a toy's picture affects 25-month-olds' preferences with real toys (Houston-Price & Slawinska). Fourth, we address pre-schoolers' perceptual and semantic processing of photographic and cartoon scenes (Bunce et al.). Finally, we investigate symbolic understanding of pictures in children with autism and typically-developing children (Hartley & Allen).</p>			
First author		Title	
Clifford	A	The development of colour-object associations	
Shinskey	J	Recognising and representing depicted objects at 9 months	
Houston-Price	C	The influence of familiar tunes and rhymes on the development of toy preferences	
Bunce	L	Children's perception of photographs and cartoon people: An eye-tracking study	
Hartley	C	Generalisation of word-picture relations in children with autism and typically developing toddlers	

Chair	Oral Papers Session Wed 1D		Room D
Phil Beaman	Hearing, Speech, Pragmatics		
First author		Title	
Halliday	L	Auditory processing and language in children with mild to moderate sensorineural hearing loss	
Knowland	V	Audio-visual speech perception in children with Specific Language Impairment	
Asano	K	Japanese-English Bilinguals' words retrieval process analysed by clustering and switching components in Verbal Fluency Test	
Murphy	S	RCT of an intervention for children with pragmatic language disorder focusing on peer interaction	
Gourdon	A	Children's interpretation of verbal probabilities: Use of directionality and pragmatic cues	

Wednesday 4 September 11:20 - 13:00 contd

Chair	Symposium Wed 1E		Room E
Helen Tenenbaum	Young people's reasoning about biology and physics		
<p>This symposium will bring together four talks on different aspects of young people's reasoning about biology and physics. The first two talks will focus on what types of science learning take place during parent-child conversations and a school trip. The third talk will examine the coherence of children's mental models of the earth and ways of building on children's knowledge for their understanding of climate change. The fourth talk will examine children's theory of biology and its implications for healthy eating. The resulting discussion will explore children's developing understandings of biological and physical science phenomena and their applications.</p>			
First author		Title	
Hohenstein	J	It sinks because it's heavy! Relations between parent-child explanatory talk and solutions to scientific problems	
Tenenbaum	H	A visit to a Natural History Museum	
Nobes	G	Children's understanding of the Earth and climate change	
Panagiotaki	G	Children's understanding of biology, diet and physical activity	
Howe	C	Discussion	

Chair	Symposium Wed 1F		Room F
David Messer	Executive functioning and developmental impairments in adolescence		
<p>Executive functioning (EF) involves higher order thinking skills (e.g. executive working memory, fluency, planning, inhibition, and switching). It is implicated in many important developmental processes. This symposium brings together new research concerned with at risk adolescents who have intellectual disabilities/special educational needs or have experienced childhood maltreatment. The presentations consider the relations between inhibition, anxiety and interpretive bias; everyday EF and interference control in relation to intellectual disabilities and behaviour disorders; EF and inner speech performance of adolescents who have been maltreated and EF performance of adolescents who have been identified as having special educational needs by teachers or clinicians.</p>			
First author		Title	
Kirke-Smith	M	EF, inner speech and maltreatment	
Kearvell-White	J	Executive functions and adolescents on the Register of Special Educational Needs	
Bexkens	A	Interference control in adolescents with Mild Intellectual Disability and Behaviour Disorders	
Van der Molen	M	Anxiety, interpretation bias and the role of executive functioning in adolescents	
Messer	D	Discussion of EF in Adolescence	

Wednesday 4 September 11:20 - 13:00 contd

Chair	Symposium Wed 1G		Room G
Gareth Gaskell	Consolidation processes in cognition and development		
<p>Memory consolidation has a rich history (e.g., in cognitive neuropsychology). However, until recently this notion was somewhat neglected in both cognitive and developmental psychology. Recent studies have begun to address this discrepancy and have led to a new understanding of the importance of consolidation to many aspects of memory and cognitive performance. Here, we will review key findings that relate consolidation to cognitive theory in adults and children, covering procedural memory, lexical learning, morphological processing and problem solving. The presentations will also cover the extent to which sleep and/or wakeful rest can promote aspects of memory consolidation.</p>			
First author		Title	
Wilhelm	I	Sleep supports the generation of explicit knowledge in a motor sequence task in children	
Henderson	L	Developmental changes in the consolidation of new word meaning	
Rastle	K	From specific examples to general knowledge during consolidation	
Monaghan	P	Sleep-dependent consolidation of semantic memory for problem solving	
Dewar	M	Resting quietly after learning boosts memory over the long term	

Wednesday 4 September 14:00 - 15:40

Chair		Symposium Wed 2A	Room A
Kate Nation		Understanding reading: Insights from eye movements across the lifespan, Part II	
<p>Much has been learned about reading from experiments investigating in detail where and when the eyes move when reading. Most of the existing literature focuses on skilled readers reading English. In this two-part symposium, we add to this body of work, with a particular focus on individual differences. Symposium I (see session chaired by Brysbaert) considers reading behaviour in a number of different languages. It also explores various levels of reading behaviour, from lexical-level to discourse-level processing. Symposium II continues these themes and addresses reading behaviour across the lifespan, in typical and atypical development.</p>			
First author		Title	
Reichle	E	The development of eye-movement control and reading skill	
Paterson	K	Effects of aging on eye movement control while reading	
Joseph	H	Online inference-making in children with and without comprehension difficulties	
Kirkby	J	Using eye movements to understand cognitive processing during copying from the board	
Radach	R	Topic monitoring and comprehension during text reading in children	

Chair		Oral Papers Session Wed 2B	Room B
Vesna Stojanovic		Language in ASD/Down Syndrome	
First author		Title	
Field	C	What processes underlie the shape and function bias in TD children and children with ASD?	
Rowland	C	How to learn the meaning of verbs: Evidence from typically-developing children and children with autism	
Jalili	M	The effects of imitative vs. cognitive method on the speech development of children with autism	
Smith	F	Consolidation of new vocabulary in Down syndrome	
Buckley	S	Individual differences in response to a reading intervention for children with Down syndrome	

Wednesday 4 September 14:00 - 15:40 contd

Chair		Oral Papers Session Wed 2C	Room C
Helen St Clair-Thompson		Cognitive Control	
First author		Title	
Engel de Abreu	P	Bilingualism enriches the poor: Enhanced cognitive control in low-income minority children	
Farrant	B	Cognitive Flexibility, Theory of Mind and Hyperactivity/Inattention	
Nkrumah	I	Effect of cognitive modeling on impulsive behavior among primary school children in Bekwai Municipality, Ghana	
FitzGibbon	L	What drives set-size effects in cognitive flexibility?	
Lucenet	J	The role of verbal labeling on reactive control: A lifespan study	

Chair		Symposium Wed 2D	Room D
Vasudevi Reddy		Understanding actions in infancy: Meaning in context and experience	
<p>Debates about the roots of action understanding in infancy, partly fuelled by neurological findings, have concentrated on the importance of action production, to the neglect of other sources of information about actions. In the present symposium we bring together four studies exploring alternative factors: infant reactions to everyday actions which they cannot themselves do, but which are familiar to them within contexts of direct engagement, or within contexts of frequent observation with or without any involvement on their part. We suggest that context, experience and emotional responses are important sources of meaning in action understanding.</p>			
First author		Title	
De Klerk	C	Visual experience facilitates action prediction in 7-9-month-old infants	
Reddy	V	Anticipatory adjustments to being picked up in infancy	
Fantasia	V	Changing the game: Infants' reactions to violations in early social games	
McCarthy	N	Passive eating? Infant reactions to others eating	
Lewis	C	Discussion	

Wednesday 4 September 14:00 - 15:40 contd

Chair	Symposium Wed 2E		Room E
Elena Hoicka	The development of creativity, innovation, and exploration		
<p>Despite the importance of creativity, innovation, and exploration in cultural evolution and learning, little is known about how these abilities develop. This symposium presents new research examining different types of creativity, innovation, and exploration. Hoicka will present a new measure of divergent thinking for 1-year-olds. Cutting will examine limits in 4- to 7-year-olds' tool innovation. Carr will discuss whether 3- to 8-year-olds switch from imitation to innovation when watching an ineffective model. Van Schijndel will explore how 7- to 9-year-olds' curiosity relates to learning for themselves versus learning from others. Beck will discuss the above research.</p>			
First author		Title	
Hoicka	E	Divergent thinking and motor skills in 1-year-olds	
Cutting	N	Why can't children innovate tools?	
Carr	K	You're doing it wrong: Does efficacy of observed behaviour influence innovation?	
Van Schijndel	T	Curiosity in discovery learning	
Beck	S	Discussion	

Chair	Oral Papers Session Wed 2F		Room F
George Georgiou	Early Social Development		
First author		Title	
Sirois	S	Do 12-month-infants learn and generalize conversation turn taking rules?	
Ross	J	Cross-cultural differences in the early development of self-awareness	
Bard	K	Emotion, rearing experiences, and joint attention in human and chimpanzee 1-year-olds	
Kirk	E	The relationship between symbolic gesture, maternal mind-mindedness and theory of mind	
Rubio-Fernández	P	How to pass the false-belief task before your 4th birthday	

Wednesday 4 September 14:00 - 15:40 contd

Chair	Symposium Wed 2G		Room G
Nicola Botting	Memory in children with atypical communication		
<p>In recent years there has been revitalised interest in the interface between language and cognition. It appears clear that children with atypical language often have important difficulties with memory tasks. These deficits include both short-term and long-term memory, tasks that involve storage and processing, and those that are non-verbal as well as those that are verbal. This symposium explores different forms of memory in children with different developmental difficulties (down syndrome, specific language impairment, deafness, and autism). Looking across tasks and disorders not only facilitates a better understanding of children with language needs, but potentially enhances knowledge of the interplay between cognition and communication more generally.</p>			
First author		Title	
Purser	H	Poor verbal short-term memory in Down syndrome cannot be explained by poor phonemic discrimination	
Henry	L	Verbal fluency and executive skills in children with specific language impairment	
Marshall	C	Executive function and language in deaf and hearing children	
Botting	N	Boundaries between 'verbal' and 'non-verbal' memory skills in children with SLI	
Williams	D	Episodic future thinking and prospective memory among individuals with autism spectrum disorder	

Wednesday 4 September 17:10 - 19:10 Posters (& Wine Reception from 6pm)

No	First Author	Title
P1	J Van Herwegen	Landmark knowledge and route-learning strategies in Williams syndrome: Evidence from eye-tracking
P2	R Wadman	Disruptive behaviours in adolescents with Tourette syndrome: Self, parent and school perceptions
P3	J Wang	Theory of Mind-use in the Director task: What makes 6- and 7-year-olds more (or less) egocentric?
P4	A Petrou	Pitch discrimination in autistic traits and its relationship to IQ and language function
P5	C Thomas	Complex visual discrimination in individuals with Autism Spectrum Disorder
P6	I Dubey	Social and non-social choices in relation to Autistic traits
P7	G Westermann	A pupil dilation study of unimodal and crossmodal novelty perception in infants and adults
P8	C Schulze	18-month-olds comprehend indirect communicative acts
P9	E Quadrelli	Investigating the ontogeny of the Mirror Neuron System: An EMG study with 6- and 9-month-old infants
P10	L Qu	Cooperative social context can increase perspective taking and cognitive flexibility in preschoolers
P11	D Spencer	Testosterone, temperament and the sex difference in young children's physical aggression
P12	D Papoudi	Mothers' and fathers' views and participation in their children's play
P13	P Oliveira	Neural correlates of attachment-disturbed behaviors among Portuguese institutionalized children
P14	L Pearce	Haunted by scary television: Effects of clip valence on children's true and false memories
P15	A Aldercotte	Observing toddlers' social-emotional competence: The validity and predictive value of the MPAC-R/S
P16	E Vagnoni	The influence of perceived motion on emotional evaluation
P17	V Proietti	Cross-cultural evidence of perceptual narrowing toward adult faces in 3- and 9-month-old infants
P18	LT Zainabid Akber	Attentional processing pertaining to own-gender bias in face recognition: An eye movement study
P19	L Simpson	Born Into the Military: Deployment status affects wife and child perceptions of family functioning
P20	S-E Williams	Goodnight sleep: The benefit of sleep consolidation on word learning and comprehension using children's storybooks
P21	M Szczerbinski	Improving reading speed through online training of fast word recognition: An effectiveness and feasibility study in two languages
P22	Z Vally	Promoting dialogic reading and infant language growth in an impoverished peri-urban South African community
P23	K Sauval	Sublexical phonological representations in advanced reader children: Evidence from priming paradigm
P24	C Okwara-Kalu	Effect of reciprocal teaching on the reading performance of primary school pupils
P25	Y Tao	Learning principle of recursion with a natural language

Wednesday 4 September 17:10 - 19:10 Posters (& Wine Reception from 6pm) contd

P26	P	Ogrodowicz	Ambiguous idiom comprehension in schizophrenia: A tale of decision-making. Preliminary results
P27	M	Peter	The role of verb bias in structural priming: Evidence from children and adults
P28	K	Twomey	Twinkle twinkle little star: Exemplar variability affects early verb learning
P29	I	Raman	The influence of Age of Acquisition (AoA) on free recall of pictures in Turkish and English
P30	P	Papakalodouka	Non-verbal communication and play in preschool children with expressive specific language impairment
P31	S	Richardson	The role of working memory in children's mathematics achievement: Processing, storage and their co-ordination
P32	J	Tellett	Comparing arousal and performance on two variants of the CPT-AX task in children: An ERP study
P33	N	Yuill	How getting noticed helps getting on: Capturing attention with a technology-augmented toy stimulates children's cooperative play
P34	C	To	Secondary school pupils' reasoning about the origins of living things
P35	L	Williams	The impact of age and temporal restrictions on face processing – an eye-tracking study.
P36	S	Toor	Eye strain symptoms are common and not always due to genuine ocular defects
P37	H	Roome	The re-invention of primary and secondary memory: How does it contribute to our understanding of immediate free recall?
P38	A	Tarlowski	The role of species essentialism in young children's reasoning about inheritance
P39	D	Trippas	Higher analytic cognitive style leads to more motivated reasoning
P40	E	Tattersall	Executive influences on school-age children's ability to generate taxonomic-thematic relations
P41	S	Tutnjević	Word-based categorization in 14 to 20-month-old children: Evidence from a Slavic language
P42	A	Weighall	The effect of language-switch and time interval on false memory formation in bilingual speakers
P43	A	Russ	Eyewitness identification in a multiple-lineup procedure
P44	S	Tan	How does the consolidated pack impact on the initial learning of crime and safety on children?
P45	G	Stoet	A novel free web-based tool for teaching cognitive psychological experiments
P46	M	Toye	Executive functions and child pedestrian behaviour
P47	G	Waters	Young children's memory of conflicting and non-conflicting gender/occupation roles
P48	K	Smyth	Children's induction from religion categories in Northern Ireland
P49	T	Vajsbaheer	How long did we take? Groups are good at estimating task duration
P50	M	Wright	Consumer culture ideals, extrinsic motivations, and well-being in children
P51	M	Hast	Children's developing theories of motion: Subjectivity and shift

Thursday: The programme in detail

Thursday 5 September 09:00 - 10:40

Chair		Symposium Thu 1A	Room A
Sophie Scott/ Katie Alcock		The links between motor and language abilities in early and maturing typical and atypical development	
<p>The link between first words and very early gesture development is well established, but we know less about other links between motor and language development, despite many theoretical speculations about links between the two. In this symposium we present data examining the links between oral motor control, gestural abilities, and speech and language in children's maturing language (Alcock, Krishnan), and between motor and language skills in older children with spoken and written language impairments (Bishop). We also look at gross motor development, temperament and early language development (Ellis-Davis), and discuss the validity of methods to quantify early gestural development (Christopher).</p>			
First author		Title	
Alcock	K	Early oral motor and gestural abilities and their relationship to preschool language abilities	
Krishnan	S	Oromotor control and imitation predict novel word production in the school years	
Bishop	D	Motor deficits in language impairment and dyslexia: same or different?	
Ellis-Davies	K	Evaluating temperament's role in associations between motor and language development	
Christopher	A	Adaptation and validation of the MacArthur-Bates CDI Gesture Scale for the UK	

Chair		Symposium Thu 1B	Room B
Geoff Ward		Recent advances in immediate memory 1	
<p>There are well-established literatures on two well-known memory tasks: immediate free recall and immediate serial recall, each supported by sets of benchmark findings and discussed within specific theoretical accounts. In recent years, there has been renewed interest in exploring the interaction between these literatures: can findings, mechanisms, and models that are associated with one task be applied to the other. Moreover, what are the mechanisms needed to underpin immediate recall. This symposium highlights recent advances in immediate memory, and focuses for the most part on experiments conducted using free recall.</p>			
First author		Title	
Ward	G	Word frequency effects in immediate free recall (IFR): A re-examination of IFR as a "two-component task"	
Brown	G	Remembering Rewarded: Data and model for incentivised free recall	
Beaman	P	Found in translation: The conceptual basis of semantic auditory distraction in immediate recall	
Spurgeon	J	Why do participants initiate the immediate free recall of short lists of words with the first item?	
Davelaar	E	Lessons from modelling serial and free recall	

Thursday 5 September 09:00 - 10:40 contd

Chair		Symposium Thu 1C	Room C
Patrick Leman		Children's identities and intergroup attitudes in a social context	
<p>Research into children's understanding of social groups has become a central feature of much social developmental psychology. However, there is recent and growing interest in how intergroup relations and attitudes operate in different contexts. This symposium brings together researchers who, in different ways, have sought to articulate developmental processes in different contexts. Four research papers will consider the ways in which children appreciate the socio-moral context when making judgments, respond to the salience of intergroup competition, and are affected by a multicultural (multiethnic) context in developing identity, acculturation and attitudes and friendships. A discussion will identify common and emerging themes.</p>			
First author		Title	
Cameron	L	Experience of ethnic diversity and strategic colour-blindness in childhood: Does experience of ethnic diversity make children less willing to acknowledge social categories?	
Lam	V	Children's attitudes towards ingroup and outgroup members and group evaluations: A minimal group study with competitive teams	
Vethanayagam	S	The development of acculturation behaviours (cultural practices) in British ethnic minority and majority children living in London	
Leman	P	Ethnic group attitudes and children's relationships in an multiethnic context	
Cameron	L	Discussion	

Chair		Oral Papers Session Thu 1D	Room D
Jagjeet Jutley-Neilson		Literacy Strategies and School Achievement	
First author		Title	
Einav	S	To the letter: Children's developing trust in the written word	
Hamilton	L	The role of the home literacy environment in the early literacy development of children at family-risk of dyslexia	
Critten	S	The development of spelling and reading strategies and children's sensitivity to word type	
Davies	R	Does the strength of orthography-to-semantics connections predict the size of the age-of-acquisition effect in word naming?	
Booth	J	Obesity impairs academic attainment in adolescents: Findings from ALSPAC	

Thursday 5 September 09:00 - 10:40 contd

Chair	Symposium Thu 1E		Room E
Helen St Clair-Thompson	Mental toughness: Its correlates and cognitive underpinnings		
<p>Mental toughness describes how people deal with challenges, stressors and pressure irrespective of prevailing circumstances. The concept originated in sports psychology but has now been applied in many domains including education. Recent research has also started to explore the cognitive underpinnings of mental toughness. This symposium is comprised of a series of studies examining the correlates of mental toughness, mainly within educational settings, studies exploring perceptions of mental toughness and its development, and studies examining its cognitive and biological underpinnings. The results are discussed in terms of implications for practice and the development of mental toughness.</p>			
First author		Title	
Bugler	M	Mental toughness in education	
Robinson	J	Mental toughness in educational settings and correlations with inhibition	
St Clair-Thompson	H	The cognitive underpinnings of mental toughness	
Crust	L	Coaches' perceptions on mental toughness and its development in an English Premier League soccer academy	
Clough	P	The biological underpinnings of mental toughness	

Chair	Symposium Thu 1F		Room F
Margaret Harris	Literacy attainment in deaf children: Has technology made a difference?		
<p>Considerable changes over the last decade in the identification of hearing loss, and in the provision of sophisticated hearing aids, have provided many born deaf children with greater access to spoken language. These changes would also be expected to impact on the development of literacy, both in terms of levels of attainment and on the underpinning developmental mechanisms, such as use of phonological skills in reading and spelling. This symposium reviews the barriers to literacy for deaf children and considers whether the way that deaf children learn to read and write has fundamentally changed.</p>			
First author		Title	
Pimperton	H	Reading outcomes in teenagers born with hearing loss: Early confirmation of deafness matters	
Harris	M	Reading and spelling abilities of deaf adolescents with cochlear implants and hearing aids	
Herman	R	Literacy and dyslexia in oral deaf children	
Kyle	F	Development of spelling strategies in deaf children	
Harris	M	Discussion	

Thursday 5 September 09:00 - 10:40 contd

Chair	Symposium Thu 1G		Room G
Denis Mareschal	The emerging use of multi-sensory information in infancy and childhood		
<p>We live in a multisensory world. And yet, the vast majority of cognitive development research has focussed on learning and reasoning within single modality domains. This symposium will chart how children and infants combine audio and visual information to support their learning and inference about the world. Topics such as spatial localisation in children, cross-modal mapping in infants, cross-modal statistical learning and word learning provide windows into how multi-modality can bootstrap learning in early development.</p>			
First author		Title	
Petrini	K	Hearing where the eyes see: children use an uninformative visual cue when localising sound	
Bremner	A	The development of crossmodal correspondences: Evidence from infants and remote cultures	
Kirkham	N	The importance of 'what': The usefulness of multisensory information in statistical learning	
Althaus	N	Infant categorisation in the presence of labels – An instance of cross-modal learning?	
Cowie	M	Multisensory processing for own-body perception develops until 10 years	

Thursday 5 September 10:40 – 12:50 Posters

No	First Author		Title
P1	M	Levlin	Oral language skills in grade 3 among a group of Swedish students with weak word-decoding and reading comprehension in grade 2
P2	L	Lee	The use of computerised intervention to support reading fluency development in Irish primary school children
P3	R	Mermelshtine	The prediction of cognitive development from maternal scaffolding behaviours in the first year
P4	A	Molyneaux	Do children who write more write better? An analysis of writing done by children aged 9-10 years
P5	S	Krishnan	Recognizing sounds in complex sound scenes: Change over the school years
P6	J	Ingram	Markedness: An empirical investigation
P7	A	Lorandi	The developmental trajectory of morphological knowledge in Brazilian Portuguese
P8	A	Holland	Can children extend facts to other objects from the same category?
P9	J	Marsh	Degree of between-sequence semantic similarity exacerbates semantic auditory distraction
P10	F	Hunt	The impact of binge drinking on emotional face recognition in males and females
P11	F	Hunt	Cognitive implications of early alcohol consumption
P12	F	Hunt	Free recall of emotional words: Patterns of alcohol intake and sex differences
P13	V	Masters	Effects of age and memory strategy use on performance in single and dual-tasks
P14	N	Lange	From idea generation to idea donation: How memory strength leads us to attribute our own ideas to someone else
P15	S	Nouwens	Semantic short-term memory predicts reading comprehension performance
P16	S	Laurence	The role of experience in face adaptation: Dog-specific adaptation for dog-owners but not non-owners
P17	M	MacLean	"My child and my dog". Thinking about others' mental states: Anthropomorphism and mind-mindedness
P18	M	MacLean	The relationship between maternal mind-mindedness and levels of scaffolding in mother-child interaction
P19	M	MacLean	'Best friends' and best friends: Attachment and mind-mindedness in relation to human and animal companions
P20	E	Mavritsaki	Investigating ADHD effects in visual search using sSoTS model
P21	L	Kenny	Cognitive systems underlying the comorbidity of motor and social difficulties in primary school children
P22	P	Martinez-Castilla	Development trajectories comparison between WS, HFA and typical development
P23	S	Holt	Investigating collaboration in children with autism using a multi-touch tabletop computer
P24	N	Kargas	The relationship between auditory processing, auditory sensory behaviours and communication skills in autism spectrum disorders

Thursday 5 September 10:40 – 12:50 Posters contd

No	First Author		Title
P25	Z	Hopkins	Mirror Talk: Alignment in the natural conversations of children with autism
P26	M	Martinez-Barona	Naming during a novel word-learning task: An exploration of toddlers at increased risk of autism
P27	S	Little	Does sensory over-responsivity account for the anxiety experienced in autism?
P28			<i>withdrawn</i>
P29	H	Lee	The distracted mind: The developmental relationship between attention and intelligence
P30	P	Matusz	Multi-modal distraction: Insights from children's limited attention
P31	A	Johnson	Hebbian learning for tactile sequence
P32	A	Johnson	Sexual promiscuity and attentional bias for sexualised stimuli
P33	C	Hien	Bilinguals demonstrate similar strategies in word learning but are superior in foreign label recall
P34	G	Mutale	The presence of perceived environmental disease shifts preferences for female body weight
P35	S	Mengoni	The Early Years Developmental Journal: A resource to record, monitor and support children's progress
P36	D	Juhová	Czech gifted preschoolers: Is early giftedness well identified by nonverbal intelligence tests?
P37	J	Law	Infants and Robots: How robotic implementations can stimulate psychological models of development
P38	R	O'Connor	Infant learning across 24 hours upon an object permanence task
P39	E	Longhi	Biomechanically possible and impossible hand movements: Do neonates discriminate?
P40			<i>withdrawn</i>
P41	A	Laville	The role of affect in fantasy-reality judgments: looking at real, near-real and make-believe entities
P42	S	Nakashima-Lobao	Effects of self-reported empathy on 5-to-7 year-olds' memory for a competitive activity
P43	L	Kuhn	Children's emotion perception in human voice and face
P44	R	Imada	How difficult is it for 3-year-olds to understand that appearance can be different from reality?
P45	A	Martin	Children's understanding of the earth's gravity: A Q-methodological study
P46	J	Hill	What children know about substances: Judging the intensity of mixtures
P47	R	Merkley	Why do preschoolers' attention and numeracy relate? Implications from cognitive training
P48	B	Krause	Neurochemical inhibition/excitation balance is linked to cognitive achievements in the developing and mature brain
P49	H	Kikuno	Is the scholastic academic ability of mathematics related with the ability of theory of mind?

Thursday 5 September 10:40 – 12:50 Posters contd

No	First Author		Title
P50	K	Naish	Sensorimotor modulation during the observation of hand-to-mouth actions in 13-14 month old infants
P51	C Y	Looi	Stimulating the brain during video games to decrease cognitive disparity and induce transfer and long-term cognitive effects
P52	J	Ng Lan Kong	The contribution of inhibitory abilities to arithmetic word problem solving containing irrelevant information
P53	S	Howarth	Are beliefs biased by logic? The effect of a secondary load and complexity on belief and logic based judgments
P54	L	Robertson	Do memory cues or communicative demands effect 3-year-olds' gesture production during recall?
P55	T	McCarthy	Risk perception and affective judgement: A linear relationship in experts and laypeople?
P56	A	Hyne	Judgements of object size by eye and hand under two measures
P57	N	Noonan	Statistical learning of word boundaries in native and non-native speakers of English
P58	A	Horwood	Developmental changes in the balance of disparity, blur and looming/proximal cues to drive ocular alignment and focus
P59	L	Kulke	Measuring the development of visual attention in infancy: More exact timing due to eye-tracking

Thursday 5 September 13:50 - 15:30

Chair		Symposium Thu 2A	Room A
Tony Charman		Neurocognitive approaches to understanding development in neurodevelopmental disorders	
<p>Over the past two decades there has been considerable progress in the application of neurocognitive developmental approaches to help better understand neurodevelopmental disorders. However, these advances have been challenging. Not least, because of the multiplicity of theoretical and methodological approaches that might be required to tease apart (or even define) developmental phenomena seen in the range of disorders being studied. Further, there is considerable heterogeneity both between children with different disorders, and within children with the same disorder, even when they have a known genetic aetiology. The speakers in this symposium have adopted different models and methods to address these complex issues.</p>			
First author		Title	
Scerif	G	Mechanisms of risk and resilience through disorders of known genetic origin	
Thomas	M	A neurocomputational model of regression in autism	
Farran	E	A cross-syndrome comparison of navigation abilities; can individuals with Down syndrome and Williams syndrome find a short cut?	
Gliga	T	Developmental pathways involved in the onset of autism symptomatology	

Chair		Symposium Thu 2B	Room B
Geoff Ward		Recent advances in immediate memory 2	
<p>Despite well-established literatures, there remains considerable debate as to the specific mechanisms underpinning immediate free recall and immediate serial recall. In this symposium, leading researchers examine the importance of different mechanisms assumed to underpin one or both tasks. These include: (1) the use of temporal oscillators that are assumed to underpin temporal grouping, (2) a critique of verbal rehearsal, (3) the roles of temporal distinctiveness and temporal grouping in temporal isolation effects, (4) the effects of short-term presentation and recall on long-term list learning and word learning, and (5) the application of temporal clustering theory to age differences in recall.</p>			
First author		Title	
Hartley	T	Effects of rhythm on memory for spoken sequences: a model and tests of its stimulus-driven mechanism	
Lewandowsky	S	Rehearsal in working memory: Friend or enemy of retention?	
Grenfell-Essam	R	Temporal isolation effects in immediate serial recall and immediate free recall	
Page	M	Order, order: serial order in short-term memory, Hebb effects, word-form learning and dyslexia	
Farrell	S	Ageing and temporal clustering in episodic memory	

Thursday 5 September 13:50 - 15:30 contd

Chair		Symposium Thu 2C	Room C
Jane Oakhill / Kate Cain		Discourse-level comprehension: Development and difficulties	
<p>The purpose of this symposium is to bring together a number of recent studies in the area of children's language comprehension: both development and difficulties. The papers focus on the different skills and abilities that support the construction of a meaning-based representation of connected prose: working memory, comprehension monitoring, inference making, and understanding connectives. This research is relevant to understanding individual differences in language comprehension and its development, including, in the final paper, studies of deaf children's comprehension.</p>			
First author		Title	
Blything	L	The role of working memory in children's understanding of temporal connectives	
Pooley	N	The effect of integration distance on children's production of bridging inferences	
Ammi	S	Children's comprehension monitoring: How task factors influence performance	
Oakhill	J	Understanding of temporal and causal relations in good and poor comprehenders	
Arfé	B	Comprehension of temporal and causal connectives: A comparison between hearing and deaf poor readers	

Chair		Symposium Thu 2D	Room D
Andy Bremner/ Marko Nardini		The development of body representations for perception and action in infancy and childhood	
<p>Representations of our own and others' bodies play crucial roles in a range of everyday functions, from guiding perception and action to forming the basis of our social perceptual abilities. Yet surprisingly little attention has been given to how representations of the human body develop. Speakers in this symposium will tackle different aspects of body representations in developing infants and children, including tactile localisation on the body, perception of actions in observed agents, and decision-making processes underlying reaching. The talks will be discussed by Dr Matthew Longo, an expert in the cognitive neuroscience of mental representations of the body.</p>			
First author		Title	
Rigato	S	The neural basis of somatosensory remapping develops in infancy	
Lloyd-Fox	S	Action perception in the pSTS-IPS region is associated with action production in young infants	
Le Cornu Knight	F	Topological body representations in early life	
Dekker	T	Embodied decision-making? Choosing optimal visuomotor strategies in childhood	
Longo	M	Discussion	

Thursday 5 September 13:50 - 15:30 contd

Chair		Symposium Thu 2E	Room E
Amanda Waterman		Investigating cognitive and motor development in children from the perspective of the Born in Bradford longitudinal birth cohort	
<p>The synergistic development of cognitive and motor proficiency is essential if a child is to successfully progress through formal education. The acquisition of cursive handwriting is a canonical example of a skill that interacts with other abilities (e.g. reading) and requires both motor and cognitive competence. Developmental disorders impact on these interacting domains and have implications for children's wellbeing. Our symposium highlights critical psychological processes that link the domains and underpin core classroom skills. The importance of this work will be presented within the context of a cohort study aimed at improving the health and education of 13,500+ children ('Born-in-Bradford').</p>			
First author		Title	
Andrews	E	Screening for motor difficulties in children using sophisticated kinematic measures and the effects	
Shire	K	Using novel robotic interventions to treat children with movement problems	
Van Rooijen	M	The development of a mental number line in primary school children: influence of motor proficiency	
Mon-Williams	M	Visual-motor memory: A quantitative test of a construct underlying writing and reading ability	
Hill	L	A novel tool for assessing visuo-motor attention and its relationship to classroom performance	

Chair		Symposium Thu 2F	Room F
Alana James		Evidence-based parenting interventions across the needs spectrum	
<p>Parenting programmes are increasingly used as community and specialist interventions to improve child and parent outcomes. This symposium shows how such interventions can effectively target a range of needs levels, child ages, and family circumstances, and considers the elements which make them successful. We begin with Empowering Parents, Empowering Communities, a peer-led community intervention, and its recent adaptation for parents of teenagers—Living with Teenagers. Following this we move to the more intensive Multi Systemic Therapy, for adolescents with complex needs. Finally we look at the Multidimensional Treatment Foster Care model and its adaptation for mainstream foster and kinship carers-KEEP.</p>			
First author		Title	
Thomson	S	EPEC: Understanding parents' perspectives on becoming peer-leaders of a parenting intervention	
James	A	Living with teenagers: The development & formative evaluation of a peer-led parenting intervention	
Wait	J	Multi Systemic Therapy: An evidence based programme working with families of antisocial adolescents	
Roberts	R	MTFC: Can specialist foster programmes improve outcomes for looked after young children?	
Roberts	R	The KEEP programme (Keeping foster and kinship carers trained and supported)	

Thursday 5 September 13:50 - 15:30 contd

Chair		Oral Papers Session Thu 2G	Room G
Jessie Ricketts		Phonological Awareness and Reading	
First author		Title	
Carroll	J	Predicting dyslexia using pre-reading skills: The role of sensorimotor and cognitive abilities	
van Bergen	E	The effect of parents' literacy skills and children's preliteracy skills on the risk of dyslexia	
Kuppen	S	Tune Time: Investigating the impact of a program of spoken versus sung rhymes on Year 1's phonological awareness	
		<i>withdrawn</i>	
Davies	R	Does reliance on phonological coding in visual word recognition diminish through reading development from childhood to adulthood?	

Thursday 5 September 16:00 - 17:20

Chair		Oral Papers Session Thu 3A	Room A
Judi Ellis		Empathy	
First author		Title	
Hepach	R	Investigating the motivational mechanism underlying young children's spontaneous helping behavior	
		<i>withdrawn</i>	
Mitchell	P	Can we guess how empathising a person is after watching them in a 30 second video clip?	
Jones	S	Bullying and belonging: A longitudinal study of the protective role of defenders in peer groups	

Chair		Oral Papers Session Thu 3B	Room B
Catriona Morrison		Memory (STM and DRM paradigm)	
First author		Title	
Jones	G	Chunking trumps temporal duration in short-term memory: The case of the length effect that disappeared	
Briscoe	J	Re-thinking lexicality; list composition effects in children's serial recall of words and nonwords	
Sherman	S	False memories can increase over time – comparing the 'better' and 'lesser' DRM lists	
Wilkinson	S	I do therefore I remember: Self-generation explains false memory priming success across age	

Chair		Oral Papers Session Thu 3C	Room C
Linden Ball		Individual Differences (Clinical)	
First author		Title	
Morsanyi	K	The effect of mathematical anxiety on cognitive reflection	
Galbraith	N	Cognitive, perceptual and affective factors predicting delusional ideation in adolescence	
Alderson-Day	B	Inner speech predictors of self-esteem, dissociation and hallucination-proneness in a student sample	
Sumich	A	Maturation of event-related potentials: Sex differences and associations with psychopathology	

Thursday 5 September 16:00 - 17:20 contd

Chair		'No Questions Asked' Papers Session Thu 3D	Room D
Simon Hunter		Social development; Parenting; Face Perception	
First author		Title	
Leith	G	Mother-child affection, but not conflict, predicts the dyad's self- and other-regulation	
Smart	K	Can parenting programmes improve children's development and attainment?	
		<i>withdrawn</i>	
Nassem	E	Why do children bully? A child's perspective	
Rix	K	How do four- to seven-year-old children explain their withdrawn behaviour?	
Papageorgiou	K	An investigation into the relationship between individual differences in infant fixation duration and later temperament and behaviour	
Bobak	A	Group differences in the scanning of faces: Insights from 'super-recognizers', developmental prosopagnosia and individuals with typical face memory	

Chair		'No Questions Asked' Papers Session Thu 3E	Room E
Daisy Powell		Language; Reading; Maths; Executive Function	
First author		Title	
Kwok	R	Visual word learning in adult British readers	
Gilbert	R	Individual differences in auditory-verbal short-term memory capacity and rehearsal timing	
Payne	H	Hemispheric lateralisation during rhyme judgement examined using fTCD	
Mayhew	K	An eye movement investigation of syntactic ambiguity in main verb and reduced relative constructions	
Keeble	S	The role of conceptual understanding in children's mathematical skills	
Hubber	P	The role of Working Memory in arithmetic differs by strategy	
Sireer	N	Theory of mind, executive function, social competence and signs of ADHD in young Pakistani children	

Thursday 5 September 16:00 - 17:20 contd

Chair		Oral Papers Session Thu 3F	Room F
Andrew Dunn		Motor Control	
First author		Title	
Kyjonková	H	Getting a grip: Developmental changes in motor overflow over the first year of life	
Wilmot	K	Linking together action sequences: Changes with movement experience	
Jackson	G	Volitional control: A different solution for regulating action in Tourette Syndrome?	
Nixon	E	Physical activity and reduced tic symptomatology in Tourette's Syndrome: An observational study	

Chair		Oral Papers Session Thu 3G	Room G
Emily Mather		Categorisation and Learning	
First author		Title	
Westermann	G	Infants' ability to link objects and sounds	
Althaus	N	Primacy/recency effects in infant categorisation	
Waters	G	The role of comparison processes in young children's understanding of referential questions	
Savage	R	The Simple View of Reading as a framework for National Literacy Initiatives: A hierarchical model	

Friday: The programme in detail

Friday 6 September 09:00 - 10:40

Chair		Symposium Fri 1A	Room A
Lynne Murray		The development of the Mirror Neuron System in human and macaque infants, and the role of experience	
<p>This symposium brings together researchers from diverse perspectives and methodologies who are working on the topic of the 'Mirror Neuron System'. They include experimental studies of imitation and/or neural responses in human infants (Nagy and de Klerk) and rhesus macaques (Ferrari), and observations of maternal mirroring to human infants (Murray). A particular focus for debate is the role of experience in the development of the system, and a consideration of the relative contributions of associationist and nativist perspectives. The contributions will be discussed by Chakrabarti in the light of ideas concerning the reward modulation of mirror system responses.</p>			
First author		Title	
Nagy	E	Imitation and communication in human neonates: Possible mechanisms	
de Klerk	C	Motor activation during action observation: the effects of visual, motor, and visuomotor experience	
Murray	L	Maternal mirroring of infant facial gestures from the first week of life and its role in the development of infant expressiveness	
Ferrari	P	The mirror mechanism in early facial communicative exchanges in nonhuman primates	
Chakrabarti	B	Discussion	

Chair		Oral Papers Session Fri 1B	Room B
Sinéad Rhodes		Attention in Developmental Disorders	
First author		Title	
Meeuwssen	M	The contribution of perinatal adversity to early symptoms of ADHD	
Rhodes	S	A longitudinal neuropsychological and clinical study of boys with ADHD: Improvements in Executive Functioning do not explain clinical improvement	
Cragg	L	Patterns of mathematics difficulties in very preterm children	
Riby	D	Making social evaluations of faces in Williams syndrome	
Hanley	M	Atypical attention during mental state recognition in Williams syndrome	

Friday 6 September 09:00 - 10:40 contd

Chair		Oral Papers Session Fri 1C	Room C
Theo Marinis		Syntax and Grammar	
First author		Title	
Svirko	E	Domain-general cognitive constraints on grammar acquisition	
Williams	J	Prior linguistic knowledge and implicit learning	
Paciorek	A	Implicit language learning: An ERP study	
Westermann	G	A computational model of brain imaging of the English past tense	
Nippold	M	Spoken language production in adulthood: Complex thought drives complex syntax	

Chair		Oral Papers Session Fri 1D	Room D
Michael Pilling		Visual Attention	
First author		Title	
Langton	S	Developmentally distinct gaze processing systems: Luminance versus geometric cues	
Senju	A	Cultural background affects the development of face and eye gaze	
Gregory	N	Follow Buzzy Bee: The effects of arrows, eye gaze and finger pointing cues on saccadic orienting in infants	
Kroll	V	Visual processing of bodies when they are targets and distractors	
Lewis	M	The impact of Navon-letter processing on expert behaviour	

Chair		Symposium Fri 1E	Room E
Pauline Horne		Fruit and Veg are Cool, Eat Them Home and School! How to change children's eating habits	
<p>Eating a diet rich in fruit and vegetables offers considerable protection against ill health and obesity. Given that food preferences are formed early in life, healthy eating programmes ought to target young children. We will present data from four programmes that can change children's eating habits: The Food Dudes Whole-School Programmes for Special Schools and for Early Years, both developed by behaviour change specialists from Wales; a Picture Book Parent Intervention developed in England; and a Veggiefruities (Groentefroetels) Home Intervention developed in The Netherlands. We will highlight and discuss the psychological principles underpinning these interventions, their effectiveness and future directions.</p>			
First author		Title	
Houston-Price	C	How picture books facilitate the introduction of vegetables into children's diets	
de Droog	S	"The World of the Veggiefruities": Increasing children's fruit and vegetable consumption	
Erjavec	M	Role-modelling, rewards and repeated tasting: The Food Dudes programme in special schools	
Sharp	C	Development of a Food Dudes Healthy Eating Programme for preschool children	
All		Discussion	

Friday 6 September 09:00 - 10:40 contd

Chair		Oral Papers Session Fri 1F	Room F
Katie Rix		Reasoning	
First author		Title	
Raijmakers	M	Self-explanation to stimulate training in logical reasoning	
Donati	M	Decision making under risk conditions in adolescents: The role of probabilistic reasoning ability	
Morsanyi	K	Developmental changes in the conjunction fallacy: The role of contextual cues	
Pitchford	M	Individual differences in belief bias: Consideration of the Algorithmic and Reflective minds	
Jones	G	Demystifying the nine-dot problem: The dynamics of problem space search and insight	

Chair		Symposium Fri 1G	Room G
Jessie Ricketts		Approaches to understanding the mechanisms of reading	
<p>The five presentations describe distinct methodological approaches that explore how reading skills develop and degenerate throughout the lifespan. Presentation 1 takes a cross-sectional approach to understanding age-related changes in the relationship between reading and semantic knowledge. This is followed by longitudinal (presentation 2) and intervention (presentation 3) studies investigating language and reading in children at risk of reading difficulties. The final two presentations probe reading in adults, with presentation 4 investigating neural correlates of learning to read and presentation 5 exploring reading deficits in patients with semantic dementia. Findings will be interpreted within the context of current models of reading.</p>			
First author		Title	
Ricketts	J	Semantics and word-level reading: Does the relationship change with age?	
Nash	H	Predicting literacy outcomes in at-risk children; the role of early language skills	
Duff	F	Effectiveness of a combined reading and language intervention for children at-risk of dyslexia	
Taylor	J	Learning to read irregular and regular words: Combining artificial orthography learning methods with fMRI	
Woollams	A	Semantic dementia offers unique insights into the nature of the reading system	

Friday 6 September 11:10 - 12:30

Chair		Oral Papers Session Fri 2A	Room A
Beth Law		Theory of Mind and Language	
First author		Title	
lao	L	Talking while thinking about other's mind in preschoolers: Direct evidence of getting Vygotskian about social cognition	
Brandt	S	Children's understanding of first and third-person perspectives in language and false belief	
Qu	L	Guided role-play benefits the development of Theory of Mind in preschoolers	
Donaldson	M	Can children with language impairments explain actions in terms of intentions?	

Chair		'No Questions Asked' Papers Session Fri 2B	Room B
Samantha Reeves		Theory of Mind; Autism; Emotional Development	
First author		Title	
Lowe-Brown	K	Children's understanding of strategies of emotion regulation: What developmental changes occur?	
Roper	C	The relation between Executive Function and Emotion Regulation in pre-schoolers	
Kondo	T	When do children recognize that they don't know emotions of others?	
Siposova	B	Relationship between oxytocin and maternal affect attunement during mother-infant interactions	
Martin	C	Children's understanding of intentional behaviours: The difference between joking and pretending	
Cage	E	A model of reputation management in typical development and autism	
Peppia	N	The unique and shared neuropsychological characteristics of ADHD and Conduct Disorder	
Jones	C	Subclinical delusional ideation, reasoning and creativity	

Friday 6 September 11:10 - 12:30 contd

Chair		Oral Papers Session Fri 2C	Room C
Bob Johnston		Face Recognition and Prosopagnosia	
First author		Title	
Sen	M	Familiar face and voice processing as influencing cross-modal identity matching in children and adults	
Hills	P	Eye-tracking face recognition in children: effects of age, familiarity, and orientation	
Bate	S	Aberrant scanpaths follow normal biases for facial expression in developmental prosopagnosia	
Bennetts	R	Intranasal inhalation of oxytocin improves face processing in developmental prosopagnosia	

Chair		'No Questions Asked' Papers Session Fri 2D	Room D
Tricia Riddell		Memory; Visual Processing; Scientific Understanding	
First author		Title	
McGourty	J	Do children value the future more than the past? Examining a bias in children's episodic future thinking	
Marshall	Z	How does temporal memory and temporal knowledge develop across the primary school years?	
Koenig	L	Recollection and familiarity in children	
Ferneyhough	S	The effects of normal cognitive ageing on surface-feature and location binding	
Armitage	E	Is pictorial development modality-specific? Evidence from children's understanding of photographs and drawings	
Begum Ali	J	The "crossed feet effect": The external frame of reference for touch emerges between 4 and 6 months of age	
Salem	S	Promoting scientific understanding of the day/night cycle: The role of conceptual change instruction	
Miller	L	Visual and proprioceptive cue weighting in children with ASD, DCD and typical development	

Friday 6 September 11:10 - 12:30 contd

Chair		Oral Papers Session Fri 2E	Room E
Bhisma Chakrabarti		Neural Underpinnings of Typical & Atypical Cognition	
First author		Title	
Dumontheil	I	Neurocognitive development of social cognition and cognitive control during adolescence	
Belmonte	M	Behavioural and physiological dimensions of Autistic traits, within and beyond the Autism Spectrum	
De Fabritiis	P	The key corpus callosum role is developmental rather than functional. Evidence from a longitudinal study of a single case with congenital callosal malformation	
Thompson	J	Creating synaesthetic brains? Noninvasive brain stimulation modulates learning of novel symbols	

Chair		Oral Papers Session Fri 2F	Room F
Alana James		Parent-Child Interactions	
First author		Title	
Pye	R	Higher self-efficacy in mothers who schedule-fed their infants at 6 weeks old, compared to those who demand-fed	
Sakkalou	E	Investigation of infant development and mother-infant interactions in infants with visual impairment	
Addyman	C	An online survey of baby laughter	
		<i>withdrawn</i>	

Chair		Oral Papers Session Fri 2G	Room G
Sue Sherman		Memory (Eye-witness testimony)	
First author		Title	
Skelton	F	The impact of morphing on own- and other-race facial composites	
Clark	C	Threat or food: Survival processing and location memory	
Calderwood	L	Children's recognition of voices from a line-up	
McNeill	A	Vigorous cross-examination of facial-mapping expert reduces false identification	

Friday 6 September 14:30 - 16:10

Chair		Symposium Fri 3A	Room A
Ian Apperly		Theory of Mind grows up	
<p>Theory of mind has traditionally been studied in a narrow age range of children, using a small set of tasks, somewhat in isolation from other aspects of cognition. The symposium presents a new trend for a broader approach that draws heavily on methods from cognitive psychology and psycholinguistics. This is yielding insights into 1) development into adulthood 2) how theory of mind integrates with other cognitive processes for language and perspective-taking 3) the nature of individual differences, across culture, gender and developmental disorders. The discussion will consider what we have learned so far and the prospects and challenges for the future.</p>			
First author		Title	
Ferguson	H	Tracking the time-course of perspective-taking: Evidence from eye movements	
Matthews	D	Perspective taking and language development: What can a two-systems account explain?	
Hamilton	A	Factors underlying visual perspective taking in children and adults with autism	
Kessler	K	Differently developed adults: Cultural similarities and differences in perspective taking mechanisms	
Apperly	I	Discussion	

Chair		Symposium Fri 3B	Room B
Elizabeth Shephard		Cognition in atypical development	
<p>This symposium will consider how a range of cognitive functions which are important in healthy child development, including cognitive control, learning, salience processing, social function and attention, are altered in children and adults with developmental disorders and how such differences can help us understand the core neurocognitive characteristics of these conditions. Findings of atypical cognition in Tourette syndrome, ADHD, autism spectrum disorders, and schizophrenia will be presented.</p>			
First author		Title	
Simeou	M	Atypical processing of face and eye gaze stimuli correlates with ASD symptoms in children with ADHD	
Dunn	S	Neural correlates of selective attention differ in those with high levels of autistic traits	
Palminteri	S	Reinforcement of motor skill learning in Tourette syndrome	
Liddle	E	Salience in schizophrenia and ADHD	
Shephard	E	Behavioural and electrophysiological correlates of cognitive control in children with tics with and without comorbid ADHD symptoms	

Friday 6 September 14:30 - 16:10 contd

Chair		Symposium Fri 3C	Room C
Vince Connelly		Influences on the writing processes of children who struggle with writing	
<p>This symposium brings together recent research on children who struggle with writing. Writing is a complex cognitive task requiring the integration of cognitive, linguistic and motor processes. Little research has been done to profile the problems experienced by different groups of children who struggle with writing. The set of papers in this symposium use a common theoretical approach, the “simple view” model of writing development, in their work (Berninger & Amtmann, 2003) to profile writing constraints. This will allow a cross study discussion of the value of the “simple view” to understanding problems with writing development.</p>			
First author		Title	
Sumner	E	Children with dyslexia: The influence of poor spelling on handwriting execution and pause behaviour	
Prunty	M	Handwriting speed in children with Developmental Coordination Disorder: Are they really slower?	
Critten	S	Morphological spelling abilities in children with language impairment	
Babayigit	S	Writing skills of learners who speak English as a first (EL1) and second language (EL2)	
Connelly	V	Discussion	

Chair		Symposium Fri 3D	Room D
Patricia Riddell		Component skills in language and literacy	
<p>Typical development of language and literacy requires that underlying component skills are sufficient to support these abilities. Yet often component skills and abilities are considered in isolation making comparisons difficult. This symposium brings together research addressing a number of component skills required for development of language and literacy in both typical and atypical development in order to provide a forum for cross-fertilisation across skills and disorders.</p>			
First author		Title	
Wydell	T	An fMRI study of visual attention span deficits in English speakers with compensated developmental dyslexia	
Tsakalaki	A	Identifying misspelling patterns: Evidence from UK elementary school pupils with and without dyslexia	
Schafer	G	Immediate auditory repetition of words and nonwords: An ERP study of lexical and sublexical processing	
Cunningham	A	Why is phonological awareness so important for early reading? An analysis of task demands	
Walter	K	The impact of oral language skills on lexical diversity in written texts	

Friday 6 September 14:30 - 16:10 contd

Chair		Oral Papers Session Fri 3E	Room E
Lucy Cragg		Maths and Number Awareness	
First author		Title	
Bull	R	Number-line estimation and mathematics achievement: Sources of individual differences	
Ang	S	Magnitude representation, working memory, and math achievement in Singaporean and British children	
Cowan	R	Number knowledge matters most: Explaining individual differences in primary arithmetic	
Lee	K	The influences of working memory, mastery and performance goals on mathematical performance	
Dowker	A	Linguistic and cultural effects on counting and number understanding: The case of Hong Kong	

Chair		Symposium Fri 3F	Room F
C Philip Beaman		Judgement and decision-making across the lifespan	
<p>While we do not expect young children to be able to reason according to rules of formal logic, we do expect children to form judgments and make decisions from a very early age – even if “serious” decisions, with substantial consequences, are ultimately made for them by adults. How does this adult capability come about? Is this capability preserved in older adults (who often also have responsibility taken from them)? Finally, how do we all (children and adults of all ages) address the problem of making decisions in an uncertain world, where information may be readily available but not always reliable.</p>			
First author		Title	
McCormack	T	Children who experience regret make better decisions	
Frosch	C	Time and intervention as cues to causal structure judgments in children and adults	
Christakou	A	Maturation of reward-driven decision-making in typical and atypical adolescent development	
Mata	R	Aging and risky choice in decisions from experience	
Beaman	P	Thinking – Fast or slow?	

Friday 6 September 14:30 - 16:10 contd

Chair	Symposium Fri 3G	Room G
Gaia Scerif	Interactions between developmental and adult cognitive psychology: Examples from attention and memory	
<p>Mechanisms of attention and memory play a central part in cognitive and developmental models. The interactions between the two fields represented at this conference have been and we hope will continue to be extremely fruitful. Through this symposium, we aim to illustrate how adult cognitive psychology can inform questions about the development of memory and attention. In turn, we also aim to discuss how developmental approaches can be informative for adult cognitive psychology research. We conclude with a call for even greater synergies across developmental and cognitive psychologists.</p>		
First author	Title	
Jarrold	C	The development of verbal short-term memory: Insights from, and implications for, adult models
Astle	D	Interactions between attention and memory in typically developing children and adults
Scerif	G	(How) does attentional control matter? The development of interactions with memory and learning
Cragg	L	The development of perceptual and response interference control in mid-childhood
Gathercole	S	Discussion

Don't forget the concluding Discussion!

17:10-17:50 in Room A

Professors Linden Ball, Sue Gathercole, Patrick Leman, Denis Mareschal, Mark Seidenberg and others will take questions from the floor on the possibilities for research in areas addressed during the meeting. Please join us for a stimulating discussion and debate.

Friday 6 September 16:10 – 17:50 Posters

No	First Author		Title
P1	T	Donova	Preschoolers' episodic future thinking skills
P2	C	Addyman	Dissociating voluntary and involuntary time expectancies in infancy
P3	C	Addyman	Evaluating a smartphone self-tracking application for people with Parkinson's Disease
P5	H	Gleeson	Effects of ageing on the rate of visual information processing: A time-accuracy function analysis
P6	J	Cane	The influence of urgency on perspective taking ability under working memory load: An eye-movement study
P7	K	Day	Semantic interference effects during rapid visual perspective-taking: An ERP study
P8	A	Carr	Minding the children: Mental state talk at 3 predicts behavioural adjustment at 10
P9	J	Cotney	Mind-Mindedness in an adult population: Appropriate (but not inappropriate) mental-state language relates to Theory of Mind understanding
P10	A L	Barreto	From adult mentalization skills to parental mind-mindedness: Is there an association?
P11	A	Petrou	The ADOS-C: A new outcome measure for autism intervention studies?
P12	T	Borbely	Inhibitory control is a prerequisite of cooperation in children with high-functioning autism
P13	D	D'Souza	Are early neurophysiological markers of ASD syndrome-specific? Preliminary results from a cross-syndrome study
P14	T	Farkas	Imitation and social engagement in children with and without autism
P16	A	Gillooly	Parenting predictors of child executive function and oppositional behaviour
P17	R	Davies	Can music improve pro-sociality and problem solving?
P18	L	Chen	The effect mechanism of social competence and sense-making coping on loneliness among migrant children in China
P19	L	Abell	Machiavellianism and peer interactions in the playground
P20	A	Dunn	Near or far away? A proximity and emotion, not size and emotion effect using Russian dolls
P21	A	Aznar	Emotion Talk: Parent-Child gender differences and children's understanding of emotions
P22	E	Costa Martins	Emotion recognition as social cognition: Is there a link with executive function?
P23	A	Aldercotte	'Hot' versus 'Cool': An exploration of how EF hangs together
P24	A	Blackwell	Methodological considerations when using technology for automated vocal analysis (LENA) with young children
P25	A	Blackwell	Characteristics of parent-child interactions: A systematic review of studies comparing children with primary language impairment (PLI) and their typically developing peers

Friday 6 September 16:10 – 17:50 Posters contd

No	First Author		Title
P26	P	De Fabritiis	Adults' knowledge of children's symbolic development, in typical and atypical conditions
P27	P	De Fabritiis	Interhemispheric transfer and pragmatic abilities in developmental dyslexia
P28	P	De Fabritiis	Adults' knowledge of risk and protective factors and possible remediation for developmental dyslexia
P29	E	Chatzispiridou	The relationship between the development of attention and foundation literacy skills
P30	E	Coyne	Longitudinal study of scaffolding errors and their impact on children's strategy choice in reading
P31	L	Cilibrasi	Reading difficulties highly correlate with cluster discrimination difficulties: Evidence from Italian
P32	T	Fosker	Examining the relationship between auditory temporal discrimination and phonological segmentation
P33	J	Ahmad	Examining Working Memory processing in developmental dyslexia across different modalities of memory. Evidence from signal detection theory, and EEG analysis
P34	M	Bukauskaite	The impact of early bilingualism on executive functioning and fine motor skills development
P35	P	Bretherton	Target and distractor processing in visual search: An event-related potential study
P36	S	Camp	Set size does influence Object Substitution Masking when the stimuli are digits
P37	M	Papera	A low-level saliency model to examine individual differences in Inattentional Blindness
P38	D	Crehan	Does a mindfulness intervention improve children's attention skills?
P39			<i>vacant</i>
P40	E	Blakey	How do two types of cognitive flexibility relate to working memory and inhibition in 2-4-year-olds?
P41	I	Fourrier	Inhibition and short-term memory: Which role in typical language development?
P42	F	Essig	Non-target utterances during verbal task switching: Evidence for a beneficial effect of overt rehearsal
P43	A	Gril	Understanding of group decision-making in adolescence
P44	M	Bangee	Examining the visual processing of lonely adolescents using eye-tracker methodology
P45	T	Georgiadou	Who has the priority for transplantation? Adolescents' moral reasoning on bioethical issues
P46	D	Edwards	Unsupervised categorization in a population with Traumatic Brain Injury
P47	C-H	Chen-Wilson	Do children jump to conclusions?
P48	M-C	Cioffi	Sense of agency: A vicarious agency illusion to unmask age-related differences
P49	L	Cragg	Cognitive control in solo and ensemble musicians
P50	A	Bussunt	Can navigational training improve facial recognition ability in developmental prosopagnosia

Friday 6 September 16:10 – 17:50 Posters contd

No	First Author		Title
P51	K	Friedlander	Fluid intelligence and cryptic crossword expertise
P52	S	Clayton	The effect of set size on non-symbolic comparison task performance
P53	N	Arias-Trejo	How visual controls affect children's performance on non-symbolic numerical comparison tasks
P54	A	Dowker	Mathematics attitudes, implicit and explicit anxiety and performance in an undergraduate sample
P55	S	Baker	Applying Bayesian change point analyses to developmental models and educational interventions
P56	P	Bhatarah	The effects of irrelevant speech, articulatory suppression and word frequency on free recall and serial recall
P57	C	Cortis	List length and output order effects in the immediate free recall of non-verbal stimuli
P58	C	Darnell	Children's handling of epistemic and physical uncertainty: Are children's guesses confident?
P59	E	Burton	Plasticity of cortical visual processing in atypical development: Evidence from congenital achromatopsia
P60	H	Alenezi	The effect of feedback on face matching accuracy

Abstracts, by first author surname

Up to six authors are listed.

Machiavellianism and peer interactions in the playground

Loren Abell¹, Pamela Qualter¹, Gayle Brewer¹, Alexandra Barlow², Peter Henzi³, Louise Barrett³

¹University of Central Lancashire, ²University of Manchester, ³University of Lethbridge

Machiavellian adults navigate through their social world with detachment, strategic planning (Christie & Geis, 1970) and protective self-monitoring (Rauthmann, 2011). Research has demonstrated that Machiavellianism influences adult romantic (Jonason & Kavanagh, 2010), platonic (Lyons & Aiken, 2010) and working (Chen, 2010) relationships. At present, few studies have considered the development of this 'dark' personality trait or the influence of Machiavellianism on children's social interactions. Furthermore, this research has not considered the influence of different levels of Machiavellianism on children's normative social behavior with peers in natural settings. This preliminary study fills that gap in our knowledge by investigating the influence of Machiavellianism on children's behaviour in a naturalistic playground environment.

Children (17 male, 16 female) age 9 to 11 years completed the Kiddie Mach (Christie & Geis, 1970) and were observed in their playground for a total of 39 recesses. Linear and quadratic regressions were then performed for overall Machiavellianism and the Kiddie Mach subscales (Lack of faith in human nature, dishonesty and distrust), separately by gender. Findings revealed that boys with extreme scores on lack of faith in human nature and dishonesty spent less time initiating positive interactions with their peers. Boys with extreme scores on the distrust subscale spent more time initiating negative interactions with their peers. Furthermore, girls with extreme scores on Machiavellianism and distrust were found to spend more time engaging in indirect aggression with their peers.

The results suggest that children who have high or low levels of Machiavellianism engage in negative behaviours that are detrimental to their peer relationships, although this is demonstrated differently for boys and girls. Possessing intermediate levels of Machiavellianism, however, may be beneficial for peer interactions. Future research needs to expand on this, focusing on the potential adaptive value of Machiavellianism in children's development and social relationships.

An online survey of baby laughter

Caspar Addyman

Birkbeck, University of London

This paper reports on the findings of the Baby Laughter project (<http://babylaughter.net>). A set of online questions for parents of children under 2½ years asked them about things which make their babies laugh. This is a strangely neglected topic in developmental psychology but one which could provide interesting new insights into infant development. By finding out what situations, people and events babies find most amusing and entertaining at different ages, we hope to learn about infants' social and emotional development.

Particular questions of interest include: What toys, games, sensations and interactions cause babies to laugh the most? How early does social laughter start? What (in parents views) are the primary causes of laughter in infancy? Do these change with cognitive development? In addition, parents were given the option to complete a temperament questionnaire (Under 1 year -Very Short Infant Behaviour Questionnaire, [IBQ - Gartstein and Rothbart, 2003], 1-2½ years Very Short Early Childhood Behaviour Questionnaire [Putnam, Garstein and Rothbart, 2006])

Over 500 parents completed the survey and of these around 320 also completed the optional temperament questionnaires. Results are still being collected and analysed but some early findings include first smiles commonly in the first month with first laughs around 3 months. However, first laughs showed a surprisingly wide age range (2weeks-8months). There was no difference in laughter to mother or father. Peek-a-boo was by far the most popular game to elicit laughter across all ages but there was a pattern that tickling and physical sensations dominate in younger ages while social games (chasing & clowning) were more popular with older infants. Parents saw laughter as having a wide range of causes and purposes (expression of happiness, communication, reaction to a surprise, response to other people laughing) but discounted other potential interpretations (release of tension, escape from fear, accompanying misbehaviour).

Evaluating a smartphone self-tracking application for people with Parkinson's Disease

Caspar Addyman¹, Bruce Hellman², Jon Stamford³

¹Birkbeck, University of London, ²uMotif Ltd, ³Cure Parkinson's Trust

Smartphone technology has the potential to empower and motivate patients with long term conditions, encouraging them to engage positively with the management of their conditions. It also presents an interesting new research platform for in-situ testing of cognitive performance. The current research evaluates a new app designed to help people with Parkinson's Disease, a group particularly impacted by the effects of their disease on their memory and motivation.

Methods: A randomized, double blind trial compared use of two smartphone apps over 2 months; a minimal app (MIN) which permitted self-tracking on 10 measures of symptom severity, mood and health behavior and a FULL app which also included medicine reminders, a physical assessment task (finger tapping) and two cognitive games (Numerical Stroop and 1-Back visual matching tasks) that user played daily.

Results: 26 patients took part (14FULL). Participants provided very positive feedback on the ease of use of the software and value of symptom tracking. Trial participants used the app for 55 days (mean), and entered data on at least 70% of days. Comparing the first and last 5 days, there were statistically significant increases in personal ratings of Energy, Water & Exercise (all $P_s < 0.05$) and marginal improvement in the Meds rating (0.15). There was marginal improvement in Sleep rating ($p < 0.07$) which was strongest in the FULL condition. Similarly, Mood improved for users in the FULL but not for MIN condition ($P < 0.08$). There were no significant changes in any of the Parkinson symptoms (Bradykinesia, Suppleness, Dyskinesia & Tremor). Analysis of finger tapping performance and cognitive games scores is still underway.

Conclusion: The tracker was used regularly by participants and gave some significant positive results that were not picked up by more traditional questionnaires, demonstrating the value of the uMotif tracker for research and as a monitoring tool.

Dissociating voluntary and involuntary time expectancies in infancy

Caspar Addyman, Sinead Rocha, Denis Mareschal

Birkbeck, University of London

Interval timing concerns our ability to judge, compare and reproduce time estimates for durations shorter than a few minutes. Previous research has shown that infants' time discrimination abilities improve between 6 and 10 months old (Brannon, Suanda and Libertus, 2007) and that physiological correlates of time discrimination can be detected in heart-rate variation at 4-months-old,

(Colombo and Richman, 2002) and event related potentials (ERPs) at 10-months-old (Brannon et al, 2008). However, no experiments have investigated interval timing ability directly in a task that actively engages the infants.

The present study used a 'peek-a-boo' animation in which a cartoon character popped up on the screen at regular intervals (every 3 seconds in one condition, 5 seconds in another) accompanied by a socially engaging sound effect (adult female voice addressing the infant). The infants saw 7 repetitions of this event then the screen remained blank for a further 6 or 10 seconds. This cycle repeated three times and a Tobii T120 eyetracker recorded gaze direction and pupil dilation.

We tested a total of 99 infants across the two timing conditions (3, 5 second) and in four ages groups (4, 6, 10, 14 months) Analysis of eyetracking data during the critical blank intervals suggest that, at all ages, there is a dissociation between voluntary and involuntary time perception. Analysis of the patterns of fixation showed that infants did not appear to actively anticipate the return of the character. However there were time locked changes in the infants' pupil-dilation. Pupil dilation has been shown to be a good measure of cognitive load in infants (Jackson and Sirois, 2009). In line with previous findings this suggests that infants have an involuntary/reactive awareness of timing.

Examining Working Memory processing in developmental dyslexia across different modalities of memory. Evidence from signal detection theory, and EEG analysis

Jumana Ahmad, Heather Ferguson, Howard Bowman

The University of Kent

The talk will present the results 4 experiments which have aimed to explore working memory processing in adults with developmental dyslexia, across different modalities of memory. The current set of studies employed the N-back task. The first two studies adopted visual presentation, and letters (experiment 1) or objects (experiment 2) were presented with a non-target: target ratio of 2:1. The first experiment demonstrated a main group upon WM processing, whereby dyslexic participants had significantly fewer hits at each level of N. However, their correct reject rate was comparable to controls. This was reflected in signal detection theory, whereby dyslexic participants adopted a significantly higher criterion than controls. This effect was unique to experiment 1. Thus, when letters were used as stimuli, dyslexic participants appeared to rely on strategic responses to maximise their overall accuracy.

In the second set of experiments auditory working memory was assessed using the N back task, with letters (experiment 3), and words (experiment 4) as stimuli. Words were manipulated by their Age of Acquisition (AoA). The non-target: target ratio was

2:1. Experiment 3 demonstrated a main effect of group, and $N * \text{group}$ interaction. Thus, in contrast to experiments 1 and 2, there was a significant main effect of group upon d' , but no effect upon the criterion. For experiment 3, there was a significant main effect of group on non-target performance, with dyslexic individuals displaying increased false alarms, and a marginally significant effect of group upon d' . AoA played a crucial role in reaction times (RTs), with shorter RTs for earlier learned words. Experiments 1-4 will be presented in terms of behavioural (Accuracy & RT), signal detection theory, and EEG data.

Early oral motor and gestural abilities and their relationship to preschool language abilities

Katie Alcock, Kirsty Krawczyk, Simon Connor
Lancaster University

Motor skills and nonverbal cognitive skills are related to developing language abilities, but it is often difficult to separate the two - in infancy, motor skills can be challenging cognitively, and nonverbal cognitive abilities are often tested using manipulation of objects. Hypotheses concerning the relationship between motor abilities and language development have included links via mirror neurons, a common symbolic origin to language and gesture, and that pre-linguistic gesture or motor abilities may boost language development either by enhancing communication or by providing opportunities for exploration and learning. However, most previous studies have looked at the links between limb motor abilities - primarily gesture - and spoken language abilities. Since most language users speak with their mouths, it is important to examine the contribution of oral motor abilities.

Previously we examined concurrent links between motor abilities and spoken language development in English-learning infants ($N = 129$) at 21 months. The strongest link was between oral motor and language abilities, with no independent link between language and gestural abilities. However, early limb gesture abilities (21 months) were found to predict later language abilities (36 months) in addition to the predictive value of oral motor abilities.

Here we examine the influence of language and motor abilities at earlier ages (21 months and 36 months) on the same set of abilities at 48 months, in the remaining 68 children.

While early language abilities predict later language abilities, and early motor abilities also predict later motor abilities, associations between motor abilities and language abilities were stronger in concurrent (48 months) data than longitudinal analyses.

We conclude that both oral motor and gestural abilities are important for developing language, but may form a limitation on each stage of language development. We discuss the pattern of association

seen at each stage in terms of motor-language theories.

Observing toddlers' social-emotional competence: The validity and predictive value of the MPAC-R/S

Amanda Aldercotte, Claire Hughes

University of Cambridge

Children who possess a toolkit of social skills, like sharing and taking turns, as well as an ability to regulate their emotion have been shown to experience more academic success, social satisfaction, and mental health later on (Tremblay, 2000; Vitaro et al., 1990). Current research on the emergence of social-emotional competence (SEC) lacks an observational measure that can reliably detect its various components and be easily implemented by researchers, clinicians, and educators alike. The goal of the current study was to explore the utility of the Minnesota Preschool Affective Checklist - Refined/Shortened (MPAC-R/S; Denham et al., 2012) in observations of 2-year-old children with a peer ($n = 104$) in order to determine its utility with younger children and its predictive utility for examining ongoing social-emotional development. Analyses revealed 3 components that paralleled those found in previous research (Denham et al., 2012). These components behaved in an expected manner with regard to: (1) gender, e.g. girls were more likely to regulate their emotions and be less aggressive; (2) social disadvantage, e.g. lower socioeconomic status was negatively related to emotion regulation; and (3) concurrent caregiver-reports of SEC. The emotionally-positive/prosocial/productive component corresponded to caregiver ratings of being prosocial and having fewer peer problems while the emotionally-unregulated/aggressive component was related to conduct problems. Although the components showed expected relations to later caregiver reports of SEC at age 6 for boys, e.g. being unregulated/aggressive and emotionally negative at age 2 predicted conduct and emotion problems at age 6, respectively, an interesting pattern emerged for girls. Unregulated/aggressive behaviour at age 2 predicted greater emotion problems at age 6 while being positive/prosocial in toddlerhood related to later ratings of hyperactivity. Taken together, these results support the use of the MPAC-R/S in measuring toddler's emerging SEC and underscore the importance of exploring the various pathways associated with social-emotional development.

'Hot' versus 'Cool': An exploration of how EF hangs together

Amanda Aldercotte¹, Aysha Foster², Zewelanni Serpell², Teresa Parr³, Michelle Ellefson²

¹University of Cambridge, ²Virginia State University, ³Ashley-Parr, LLC

A number of studies distinguish between 'hot' and 'cool' components of executive function (EF) as they

differentially relate to other cognitive abilities, childhood disorders, and developmental outcomes (Dawson et al., 1998; Dinn et al., 2001; Kim et al., 2013; Willoughby et al., 2011; Zelazo & Müller, 2002). Despite this support for a heterogeneous model of EF, other studies fail to find evidence of distinct 'hot' and 'cool' factors (Allan & Lonigan, 2011; Sulik et al., 2010; Weibe et al., 2011). To examine which approach to defining EF may be of more use, the current study compared the fit of various heterogeneous and unidimensional models a sample of 9- to 11-year-old children. As part of an ongoing investigation of the cognitive benefits of an after school chess program, participants completed four computer-based 'cool' EF assessments (inhibition, working memory, and attention flexibility) and a gambling task that indexed 'hot' EF abilities (affective decision-making). Confirmatory factor analyses in Mplus revealed that including a variety of tasks deemed to tap 'cool' EF skills into a model did not yield an accurate portrayal of the individual differences observed in children's actual performance. Although this model met goodness-of-fit indices cut off values (CFI = 1.00; TLI = 1.243; $\chi^2 = 1.15$, $df = 2$, $p = .562$), the model did not significantly account for the variance seen in observed EF scores ($\beta = 806.45$; $SE = 626.03$, $p = .198$). Including a 'hot' EF tasks did not significantly improve the variance accounted for by this latent factor, suggesting that the variability seen across different types of EF tasks may not be due to a unified underlying advantage or deficit in executive abilities. These results have implications for guiding task selection for future research tapping the components of EF.

Inner speech predictors of self-esteem, dissociation and hallucination-proneness in a student sample

Ben Alderson-Day, Charles Fernyhough
Durham University

Inner speech, or verbalized thinking, has traditionally been linked to psychopathology in terms of specific cognitive biases or habits such as rumination. However, the form and content of inner speech can vary considerably, and may play a key role in the development of psychosis and mood-based disorders.

The present study investigated the relationship between inner speech and a) proneness to auditory hallucinations, b) dissociative experiences, and c) self-esteem in a sample of 156 undergraduate students. Participants completed an online schedule including the Varieties of Inner Speech Questionnaire (VISQ; McCarthy-Jones & Fernyhough, 2011), a revised version of the Launay-Slade Hallucination Scale (Morrison et al., 2000), the Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986) and the Rosenberg Self Esteem Scale (Rosenberg, 1965).

The VISQ provides an index of various characteristics of inner speech, such as dialogicality, evaluative content, condensed structure and the presence of other people. Hierarchical regression analysis indicated that evaluative tone and the presence of other people in inner speech uniquely predicted hallucination proneness. Frequency of dissociative experiences and global self-esteem were also predicted by evaluative inner speech.

Finally, dissociation and self-esteem scores were added to the predictive model for hallucination proneness: when this was done, scores for the DES, condensed inner speech, and other people in inner speech were related to hallucinations. This suggests that specific characteristics of inner speech play a unique role in understanding of auditory hallucinations, independently of associations with dissociation and self-esteem.

The effect of feedback on face matching accuracy

Hamood Alenezi, Markus Bindemann
University of Kent

Face matching refers to the process by which an observer has to decide if two simultaneous presentations of a face, such as a pair of photographs, belong to the same person or different people. This task can be surprisingly difficult when different pictures of unfamiliar faces, which are unknown to an observer prior to the task, are shown. Considering this difficulty, a question that arises is why observers continue to make errors in this task. A possible explanation is that we rarely receive feedback on our accuracy in the identification of unfamiliar people in real life. In this study, we therefore sought to examine the role of feedback in face matching directly, to determine if this could improve performance. In a series of six experiments, observers were either given feedback on their face-matching performance or not. To determine whether any feedback effects generalize, performance was then assessed with faces that had been seen previously with or without feedback, and for completely new faces. The results show that feedback can prevent a decline in face matching accuracy, whereby observers find it increasingly difficult to tell different facial identities apart over the course of a face-matching task when no feedback is given. However, the specific type of feedback that is administered is crucial for maintaining face-matching accuracy. The implications of these findings are discussed.

Primacy/recency effects in infant categorisation

Nadja Althaus¹, Valentina Gliozzi², Julien Mayor³,
Kim Plunkett¹

¹University of Oxford, ²Università degli Studi di Torino, ³University of Geneva

We present converging evidence from computational modelling and experiments with infants highlighting the importance of familiarization contingencies in the process of

category formation. While Mather & Plunkett (2011) demonstrated the impact of familiarization presentation order, we argue that specifically primacy/recency effects influence how 10-month-olds organize sequentially presented stimuli. This contradicts the traditional view that the abstract category representation formed during familiarization represents all stimuli equally.

New simulations from a self-organizing map model of category formation in 10-month-olds (Gliozzi et al., 2009) predict that novelty preference is in fact driven by a primacy/recency effect. Initial observations indicated that initial/final stimuli influenced categorization in the model. Training sequences were therefore constructed systematically such that the first and last stimuli were either close to the category average (“mild” start/end stimuli) or distant from it (“extreme”). Manipulating start/end stimuli as well as average Euclidean distance, which Mather & Plunkett (2011) had found to have a large impact on category formation in infants, we obtained the following combinations of average distance and start/end stimuli: High / Mild, Low / Mild, High / Extreme, and Low / Extreme.

After training with “mild” sequences, the model’s “novelty preference” for a peripheral test stimulus over the category average was higher than after training with “extreme” sequences, an effect that was stronger than other sequence-related effects.

Ten-month-old infants (N=104) were subsequently familiarized with sequences in the same four conditions, and presented with the same test trials. Infants’ novelty preference scores on test reflected the model’s prediction: an ANOVA with factors Distance and Start/End stimulus revealed only a main effect of Start/End stimulus ($F(1,92)=6.242$, $p=.014$), and only infants in the “mild” conditions exhibited novelty preference.

This finding implies that, in contrast to common assumptions about familiarization, 10-month-olds’ novelty preference responses can be heavily influenced by primacy or recency effects.

Infant categorisation in the presence of labels – An instance of cross-modal learning?

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Several studies have provided evidence that verbal labels facilitate visual category formation in infants between 6 and 12 months (e.g. Waxman & Markow, 1995; Fulkerson & Waxman, 2007; Ferry et al., 2010). However, this finding is controversial, as contradicting results of auditory overshadowing in the presence of labels have also been reported (Robinson & Sloutsky, 2007). Moreover, how exactly labels interact with visual processing is unclear. On the one hand, some researchers argue that infants have an expectation for labels to refer to object categories, providing a top-down mechanism for grouping objects (e.g. Waxman & Gelman, 2009).

On the other hand, it has been hypothesised that labels act as features, increasing similarity between category exemplars (e.g. Sloutsky et al., 2001).

Combining findings from computational modelling and eye tracking studies with infants, we will present a view that emphasizes the label’s role as a signal in a different modality. Simulations with a computational model of word and object learning show that cross-modal signals are superior in terms of informativeness: Being independent from visual features on a sensory level, labels provide an external source of information, allowing them to play a role in the structuring of visual representations.

In a series of eye tracking studies, we further demonstrate that infants’ processing of labels and objects depends on the temporal characteristics of stimulus presentation. Synchronous presentation increases cognitive load and appears to cause infants to exhibit an extended period of familiarity preference, whereas asynchronous presentation does not appear to interfere with processing. This result highlights the importance of a view of word-object integration as an instance of cross-modal processing, as it highlights the relevance of online interactions between visual and auditory/linguistic processes.

The status of object labeling as a cross-modal event – differences and similarities to other types of audiovisual events – will be discussed.

Children’s comprehension monitoring: How task factors influence performance

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We investigated 7- to 10-year-olds’ ability to monitor their comprehension whilst reading short stories by recording reading times and responses to a sense question (i.e. did the story make sense). The stories were presented sentence by sentence on a computer screen, and some of the stories contained errors. There were two error types: a violation of general knowledge or an internal inconsistency (two sentences containing contradictory information). Children also received two types of instruction: reading for meaning, in which children were told to read carefully in order to answer a question about each story, or reading for sense, in which children were told that the stories might contain errors. Older children were better at identifying that a story did not make sense than younger children, and this was particularly true when the errors were violations of general knowledge. For both age groups, the presence of an error increased the reading times of the critical sentences, indicating detection of errors and, therefore, that comprehension monitoring had taken place. However, this effect was mediated by task instructions: a significant increase in reading times was found only when children were alerted to the presence of errors. These findings illustrate that

both error types and task instructions influence the online comprehension monitoring process and that this skill is still developing in 10-year-olds. Further, it is suggested that the provision of instructions that alert the reader to the presence of potential errors in texts may encourage them to read for sense, and thereby facilitate their engagement in constructive processing.

Screening for motor difficulties in children using sophisticated kinematic measures and the effects

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Children with movement problems such as Developmental Coordination Disorder (DCD) typically lag behind their peers in mastering everyday tasks like dressing and writing legibly. Difficulties with such fundamental skill can subsequently have a huge impact on a child's development, with children with DCD being shown to be significantly more likely to perform poorly academically, be more anxious and depressed and less physically active.

Test batteries for formally diagnosing coordination problems in children exist but are too time consuming to be used for population-level screening programmes; they are also limited in detail and rely partially on administrators subjectively scoring how well participants perform. In response to these inadequacies our research group developed an innovative software platform (the Clinical Kinematic Assessment Tool [CKAT]) that runs on portable tablet computers and presents brief test batteries capable of recording high resolution, accurate measures of children's manual dexterity. Alongside this we have built a measure of children's balance and postural stability, based on Nintendo Wii balance-board technology, and in combination these tools provide quick (~12 min), objective and detailed measures of a child's fine and gross motor control.

We will present data on the large normative dataset already collected for CKAT and also analyses of the concurrent-validity between CKAT and more traditional assessments of motor coordination such as the Beery Visuo-Motor Integration test, movement ABC and DCDq questionnaire.

Finally, CKAT's recent adoption for use by the Born in Bradford (BiB) longitudinal birth cohort study, as one of the core measures within their routine reception-year screening programme, will be discussed. This project means that every consenting child in reception year schooling in Bradford over the next four years will perform the CKAT battery (n~13,500), alongside a series of further standardised assessments measuring important educational (early literacy) and health outcomes (child mental health, vision).

Magnitude representation, working memory, and math achievement in Singaporean and British children

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Studies have found that children who are more accurate in making magnitude discriminations have higher mathematical achievement (e.g., De Smedt, Verschaffel, & Ghesquiere, 2009). However, markers of math ability may change during development; being able to discriminate magnitudes may enable learning of basic numerical skills, but may be unimportant for later complex mathematical skills. Domain general skills (e.g., working memory) may provide a better marker of math achievement in older children and at higher levels of mathematical proficiency. This research examines the unique and shared roles of working memory and magnitude discrimination in children's mathematical ability. Additionally, in collaboration with colleagues at the University of Cambridge, we seek to determine whether Singaporean children's mathematical skills are predicted by different factors compared to UK children. The hypotheses tested are a) magnitude discrimination will be more important for math achievement in younger than older children; b) this relationship will be stronger for British compared to Singaporean children, the latter having better developed mathematical skills; c) domain general skills will be more important for math achievement in older than younger children; d) this relationship will be stronger for Singaporean compared to British children, the former being involved in more complex and advanced mathematical skills. The children completed a battery of tasks assessing math, reading, intelligence, working memory, and magnitude discrimination. Data collection is ongoing. However, preliminary analysis of the Singapore data (N = 152; 80 boys; mean age in months: 80.6 (Primary 1), 92.5 (Primary 2), 104.7 (Primary 3)) show that accuracy scores for the non-symbolic magnitude discrimination task are significantly correlated with math achievement scores for the younger children (Primary 1 and 2) but not the older children. Results will be discussed in terms of the role of the approximate number system and working memory in math achievement at different developmental points.

Comprehension of temporal and causal connectives: A comparison between hearing and deaf poor readers

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Both hearing and deaf poor readers show specific difficulties in integrating textual information into a mental representation (e.g. Cain et al., 2001; Banks,

Gray, & Fyfe, 1990). For hearing poor readers, these difficulties have been generally attributed to a specific cognitive deficit in establishing relations between sentences (Cain, 2003), i.e. inference making. For deaf readers, reading comprehension problems have been typically attributed to limits in processing complex sentences with subordinate conjunctions (Sullivan et al, submitted). In two experiments, we compared hearing and deaf poor comprehenders' understanding of temporal and causal relations between sentences expressed by specific connectives and by the generic connective "and".

One hundred and forty-two Italian children aged between 7 and 11 years took part in the: 38 hearing poor readers (PC, $M_{age} = 8.66$), 81 hearing good readers (GC, $M_{age} = 8.35$), and 23 deaf poor readers (DC, $M_{age} = 9.03$). The three groups were matched for age and word reading ability. In experiment 1, children were required to comprehend sentences expressing causal and temporal relations by specific connectives (*before, after, while, because, so, therefore*). Twenty-four items were presented, which included a picture describing an event and three sentences differing only in their connectives. Children had to choose the sentence that best matched the picture. Experiment 2 tested whether children's understanding of causal and temporal relations between sentences was facilitated by the use of a generic connective (*and*). The experimental task was a revision of the task used in experiment 1, in which the items always always sentences with "and" among the choices. The results suggest that, differently from DCs, PCs do not show a general limited capacity to elaborate subordinate conjunctions, but may have a more specific problem with the elaboration of some relations that are cognitively more demanding for good comprehenders too (i.e. temporal relations).

How visual controls affect children's performance on non-symbolic numerical comparison tasks

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In current years, it has been proved that humans are able to compare quantities from a very early age (Izard, Sann, Spelke, & Streri, 2009). The most common task to evaluate this ability in children has been through non-symbolic numerical comparison tasks (Halberda & Feigenson, 2008); although, there have been some efforts to standardized the visual controls used in these tasks (Halberda, Mazocco, & Feigenson, 2008), researchers still use different visual controls (Rousselle, Palmers, & Noël, 2004; Wagner & Johnson, 2011). The main goal of the present study is to explore how the usage of different visual controls (density, total surface area, and correlated and anti-correlated control) affects children's performance in these tasks. Seventy-six

preschoolers participated in the current study. Children performed two tasks: 1) A non-symbolic numerical comparison task in which children were asked to point at the set with more geometric figures when two sets were displayed on a screen. Children saw one of the three visual controls: density, total surface area, or correlated and anti-correlated area. 2) An assessment of children's number knowledge by means of the Give a Number task (Wynn, 1990, 1992). The results suggest that children perform differently in the three different visual controls, being density control the easiest, and the correlated and anti-correlated control the hardest. How this outcome helps to explain conflicting findings from previous research, and how this relates to children's number knowledge is discussed.

Is pictorial development modality-specific? Evidence from children's understanding of photographs and drawings

Emma Armitage, Melissa Allen

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Photographs and drawings possess unique properties, and it has been suggested that comprehension of these two forms of pictorial representation require divergent skill sets. Artists are free to distort the world or depict imaginary entities, whilst photographers depict the world in a veridical manner as a result of the mechanical constraints on the modality. Photographs are also created more quickly than drawings, and are easier to produce. We used a forced-choice question paradigm to investigate 4-8-year-old children's ($N=128$) understanding of the distinction between photographs and drawings. Initially, children were introduced to two puppets, an artist (Jack) and a photographer (Luke). To ensure they could identify the puppets and type of picture they create, children were asked to match 4 pictures (2 photographs and 2 colour drawings) to the correct puppet. Following this, children were asked ten questions of the format "I want a picture of [subject matter]. Who could make me that picture, Jack or Luke?" The artist was the correct answer to five of the questions, and the photographer was the correct answer to the remaining five questions. These questions were intended to address children's understanding of three broad topics: 1) the ability of artists (and inability of photographers) to depict absent or non-existent entities, 2) the enhanced realism of photographs compared to drawings, and 3) the necessary skill level of artists and photographers. Overall, children demonstrated a more sophisticated knowledge of photographs than drawings, for instance, correctly inferring that a photographer can produce a picture faster than an artist. An understanding of both modalities increased with age; 6-, 7- and 8-year-olds performed similarly yet significantly better than 4- and 5-year-olds. Between the ages of 4 and 8 there is a clear development of pictorial reasoning and individual

question analyses indicate a different developmental trajectory for photographs and drawings.

Japanese-English Bilinguals' words retrieval process analysed by clustering and switching components in Verbal Fluency Test

Keiko Asano

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This study investigated how different English-Japanese bilinguals and Japanese L2 learners of English orally produce words from their native languages aspects of process of clustering and switching in Verbal Fluency Test. This task is commonly used in clinical and neuropsychological assessments for checking language development and frontal lobe function. As for the assessment for lexical capability, the Test was applied and conducted to English-Japanese bilingual speakers and Japanese L2 learners of English. The Test is consisted on two different tasks: phonemic and categorical sections. As for phonemic verbal fluency test, the participants were to produce orally as many different words as possible beginning with the given letter such as "S" within a minute. In the categorical one, assigned item's names such as "animals" were asked to produce also within a minute. In this study, in order to examine the qualitative words production process more precisely, clustering (the production unit of words within phonemic or categorical sequence) and switching (the ability to shift efficiently to a new phonemic or categorical word), which Troyer and Moscovitch (1997) proposed were adopted to analyze as the important components of fluency performance. As for the number of times clustered, bilingual speakers produced larger when produced in English, and use different words retrieval process compared with L2 learners of English. Even in the clustering in Japanese as native language, both of groups retrieved the words followed by different clustering phonemic characteristics. Moreover, it was interestingly observed that some speakers were even used their categorical clustering during the production of phonemic performance. Overall, these two components are less correlated with the number of words generated on the phonemic fluency test. The further studies will be focused on how the different brain area is activated when the words are clustered and switched to generate among the different speakers.

Interactions between attention and memory in typically developing children and adults

Duncan Astle

MRC Cognition and Brain Sciences Unit, Cambridge

In recent years research on attention and memory, both in the cognition and neuroscience literatures, has seen a rapid advancement in our understanding of their common and separate mechanisms in adulthood. This is partly due to some very elegant

cognitive science; new and novel paradigms have enabled researchers to explore with much greater precision the mechanisms that underlie these processes. Furthermore, researchers in the adult neuroscience literature have developed a wide repertoire of techniques enabling them to explore how the neural systems responsible for attentional control interact with memory representations, during maintenance and at retrieval.

In this talk I will discuss how we are adapting these techniques and approaches for explaining memory performance during development, and, in particular, to explain variability in memory performance in childhood. This includes work using behavioural techniques, such as cueing studies, to demonstrate the role of spatial attention in memory maintenance. The work also includes electrophysiological scalp recordings, demonstrating the role of attention in memory retrieval. Finally I will discuss our work utilizing magnetoencephalography, exploring the neural networks that underpin the interaction between attentional control and memory in childhood, and how these more advanced neuroimaging techniques enable us to implicate the role of attentional control mechanisms in memory performance more directly.

Emotion Talk: Parent-Child gender differences and children's understanding of emotions

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Parent-child emotion talk contributes to children's emotion understanding (Kuebli & Fivush, 1992). Indeed, research shows that how well a child understands emotions is influenced by the frequency that his or her mother talks to him or her about emotions. Specifically, the more a child talks about his or her emotions with his or her mother, the better understanding of emotions he or she will acquire (Dunn, Brown, & Beardsall, 1991). Extensive research has analyzed gender differences in mothers' emotion talk. In contrast, research on father-child emotion talk is still scant. The analysis of father-child emotion talk has become especially relevant as fathers have become more active in children's education over recent years. This study examined sixty-three Spanish mothers' and fathers' emotion talk with their 4 (M = 53.35 months, SD = 3.86) and 6-year-old (M = 76.62 months, SD = 3.91) children (30 girls and 33 boys), during a play-related storytelling task and a reminiscence task and its relation with children's understanding of emotions as measured by the Test of Emotion Comprehension (TEC). Parent-child interviews took place in the participants' own homes. On the first visit, the mother or the father and the child completed a storytelling task and a reminiscence task. Within a minimum of one day and a maximum of seven days, the other parent and the child completed the same two tasks. Children completed the TEC twice once during the first home visit and the second time six

months later. Findings indicated that mothers and fathers talked similarly about emotions. Specifically, they mentioned more emotion words with their daughters than with their sons, especially about happiness. Mothers' use of emotion labels during the play-related storytelling task predicted children's emotion understanding, whereas fathers' use of emotion explanations during the reminiscence task predicted children's understanding of emotions. These findings imply that mothers and fathers might have a distinct influence in children's socialization of emotions.

Writing skills of learners who speak English as a first (EL1) and second language (EL2)

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University of the West of England

The rate of learners who do not speak English as their first language has been increasing steadily in the UK and according to the recent estimates, there are about one million school age children who speak English as a second language (EL2) (Statistical First Release [SFR], 2012). However, there is a significant gap in our current understanding of the writing development of this increasing population of minority language learners at schools. This is all the more important given the reports of EL2 attainment gap on the national curriculum tests of writing (SFR, 2011, 2012). The present study sought to address this issue and examined the role of word-level (i.e., spelling and word reading) and verbal skills (i.e., vocabulary, verbal working memory, and semantic fluency) in writing levels of EL2 learners and their native English-speaking peers (EL1). The sample was composed of 168 EL1 and EL2 learners ($M = 115.38$ months, $SD = 3.57$) and all testing was conducted in English. The two language groups performed on a par on the measures of word-level skills but there was a significant EL1 advantage on the measures of writing quality and verbal skills. This finding confirmed the previous reports on EL1 and EL2 learners (e.g., Cameron & Besser, 2004) and suggested that even when the duration of formal schooling in English and the group differences in socio-economic status were taken into account, more EL2 learners tended to underperform on the measures of writing quality. Results from the multi-sample structural equation modeling analysis also indicated that the word-level and verbal skills made independent contributions to the writing quality levels of EL1 and EL2 learners and the strength of these relationships was invariant (equivalent) across the two samples. Findings underscored the importance of targeted educational support for children from minority language backgrounds.

Applying Bayesian change point analyses to developmental models and educational interventions

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When it comes to learning and development, group averages can only tell us so much. In this talk we'll demonstrate how individual performance records can be evaluated with Bayesian statistics (using a change point analysis in MatLab or WinBugs; Baker, Leslie, Gallistel & Hood, under revision). Bayesian statistics are used more and more to model cognitive change and multiple schools of thought are emerging (Goodman, et al, 2011). Our approach uses Bayesian statistics to locate 'tipping points' in individual curves and to examine what might bring these about.

We will illustrate what the Bayesian change method has to offer the study of cognitive change using data from observations and interventions on preschoolers' theory of mind and folk physics development in two different countries ($n=108$). In a first wave of studies, we simply observed the natural developmental time course of basic cognitive abilities. In a second wave of studies, we included an intervention phase, extending the Bayesian change point method to evaluate the effectiveness of an intervention. Near and far transfer of trained and untrained abilities were explored. This analytical method encourages more precise, testable predictions in our theoretical models, as well as individually tailored applications within educational contexts.

Examining the visual processing of lonely adolescents using eye-tracker methodology

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University of Central Lancashire

A recent model of loneliness (Cacioppo & Hawkley, 2009) proposes that loneliness is associated with hyper-vigilance to social threat. The current study examined this assumption in lonely adolescents using eye-tracker methodology. Visual attention was recorded for (1) emotional faces, (2) IAPS pictures, and (3) Faces in the crowd stimuli. Curvilinear analyses found the following: (1) no association between loneliness and attention to emotional faces, specifically to angry and afraid faces, suggesting that lonely adolescents are not hyper-vigilant to negative emotional information when displayed as facial expressions; (2) quadratic regression analyses found a quadratic relationship between loneliness and attention to social threat in emotional pictures of social scenes (linked to rejection stimuli), with lonely adolescents fixing their attention on the social threat stimuli in the first four seconds of viewing time and over the extended period of viewing time; and (3) no association between loneliness and attention to

face in the crowd stimuli, where the ratio of angry faces increased. These effects were found when depression and social anxiety were controlled in the analyses. The findings from the studies converge to show that lonely adolescents do not show a hyper-vigilance to negative emotional information, but show a specific attentional bias to social threats linked to rejection stimuli.

Emotion, rearing experiences, and joint attention in human and chimpanzee 1-year-olds

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The prototypical form of infant social cognition is joint attention, in which infants coordinate attention to a social partner with attention to an object or event. Current theories on the evolution of primate social cognition ignore the possible influences of emotion and rearing experiences. We observed human infants (with 3 different cultural experiences: from Western urban, Subsistence farming, and Hunting/gathering societies) and chimpanzee infants (with 4 different rearing experiences: Zoo, Enriched Laboratory, Wild, and Human-raised) in their everyday settings, at 1 year of age, to document the role of experiences on joint attention. Human and chimpanzee infants engaged jointly with someone about an object or event at equivalent rates (3.8 times per minute). We found no significant species difference in motivation to engage jointly with social partners: rates of infant-initiated joint engagement were equivalent in the human and chimpanzee groups (1.9 times per min). Interestingly, in three of the groups (Western and Farming humans, and human-raised chimpanzees) joint engagement was more often about objects. In the Hunting/gathering humans, and all group-living chimpanzees, joint engagement was more often about social events. Positive emotion from social partners during joint engagement (encouraging, entertaining, or with positive facial or vocal expressions) was significantly higher for infants living in groups that focussed more often on objects (65% of engagements were surrounded with positive emotion) than for infants living in groups focussed more on social events (46% of engagements were surrounded with positive emotion). There was significant variation among the human groups and among the chimpanzee groups: We could not identify any differences attributable to a 'main effect' of species. In building evolutionary scenarios, therefore, we must be mindful of the significant impact of socio-emotional settings on developing social cognition.

From adult mentalization skills to parental mind-mindedness: Is there an association?

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Literature on mentalisation skills often mentions other constructs, such as mind-mindedness (Meins, 1997), without, however, clarifying their relationship. In fact, mind-mindedness defined as parents' understanding of their children as mental agents, is seen by some authors as an operationalization of mentalisation (Sharp & Fonagy, 2008), but as a distinct ability by others (Meins, Harris-Waller, & Lloyd, 2008). Moreover, few studies have examined factors which may account for the reported individual differences on mentalisation and mind-mindedness.

This poster aims to: 1. Analyze if and how parental mentalisation and mind-mindedness are related; 2. Explore socio-demographic correlates of mentalisation and mind-mindedness; 3. Investigate whether mothers' and fathers' mentalisation and mind-mindedness differ.

Seventy-one mothers ($M_{\text{age}} = 36.54$, $SD = 3.39$) and 68 fathers ($M_{\text{age}} = 38.57$, $SD = 6.19$) participated in this study. Parents' mentalisation skills were assessed using the Visual Jokes Task (Corcoran, Cahill, & Frith, 1997) and their mind-mindedness using the Describe your Child Interview (Meins, Fernyhough, & Russell, 1998).

Maternal mentalisation was significantly associated to maternal mind-mindedness, $r_s = .26$, $p = .038$, indicating that mothers with more mentalising abilities used more mental attributes when describing their children. No such association was found for fathers.

Both mothers' and fathers' mentalisation were positively associated to their education level, $r_s = .28$, $p = .022$ and $r_s = .25$, $p = .046$, respectively. No significant associations were found between maternal and paternal mind-mindedness and socio-demographic variables.

Mothers and fathers did not significantly differ on either mentalisation or mind-mindedness.

Although mothers and fathers did not differ in their degree of mentalisation and mind-mindedness, it is curious to note that maternal, but not paternal, mentalisation is reflected in the way mothers describe their children. These discrepant findings bring further understanding on the links between parents' mentalisation and how they represent their children as mental agents.

Aberrant scanpaths follow normal biases for facial expression in developmental prosopagnosia

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Developmental prosopagnosia (DP) is a cognitive condition characterized by a severe and permanent difficulty in face recognition that occurs in the absence of neurological injury. Recent work has used eye movement technology as a means to examine actual processing strategies in DP, and reported reduced attention to the inner facial features with a particular avoidance of the eye region. However, it is unclear whether these unusual patterns of scanning are a fixed characteristic of the condition, or whether they still follow the expected trends for non-identity aspects of face processing. Indeed, previous work reports different patterns of feature exploration for happy, sad and neutral expressions, characterized by greater attention towards the mouth for happy faces but more time studying the eyes for sad faces. The current study adopted this paradigm, and nine participants with DP and 18 matched controls free-viewed a set of 36 faces displaying the three expressions. While the DP participants spent less time on the inner features than controls regardless of facial expression, they still demonstrated two key trends akin to those observed in the control participants. First, they spent more time viewing the inner features of happy compared to sad or neutral faces. Second, analysis of a dominance ratio (i.e. the length of time spent studying the eyes and mouth in relation to the rest of the face) indicated that all participants spent more time looking at the mouths of happy faces but the eyes of sad faces. These findings suggest that the avoidance of the inner features noted in DP is not absolute, and also provide evidence for independent developmental trajectories for different aspects of face processing.

Found in translation: The conceptual basis of semantic auditory distraction in immediate recall

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English monolinguals and proficient Welsh-English bilinguals were visually-presented with lists of target items to recall in English, drawn from a single semantic category. To-be-ignored lists of auditory distracters, drawn from either the same category or semantically unrelated category, were presented in either English or Welsh. For Welsh-English bilinguals, a semantic auditory distraction effect from distracters taken from the same category as the targets was shown by lower correct recall of targets and higher false recall of distracters, regardless of whether distracters were English or Welsh. These results show that, regardless of language of origin, auditory distracters are processed to a conceptual, rather than an exclusively lexical, level and

processed to this level automatically, regardless also of the language of primary task. A multinomial processing tree model suggests that the semantic distraction effect may operate by blocking or corrupting a secondary retrieval process, indicating a possible role for speech production processes in free recall.

Thinking – Fast or slow?

Philip Beaman, Philip Smith

University of Reading

It is generally agreed that much of judgment and decision-making is heuristically driven. Controversies arise over exactly how much, whether this is a good or bad thing (heuristics and biases (Kahneman & Tversky, 1974) vs. fast and frugal heuristics (Gigerenzer et al., 1999) approaches) and – to a lesser extent – whether the heuristic is the strategy-of-choice or a counsel of despair. We argue that determining whether a given heuristic is the first- or last- choice strategy is actually informative in resolving the former two issues. Taking the example of a particular heuristic – the recognition heuristic (Goldstein & Gigerenzer, 2002) – we outline a means by which the order in which strategies are implemented can be assessed. This procedure is potentially applicable to other strategies (e.g., the fluency heuristic) and to different population groups (including different age-ranges). Determining, on an individual basis, the order in which different decision-making strategies (heuristic or otherwise) are considered informs the extent to which they are used and the subjective confidence exhibited by participants in whether such strategies are the most appropriate or not for any given environment or “cognitive niche”.

The “crossed feet effect”: The external frame of reference for touch emerges between 4 and 6 months of age

Jannath Begum Ali, Andrew Bremner

Goldsmiths, University of London

The “crossed-hands effect” (a deficit in the localisation of tactile stimuli to the hands when they are placed in less familiar postures) has been argued to arise due to conflict (when the hands are crossed) between the anatomical and external frames of reference within which touches can be perceived. It has therefore been identified as a means of determining whether infants and children are able to localise touches in external space. Previous studies have shown that infants as young as 6 months of age are able to use an external reference frame when locating touches on the body (Bremner et al., 2008). However, research with late and congenitally blind individuals indicates that early visual experience plays an important role in the emergence of the crossed-hands effect (Röder et al., 2004; Ley et al., 2013). Therefore, we hypothesised that the crossed-hands effect (and thus external localisation of touch) emerges during

the first half year of life. To investigate this hypothesis we investigated the corollary of the crossed-hands effect 17 4-month-old infants (mean: 16.6-weeks). However, as young babies do not have the flexibility to cross their hands at the forearm, we decided to cross their feet. Infants were seated in a specialist baby chair in the reclined position and tactors were secured on the soles of infant's feet. A single vibrotactile stimulus was presented to each foot in either the crossed, or the uncrossed, posture. Foot orienting behaviour (i.e. foot and/or leg movement which was directional in nature) was recorded for up to 8 seconds after stimulus presentation. We observed no difference in manual orienting behaviour across the two postures, indicating that 4-month-old infants were able to correctly orient to the tactile stimulus in both the uncrossed, and the crossed, feet postures. This suggests it is between 4 and 6 months that an external reference frame for tactile localisation emerges.

Behavioural and Physiological Dimensions of Autistic Traits, within and beyond the Autism Spectrum

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The closer one looks at behavioural and physiological qualities of autism, the more one finds that traits once presumed to be categorical properties of the diagnoses actually are dimensional and potentially endophenotypic. To ascertain physiological correlates of such dimensional autistic traits within and beyond the autism spectrum, age-matched groups of subjects with ADI-R-diagnosed autism spectrum conditions, clinically unaffected sibs, and controls performed several game-based tasks, including an analogue of the Posner visual spatial attention task and a go/no-go "shooter" task. In the Posner analogue, targets and irrelevant distractors were presented in cued and uncued sectors of the upper visual hemifield. In the go/no-go, subjects inhibited a button press based on the shape of a target appearing at fixation after a variable delay. After recording of 128-channel EEG, detrending, interpolation of bad electrodes, deletion of noisy intervals, and independent-components-based deletion of eye components, epochs -200-1200 ms from stimulus onset were extracted, baselined, averaged, smoothed with a 30 hz cutoff, and integrated from 160 to 230 ms for P2, 350-600 ms for P3b and 600-800 ms for slow-wave. Differences were assayed by a 3x2 (diagnostic group by cueing condition) analysis of variance. For lateral occipital P2 in the Poser task, unaffected sibs responded abnormally strongly to uncued targets; sibs and autism manifested abnormally low occipitoparietal P3b difference to targets versus distractors, and inverted slow-wave difference with positive-going response to distractors exceeding response to targets. For the go/no-go, P3 amplitude

correlated with psychometric measures of autistic traits across all three diagnostic groups. These results are consistent with fMRI findings of abnormally strong and delayed top-down-modulated perceptual activation in autism and sibs, possibly reflecting an endophenotype of delay in evaluating a stimulus's behavioural relevance, and with a strategy of distribution of attention across cued and uncued locations when attention cannot be shifted rapidly.

Intranasal inhalation of oxytocin improves face processing in developmental prosopagnosia

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Developmental prosopagnosia (DP) is characterised by a severe, lifelong impairment in face recognition. Little work has attempted to improve face processing in these individuals, but intriguingly, recent evidence suggests oxytocin can improve face processing in both healthy participants and individuals with autism. This study examined whether oxytocin could also improve face processing in individuals with DP. Ten adults with the condition and 10 matched controls were tested using a randomized placebo-controlled double-blind within-subject experimental design (AB-BA). Each participant took part in two testing sessions where they inhaled 24IU of oxytocin or placebo spray and completed two face processing tests: one assessing face memory and the other face perception. Results showed main effects of both participant group and treatment condition in both face processing tests, but the two did not interact. Specifically, the performance of DP participants was significantly lower than control performance under both oxytocin and placebo conditions, but oxytocin improved processing to a similar extent in both groups.

Interference control in adolescents with Mild Intellectual Disability and Behaviour Disorders

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This study investigated the effects of both Mild Intellectual Disability (MID) and behaviour disorders on interference control and everyday executive functions. Interference control is a type of inhibition process that concerns the suppression of irrelevant information or stimuli in order to perform well on the task at hand. Previous research has indicated that children and adolescents with MBID have deficits in interference control. However, MID is a heterogeneous condition and comorbidity with psychiatric disorders is high. Because behaviour disorders such as attention deficit-hyperactivity disorder, oppositional defiant disorder or conduct

disorder have also been linked to interference control deficits, it is important to determine whether interference control problems in MID are attributable to MID, behaviour problems, or both.

This issue was addressed by examining four groups that varied in the presence of MID and behaviour disorders; i.e., normal controls, adolescents with behaviour disorders, adolescents with MID, and adolescents with MID + behaviour disorder. The Flanker task was given to all participants, this is a performance-based measure of interference control. In addition, teachers rated everyday executive function behaviour using the Behavior Rating Inventory Executive function (BRIEF).

The findings indicated that the presence of MID was associated to impaired interference control as assessed by the Flanker task. This was especially the case for adolescents with MID without behaviour disorders. There were small effects of MID on the BRIEF, but substantial effects of behaviour disorder. Thus, the results that emerged from this study showed an interesting dissociation between MID (primarily deficient in interference control) and behaviour disorder (primarily deficient in everyday executive function). This pattern will be discussed vis-a-vis current notions of cognitive control and issues regarding laboratory vs. daily life assessment of executive function.

The effects of irrelevant speech, articulatory suppression and word frequency on free recall and serial recall

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Two experiments investigated the effects of irrelevant speech, articulatory suppression and word frequency in free recall (FR) and immediate serial recall (ISR). These tasks are traditionally thought to be underpinned by separate memory processes: ISR by the phonological loop in Working Memory (WM; Baddeley, 1986) and FR by long-term memory. This study aimed to examine whether the effect of irrelevant speech, articulatory suppression (both long-term memory variables) and word frequency (a short-term memory variable) was similar in FR and ISR. Experiment 1 found similar effects of irrelevant speech on FR and ISR and Experiment 2 found similar effects of articulatory suppression and word frequency in FR and ISR. These findings demonstrate the similarity between the two tasks. Rather than the traditional long-term memory-short-term memory/WM separation between FR and ISR, we propose that the two tasks share a common processing mechanism.

Motor deficits in language impairment and dyslexia: same or different?

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Language impairment and dyslexia are specific developmental disorders, identified when the child has problems with oral or written language in the absence of a known cause such as low IQ or neurological damage. However, the nonspecific nature of these deficits is increasingly recognised. Deficits in motor skills often co-occur with language or reading problems, but it is unclear whether the nature of the motor difficulties is the same in these two conditions. We used a large ($n = 322$) sample of children who had explicitly been assessed for both oral and written language skills. The nine- and ten-year-olds were given fine motor tasks to assess their speed, sequence, and imitation abilities. When categorised according to oral language ability, those with language impairment (LI, $n = 82$) were slower than language typical children (LT, $n = 240$) at peg-moving, and less able to imitate hand positions. When categorised according to reading ability, those with reading delay (RD, $n = 118$) were slower than reading typical children (RT, $n = 204$) at peg-moving and finger-tapping in sequence. Overall, comorbid motor deficits were found for both language and reading impairments, with slower performance for moving small objects associated with both conditions. However, deficits in motor imitation were not found for children with pure reading impairments but were specifically linked with impairments of oral language.

Methodological considerations when using technology for automated vocal analysis (LENA) with young children

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Background: Traditionally, child language use and interactions have been explored through short observations in children's homes or laboratory-based playrooms. However, using new technology (LENA: Language Environment Analysis) up to 16 hours of audio can be recorded from the child's natural environment, using a small recorder worn by the child. The software provides automated data analysis.

Aims: To assess feasibility and reliability of using LENA to capture information about children's communicative environments in preparation for a full-scale longitudinal study of children with language delay.

Methods: A pilot study was carried out with two typically developing children, aged 2;1 and 3;0, and their primary caregivers. LENA recordings were collected for each child, 16 and 3 ½ hours respectively. Automated analysis provided frequency histograms of child vocalisations, adult

words, conversational turns and audio environment information (e.g. TV). These were used to identify high levels of language use from which five-minute samples were transcribed for detailed analysis of language use and parent-child interaction.

Results: LENA demonstrated clear, high quality audio. However, methodological considerations were highlighted, particularly the problem of unintelligible, or overlapping speech for accurate transcription of child language. Reliability of the automated analysis was also questionable in some instances, including incorrectly coding 'TV speech' as 'real' adult words.

Discussion: The LENA system is a useful, practical tool for collecting large amounts of data. However, there are problems with unintelligible speech, which could be more pronounced for children with language delay. Consequently, LENA may be more suitable for transcription of language input. Xu, Yapanel and Gray, (2009) demonstrated 71% sensitivity agreement for LENA TV coding with human transcription from 70 hours of audio. However, issues with reliability may be of greater importance to studies with a small samples using detailed analysis, therefore checks should be carried out according to individual aims and sample size.

Characteristics of parent-child interactions: A systematic review of studies comparing children with primary language impairment (PLI) and their typically developing peers

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Background: The importance of parent-child interaction (PCI) for language development has been well established. Studies have suggested that PCI is different with children with PLI compared to typically developing (TD) peers. Many language interventions exploit PCI strategies found to be positively associated with TD language. However, study results are mixed. The Bristol research programme 'Child Talk - What Works' is currently exploring the effectiveness of interventions for preschool children. In association with this programme the current review examined research into PCI differences for children with PLI.

Aims: To compare PCI, observed in naturally occurring contexts, with children with PLI and control children matched on age or language levels.

Methods: A systematic review of the literature searched 10 databases for studies using a case-control design. Potentially relevant papers had data extracted concerning participants, matching, selection, design, assessments, measures, findings, statistics and bias. Quality appraisal used the case-control CASP checklist.

Results: 17824 papers were identified and reviewed against exclusion criteria. The final review included

nine papers, heterogeneous regarding matching, PLI criteria and PCI measures. A narrative synthesis was therefore conducted. The evidence for PCI differences was limited and any suggestion that parents were less responsive could generally be attributed to limited language skills of children with PLI. However, findings came from a small sample of children from middle class families.

Discussion: There was limited evidence for group differences in PCI, questioning the assumption that communicative environments of children with PLI are different. However, comparisons with speech and language therapy (SLT) studies suggest that children with PLI may benefit from modifying features typical of this environment. The review highlights the significant gap in understanding the relationship between PCI and child language. The need for further, longitudinal research is emphasised, which should include children with a range of delay severity, across different SES backgrounds.

How do two types of cognitive flexibility relate to working memory and inhibition in 2-4-year-olds?

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Cognitive Flexibility (CF) allows us to adjust our behaviour in line with changes in our goals or in the environment. CF has been studied in the preschool years using the Dimensional Change Card Sort task (DCCS; Zelazo et al., 2003). While 4-year-olds can switch from sorting picture cards by colour to shape, 3-year-olds perseverate, continuing to sort by the first rule. Perseveration can be explained either as a failure to maintain the current rule in working memory (Graded Representations account: Munakata, 2001), or a failure to inhibit attention to the previously relevant dimension (Attentional Inertia account: Kirkham, Cruess & Diamond, 2003). The current study aimed to understand how different forms of CF develop using a new task designed for use with younger children (The SWIFT: Carroll et al., submitted). On the SWIFT, children match coloured shapes on a touchscreen computer by a rule (e.g. colour), and then must switch to matching by a new rule (e.g. shape). Sixty-one 2-year-olds, 3-year-olds and 4-year-olds completed two versions of the SWIFT that differed in their conflict resolution demands: 1) the Conflict-SWIFT where the non-relevant dimension matched the target; 2) the Distracting-SWIFT where the non-relevant dimension was present, but did not match the target. Children also completed measures of working memory and inhibitory control. Inhibition performance was only associated with post-switch accuracy on the Distracting-SWIFT. This suggests that inhibition is required to resist distraction while maintaining a task-set. Working memory performance was associated with post-switch accuracy on both SWIFT versions. This suggests that

switching requires working memory to maintain the current sorting rule. In addition, most 2-year-olds and younger 3-year-olds did not persevere on the Conflicting-SwIFT, instead performing at chance levels. These results support the Graded Representations account: young children may fail to maintain in working memory the current sorting rule after a rule-switch.

The role of working memory in children's understanding of temporal connectives

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The role of working memory on three- to seven-year-olds' comprehension and production of temporal connectives was examined. The (target) sentences comprised two clauses joined by the temporal connectives *before* or *after*, presented in either a sentence-initial (e.g., *before he played in the garden, he finished his homework*), or a sentence-medial (e.g., *he finished his homework before he played in the garden*) position. Such sentence positions of the connective vary whether the order of mention of the events matches the temporal order, either chronological order (e.g., *after he finished his homework, he played in the garden*), or reverse chronological order (e.g., *he played in the garden after he finished his homework*). To assess comprehension, children heard the sentence read aloud and were then presented with two pictures on a touch screen computer, representing the target object in each clause (e.g., *garden, homework*). Their task was to select the object representing the event that happened first in the sentence. To assess production, children were shown two videos and required to produce a sentence describing the two events. Memory was assessed using the digit span task from the Working Memory Test Battery for Children (Pickering & Gathercole, 2001). It was predicted that performance in the reverse-chronological sentences in both tasks would be poorer than for chronological order. Further, we tested whether performance in the reverse-chronological condition would be more strongly related to working memory because, for these sentences, the participant has to store and re-order the two clauses in order to construct an accurate situation model. Implications will be discussed in terms of how working memory capacity relates to children's understanding of complex sentences and their construction of a coherent situation model. Reference: Pickering, S.J., & Gathercole, S.E. (2001). *Working Memory Test Battery for Children*. Psychological Corporation UK.

Group differences in the scanning of faces: Insights from 'super-recognizers', developmental prosopagnosia and individuals with typical face memory

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Recent work has reported the existence of super-recognizers, people with extraordinary face recognition ability (Russell et al., 2009). Very little is known about the processes underlying superb face recognition ability, but a study by Sekiguchi (2011) suggested that fixations on the eyes serve an important role in face memory. Other work has reported that eye-movements change as a function of previous experience, in that novel stimuli are viewed in a different manner than previously seen displays. This 'eye-movement based memory effect' has been reported in typical perceivers (Althoff & Cohen, 1999), individuals affected by prosopagnosia (Bate et al., 2008) and those with autistic spectrum disorder (Hedley et al., 2012). The current work investigates the eye-movement patterns during face study and recognition in super-recognizers, individuals with developmental prosopagnosia and matched control participants. We examined the scanning patterns during learning and recognition of unfamiliar faces. Initial results show that in the learning phase, prosopagnosic participants spent more time looking at the mouth than the eyes than control participants, who, in turn looked at the eye region less than super-recognizers. Similarly, in the recognition phase, prosopagnosic individuals fixated less on the eyes than control participants, who again spent less time looking at the eye region than super-recognizers. These results converge with previous evidence and suggest that the eye-region of human faces is responsible for individual differences in face recognition. It has been suggested that the eyes may constitute the main reference point for spatial relations between face features, and that saccade latencies during transitions between the eyes can be informative about the distance between them. Hence, the critical information that is necessary for accurate face recognition may be stored in the eye region and explain the current pattern of findings (Henderson et al., 2005).

Obesity impairs academic attainment in adolescents: Findings from ALSPAC

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Background: Obesity may be associated with academic attainment, however the extent to which this is related to psychological factors is not known. The present study examined whether obesity at age 11 is longitudinally associated with academic

attainment after controlling for a wide range of confounders.

Method: 5966 participants (46.2% male) from the Avon Longitudinal Study of Parents and Children (ALSPAC) attended a research clinic at 11 years old and were categorised into healthy-weight, overweight or obese. Data linkage was performed with nationally administered school assessments at age 11, 13 and 16 years.

Results: 14.5% of females and 16.3% of males were obese at 11 years old, with smaller proportions overweight (females = 13.1%; males = 13.5%). Regression analyses found that, in females, after controlling for confounders, those who were obese were predicted to have lower academic attainment than participants of a healthy weight at age 11 (Beta = -1.35, 95% CI = -3.17 to 0.48), age 13 (Beta = -3.71, 95% CI = -6.38 to -1.04) and age 16 (Beta = -0.26, 95% CI = -0.47 to -0.05). The same pattern was not observed when comparing those who were overweight. While similar associations were observed in males at 11 (Beta = -2.52, 95% CI = -4.78 to -0.26) associations were smaller at 13 (Beta = -1.59, 95% CI -4.76 to 1.58) and 16 years (Beta = -0.08, 95% CI = -0.33 to 0.16).

Conclusions: Obese adolescent girls achieved lower grades in both the short and long-term, however being overweight was not as detrimental. Results were apparent even after controlling for confounders, suggesting that psychological factors such as depressive symptoms and IQ cannot fully account for observed associations. These findings indicate that obesity has detrimental effects on educational attainment which may have important implications for both research and policy.

Inhibitory control is a prerequisite of cooperation in children with high-functioning autism

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High-functioning children with autism (HFA) typically show impairments in cooperation, a capacity that forms the basis of social play and group learning. Despite its developmental importance, the proximal causes of this impairment are little researched; previously identified candidate mechanisms include theory of mind (ToM) and responding to joint attention. We set out to contribute to the executive dysfunction account of social impairments in autism by exploring the links between inhibition and these component mechanisms of cooperation: reciprocity, accepting the play partner's input and fairness. In Study 1, twelve HFA children attending mainstream primary schools completed an inhibition battery and a collaborative drawing task. Their performance was compared to that of twelve age-matched typically-developing (TD) peers. The groups did not differ on first-order ToM and joint attention, but the HFA group showed impaired cooperation. Inhibition was found to predict reciprocity and accepting the play

partner's input in HFA children, even after controlling for verbal ability. In Study 2, we investigated HFA children's level of reasoning about fairness, and tested whether there is a discrepancy between their judgments in hypothetical scenarios and actual behaviour in situations where they have a vested interest. We hypothesised that while social understanding would be relatively intact in the HFA population, impaired inhibitory control would prevent the application of this understanding in practice. As a result, the behavioural differences between hypothetical and actual settings for HFA children would be more extreme than in an age-matched TD sample, and would be a function of the severity of impairments in inhibition. The results of these studies are discussed in terms of a model of social impairments in HFA where executive dysfunction acts as a moderator between relatively intact social knowledge and impaired social competence.

Boundaries between 'verbal' and 'non-verbal' memory skills in children with SLI

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In recent years, evidence has emerged that suggests Specific Language Impairment does not exclusively affect linguistic skill. Studies have revealed memory difficulties including those measured using non-verbal tasks. However there has been relatively little research into the nature of the verbal/non-verbal boundaries either at a conceptual or a task-related level. This study explores the short term memory performance of children with and without SLI on a series of tasks that involve varying degrees of verbal content. In total 14 children with SLI and 20 comparison peers participated.

Findings show that children with SLI performed more poorly than peers on all tasks (all $p < 0.01$) except the purely non-verbal block recall task ($p > 0.2$). Interestingly, a task that required no verbal processing or output was as problematic for the SLI group as a traditional non-word span task suggesting that 'verbal encoding' was used by the typical peers but less so by those with SLI. Furthermore, a verbal-input picture span task correlated strongly with block recall tasks for children with SLI. This may provide preliminary evidence that 'visual encoding' was being used as a central strategy by this group to aid performance.

The findings have implications for our understanding of memory task properties, in particular hidden verbal content and also for the use of verbal and visual content in the classroom and other real life settings.

Children's understanding of first and third-person perspectives in language and false belief

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De Villiers (2007) suggests that the recursive structure of complement clauses supports children's understanding of False-Belief. In *he believes it's raining*, the main clause (*he believes*) expresses a perspective on what is stated in the complement (*it's raining*), and this perspective differs from the speaker's own perspective. In the training studies that found correlations between children's understanding of complement clauses and False-Belief, the main clauses contained a 3SG subject, as in the example above (Hale & Tager-Flusberg, 2003). However, children frequently hear complements with 1SG subjects in the main clause, such as *I believe it's raining* (Diessel, 2004). We investigated how children's interpretation of complement clauses with 1SG and 3SG subjects in the main clause correlates with False-Belief understanding.

We tested 64 English-speaking children aged 3;5 and 4;5. They saw two boxes. Two hand puppets indicated which of the two contained a sticker and how sure they were about this (e.g., *I know it's in the red box vs. I think it's in the blue box*). In the 1SG condition the puppets spoke for themselves; in the 3SG condition the experimenter spoke for the puppets. In a between-subjects design, each child received eight trials and then took part in four standard False-Belief tests.

The 3-year-olds performed at chance in the 1SG and 3SG conditions and below chance in the False-Belief tests. The 4-year-olds performed above chance in both conditions and the False-Belief tests. However, only their performance in the 3SG condition, not the 1SG condition, correlated with their False-Belief understanding ($r=.651$; $p>.001$). These results were replicated with 3- and 4-year-old German-speaking children. This suggests that complement clauses with a 1SG subject in the main clause do not have the same meaning and/or structure as complement clauses with a 3SG subject in the main clause. Only complement clauses with a 3SG subject in the main clause support the ability to represent other minds.

The development of crossmodal correspondences: Evidence from infants and remote cultures

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In the multisensory development literature, there is currently a lack of consensus concerning the developmental origins of an ability to perceive crossmodal correspondences between what are considered to be arbitrarily related dimensions of sensory experience (e.g., the tendency to link high pitched sounds with brighter visual displays). A number of researchers have argued that some such crossmodal correspondences are phylogenetically innate, or at least an unlearned aspect of perception because they are perceived by neonates, young infants, and young children (Maurer et al., 2013; Walker et al., 2010), and also because certain clinical populations show deficits in identifying correspondences (see Oberman & Ramachandran, 2008). Other researchers have suggested that such "arbitrary" crossmodal correspondences may be learned via their association in the environment (Bahrick & Lickliter, 2013; Davis, 1961), and some have even questioned whether the data obtained from young infants, and clinical populations is informative about arbitrary crossmodal correspondences (Lewkowicz, 2011). In this talk we will describe recent observations of early emerging "arbitrary" crossmodal correspondences from our own research on pitch-brightness associations in 8-month-old infants. The 8-month-olds in our study ($N=16$) showed a visual preference for congruently over incongruently matched displays of varying pitch and brightness ($p=.033$). We will also discuss a recent study of the universality of certain crossmodal correspondences across Western and remote cultures (Bremner et al., 2013). We argue that, in order to determine the nature and developmental origins of crossmodal correspondences more clarity is needed regarding: i) the precise classification of various forms of amodal and arbitrary crossmodal relations, and ii) the extent to which arbitrary relations are available from the ecological environment. More specifically, we will call into question the hitherto accepted distinction between redundant and arbitrary crossmodal relations.

Target and distractor processing in visual search: An event-related potential study

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Recent evidence suggests that attentional selection, as indexed by the N2pc event-related potential (ERP) component, may reflect more than one attentional mechanism: target processing, as indexed by a target negativity (N_T) component, and distractor suppression, as indexed by a distractor positivity (P_D) component (Hickey et al., 2009). We sought to further investigate these attentional sub-components, and also examine the attentional effects of manipulating target and distractor salience. Participants viewed visual search arrays containing one target (for a line length judgement

or shape discrimination) and one distractor (line or shape). One stimulus appeared laterally whereas the other appeared on the vertical meridian. The salience of line stimuli was varied by displaying one versus three lines. We replicated previous results showing an N_T associated with target processing and a P_D associated with distractor suppression. There was no effect of stimulus salience on these components. Notably, a distractor negativity (N_D) appeared before the P_D component; a finding that has not, to our knowledge, been previously reported. Implications of these findings and future directions are discussed.

Re-thinking lexicality; list composition effects in children's serial recall of words and nonwords

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Phonological coding to short-term memory is long established, but phonemes within lists are generally unstable at recall. Lexical status offers an advantage for pure word lists; recall of whole items and phoneme-level errors markedly improve for lists of words compared to nonwords. Children's memory often demonstrates a 'lexical bias' towards producing words, when given a list of nonwords, that could be linked to selection or control processes. To eliminate such a lexical bias, using a mixed list methodology that varies the ratio of words to nonwords within a list offers a means to titrate the lexico-semantic influence on serial list recall. The present study employed a mixed list methodology to evaluate young children's serial recall of words and nonwords (Jefferies et al. 2006; JML). Initial findings suggest a much reduced lexicality effect for children's recall of mixed lists, relative to pure lists of words and nonwords. Notably, the recall of phonemes placed within words was robust to the manipulation of mixed list composition, whereas phonological coherence within nonwords decreased as the word:nonword ratios in mixed lists also decreased. Findings will be discussed in relation to two contemporary interpretations of the lexico-semantic influences on serial recall i.e. late-stage item-specific reintegration processes versus semantic support for phonological coherence (semantic binding account).

Remembering Rewarded: Data and model for incentivised free recall

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In free recall, items presented at the end of the list are typically recalled first. This accounts for part of the ubiquitous recency effect. However, output order effects make it difficult to know whether the direction of causality is from greater memory strength to earlier recall, or from earlier recall to superior memory performance. Thus serial position

curves in free recall do not provide an unambiguous measure of items' retrievability at the time recall starts. We report three experiments in which participants receive differential monetary incentives for recalling items from particular portions (thirds) of the presented list. Items associated with higher rewards are recalled earlier and more accurately (Experiment 1). The effect survives rapid presentation (Experiment 2) and is also seen when reward schedule is post-cued (Experiment 3). We explore the results using the SIMPLE model of memory.

Individual differences in response to a reading intervention for children with Down syndrome

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This presentation will explore in more detail the individual differences of children with Down syndrome in response to a reading and language intervention. The first 20 week phase of the study was an RCT of the intervention, with 57 children randomly assigned to a waiting control or intervention group. For the next 20 week phase all the children received the intervention and we can look at the response of 54 of the children to a first 20 week period of intervention. The reading and language intervention evaluated in this study was based on the successful reading intervention, developed by Hatcher, Hulme, Snowling and colleagues 1, adapted for the learning profile of children with Down syndrome. The main findings of the RCT have been published². While age (younger children doing better), receptive language and number of intervention sessions attended were shown to predict progress on word reading, scatterplots indicate the difficulty of translating the significance of this information if deciding the suitability of the intervention for a particular child. For example, while the data indicate that literacy teaching should begin at the same chronological age for children with Down syndrome (5-6 years) despite their language and cognitive delays, not all younger children do well and some older children do. The data do indicate clearly the need for individually targeted and carefully structured teaching to continue daily over time (some 80 sessions) for the children with Down syndrome to show measurable progress.

Mental toughness in education

Myfanwy Bugler

University of Hull

Research examining the relationships between mental toughness, academic motivation and negative classroom behaviour are sparse. This study was designed to redress this imbalance. The current study explored academic motivation, mental

toughness and classroom behaviour and whether mental toughness could predict negative classroom behaviour over and above motivation. One hundred and eighty one adolescents (93 females and 88 males) aged 15 - 16 years (M age 16.19, 1.9 SD) completed two questionnaires, one examining academic motivation and the other examining mental toughness, and teachers completed assessments of the students' classroom behaviour. Both motivation and mental toughness were significant predictors of classroom behaviour. However, mental toughness was more significantly negatively associated with behaviour. The results are discussed in terms of implications for both theory and practice. For example, there may be benefits in considering educational interventions focused not only on motivation but also on mental toughness.

The impact of early bilingualism on executive functioning and fine motor skills development

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Previous research has shown that regular use of more than one language benefits early development of cognitive functions such as switching attention, inhibition, working memory and problem solving, commonly referred to as executive functions (EF). This benefit is observed even for children from disadvantaged backgrounds. Early EF and fine motor skills are both predictive of later academic achievement and the existence of a relationship between cognitive and motor development is widely accepted. This pilot study explores whether the cognitive advantage associated with bilingualism extends to precocious development of motor skills in young children from low socioeconomic backgrounds in East London.

Study participants included 25 children aged 3-4 years attending an East London Nursery School. A battery of EF, fine motor tasks and English vocabulary (BPVS) was administered to each child. The majority of the children (N = 20) were from families that spoke a language other than English in the home (L2). A measure of each child's pattern of language use in the home and at nursery was obtained via parent questionnaire. This variable reflected the level of bilingualism in each child and ranged from equal exposure to English and L2, to exposure to mainly one language (either English or L2).

Measures of bilingualism were not associated with either EF or fine motor scores. However in support of previous findings, children that were equally bilingual (N = 12) scored significantly above the standardised mean on a task requiring selective attention. Although we found no evidence for precocious fine motor skills in bilingual children it is possible that differences may be observed in slightly older school-age children, when fine motor skills are becoming more established. Comparing bilinguals

with a matched group of English monolinguals would also help determine whether the cognitive advantage of bilingualism extends to fine-motor skills.

Number-line estimation and mathematics achievement: Sources of individual differences

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The National Council of Teachers of Mathematics (2006) stated learning an accurate number line to be a core element of basic maths education, and recent studies indicate that children with mathematical learning difficulties have poorer acuity in number-line approximation. The current research examines potential sources of individual differences in number-line approximation prior to formal schooling, specifically investigating children's spontaneous focus on number (a self-initiated focusing of attention on the exact number of a set of items or incidents in the environment) and factors associated with the home environment that may result in opportunities for incidental learning about number. 347 kindergarten children (mean age 6 years 2 months) completed standardised assessments of mathematics achievement, vocabulary, and nonverbal reasoning, and completed a computerised number-to-position task to determine accuracy of number-line approximation. Partial correlation analyses controlling for age, vocabulary, and nonverbal reasoning revealed that higher accuracy in number-line estimation was significantly correlated with higher concurrent and future maths achievement (r 's from .25 to .44). Children who showed a higher tendency to spontaneously focus on number showed significantly better accuracy in number line estimation. Incidental learning in the home environment via number game play was not associated with better number-line approximation. However, factors associated with socio-economic status (income and parent education) were significantly associated with higher accuracy in number-line approximation. This relationship may be via explicit enrichment from kindergarten as children who started kindergarten later showed lower accuracy in number-line approximation and were from lower income families. This suggests that children from lower SES families may not be gaining as much explicit exposure to number learning, but that a guided focus on number in everyday experiences, or games designed to offer specific multiple cues to number (e.g., Ramani & Siegler, 2008) may be beneficial and could be easily offered within the home environment.

Children's perception of photographs and cartoon people: An eye-tracking study

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Our visual world is proliferated with pictures that we need to interpret and respond to appropriately (Jolly, 2010). This study examined how 2;9-year-olds (n = 34), 3;11-year-olds (n = 37) and adults (n = 20) looked at two types of pictures: real photographs and cartoons, comprising person + vehicle scenes. There were two conditions: one was 'semantically congruent' whereby the person (e.g. fireman) was related to the vehicle (e.g. fire-engine); and the other was 'semantically incongruent' whereby the person (e.g. postman) was not related to the vehicle (e.g. fire-engine). In addition, half of the scenes contained a perceptual match (cartoon person + cartoon vehicle), and half a perceptual mismatch (cartoon person + real vehicle). There were 24 scenes in total and children's spontaneous looking patterns were recorded while they looked at each scene for 3 seconds. In the semantically congruent condition, participants looked at the cartoon person longer when they were in a cartoon background than a real background. In contrast, participants looked longer at the real person when they were in a cartoon background than real background, and these effects were stronger in adults than children. In the semantically incongruent condition, looking behaviour was less consistent, suggesting that looking behaviour was affected by both perceptual (bottom-up) and semantic (top-down) processes. The results have implications for designing visual materials that capture our attention.

Plasticity of cortical visual processing in atypical development: Evidence from congenital achromatopsia

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Early visual experience is critical for typical visual development, and temporary disruption can result in long-term problems. For example, infants treated for congenital cataracts show persisting deficits in extra-striate visual function many years after cataract removal [Elleberg et al (2002), *Vis Res* 42, 169; Lewis et al (2002), *Vis Res* 42, 939; Bat-Sheva et al (2012), *Dev Sci* 15, 474]. In this study we assessed the impact of congenital achromatopsia on extra-striate vision.

Congenital achromatopsia is characterised by an absence of functioning cone photoreceptors, but spared rods. It is a stationary condition in which patients have impaired but consistent vision throughout childhood. We measured coherence

thresholds to circular form, rotating motion and biological motion in 4 patients and 5 controls. Patients had elevated form and motion thresholds compared to controls, even under scotopic conditions in which all participants were equally reliant on rods for vision. However, biological motion thresholds were relatively spared suggesting independence from form and motion perception.

Our results show that atypical photoreceptor function can cause impairment of mid-level, extra-striate vision in addition to previously reported low-level deficits. The persistence of the impairment under scotopic conditions suggests that it may be a consequence of atypical visual development. To assess this, we will compare our patients to a group with progressive cone dystrophy. These patients have typical vision throughout childhood but lose their cone photoreceptors later in life, developing a condition very similar to congenital achromatopsia. By examining differences between these two patient groups we can gain an understanding of how early visual experience can influence the development of extra-striate vision.

Can navigational training improve facial recognition ability in developmental prosopagnosia

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Topographical disorientation (TD) is the inability to orient and navigate within an environment. Cognitive map test (CMT) training has been successful in rehabilitating individuals with the developmental form of TD. These tests involve creating a mental representation of an environment, for the purpose of reaching a target location. TD has also been found to co-occur with cases of developmental prosopagnosia (DP) presenting a form of developmental TD. This suggests that the neural mechanisms responsible for face recognition may to some extent function for navigation. This study actively detected the presence of navigational impairments in a single case of adult DP in order to determine if improving these abilities using intense CMT training could also improve facial recognition ability. Three face recognition baseline tests were completed before commencing the training, which was then carried out twice a week for four weeks. On completion, a post assessment of navigation and facial recognition abilities were carried out, as well as a follow-up face recognition test one month following training. The study found that intense CMT training significantly improved navigational ability, which resulted in a significant improvement in face recognition performance. The results indicate the possibility that common neural mechanisms could be involved in both navigation and face recognition, and suggest navigational training may be incorporated into treatment programmes for DP.

A model of reputation management in typical development and autism

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People often change their behaviour to affect what others think of them, that is, they attempt to manage their reputation. Some authors have suggested that individuals with autism lack this ability due to difficulties with social cognition. Our recent work, however, suggested that reputation management in autism is not so straightforward. In our first study, 20 typical adults and 19 autistic adults were administered a donation task in which they donated to charity and a person, once when watched and once alone. Additionally, half of all participants were told that the person watching them was the person they could donate to, and that this observer would have the opportunity to donate to them next (motivation condition). Results showed that autistic adults did *not* donate more to charity when observed, that is, they failed to show an 'observer effect'. Yet, in the motivation condition, we found that adults with autism *did* donate significantly more to the observer when watched, albeit less than typical adults, presumably because there was a potential reward to be gained by doing so. We also found that although autistic participants had high beliefs in the norm of reciprocation, they may have low expectations of reciprocation from others. These results indicate that autistic individuals may have the ability to think about reputation, but a reduced propensity to manage it. Our second ongoing study considers the development of reputation management in typical and autistic children. We propose a model of reputation management in which theory of mind is moderated by a number of other variables including social reward and expectations of reciprocation to determine one's skill in reputation management. Preliminary findings from this study will be discussed.

Children's recognition of voices from a line-up

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It has been well documented in the eyewitness literature that children are as accurate as adults at identifying a 'suspect' from a target-present lineup from the age of 6 years. However, when the lineup does not contain the 'suspect', children find it very difficult to reject the lineup and instead pick an innocent member. This high rate of false identifications persists into adolescence and is believed to be driven mainly by social factors and a desire to please the experimenter (e.g. Pozzulo, Dempsey, Bruer & Shehan, 2011).

In the present study, we examine whether children still have a tendency to pick someone from a target-absent lineup using voices instead of faces

(materials and procedure adapted from Stevenage, Clarke & McNeill, 2012). 138 children aged 12, 14 and 16 years completed two sequential voice lineups, 1 target-present and 1 target-absent (fully counter-balanced across age groups). They listened to a clip of a 'target' voice speaking for 30 seconds and immediately following this they were presented with a sequential six-person lineup. In the lineup, each speaker was heard for 8 seconds and participants had to decide whether the speaker was or was not the person they had heard previously. For both lineups, participants were told that the 'target' may or may not be in the lineup. Overall accuracy for both lineups was low – 31% for target-present and only 13% for target-absent line-ups. The results for target-present lineups show a significant association of accuracy with age, with older children making more correct identifications. The results for target-absent lineups show no significant association of accuracy and age with 87% of all children making a false positive identification. The results suggest that children's tendency to choose someone from a target-absent lineup extends to the area of 'earwitness' identification and persists well into mid-late adolescence.

Experience of ethnic diversity and strategic colour-blindness in childhood: Does experience of ethnic diversity make children less willing to acknowledge social categories?

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In 2008, Apfelbaum and colleagues uncovered intriguing findings whereby White adults avoided acknowledging race even when it was relevant to the task at hand. They argue this is motivated by self-presentation, a desire not to appear to be racist, and referred to it as 'strategic colourblindness' (Apfelbaum, Sommers & Norton, 2008). This phenomenon was also found to develop with age through early to middle childhood (Apfelbaum, Pauker, Ambady, Sommers & Norton, 2008). The current study extends this research by examining, among a sample of UK children, the following research questions: i) does *experience of ethnic diversity* moderate children's strategic adoption of the colorblind approach, ii) are children also unwilling to acknowledge other social group memberships (non-disabled-disabled) and iii) does *experience of ethnic diversity* moderate children's willingness to acknowledge disability (Secondary Transfer Effect; Pettigrew, 1998). Non-disabled children (8-10 years; $n = 101$) performed two target identification tasks in which performance is improved if participants acknowledge social category membership. The target was either Black (race-relevant task) or physically disabled (disability-relevant task). As predicted, experience of ethnic diversity had a detrimental effect on performance: children with greater experience of diversity were less willing to acknowledge race in the task and so performed less well than those

children with less experience of diversity. Children were also more efficient on the disability-relevant task and were more likely to acknowledge disability than race. These findings are consistent with the argument that experience of diversity increases salience of the norm to *not* refer to social category membership leading to strategic colorblindness. Mediation analysis showed evidence of the STE. Implications for educational practice, prejudice reduction and future research are discussed.

Set size does influence Object Substitution Masking when the stimuli are digits

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Object substitution masking (OSM) is a phenomenon in which the mere presence of four dots surrounding a target (four dot mask; 4DM0) can render a briefly presented target imperceptible when the 4DM trails the target offset. OSM is interesting as it is not easily explained by conventional theories of masking or within traditional feed-forward models of visual perception. OSM was originally assumed to occur only under conditions of diffuse attention, or when attention is focused away from the target location (eg DiLollo, Enns & Rensink, 2000). In support of this DiLollo et al (2000) reported that OSM depended on the number of distractors presented with the target item (set-size): masking increasing monotonically as set-size increases. More recently, Argyropoulos, Gellatly, Pilling & Carter (2012) presented data showing the OSM effect to be independent of set-size. It was argued that the interaction between set-size and mask duration originally reported by DiLollo and colleagues (2000) was a consequence of restrictions in measurable performance (ceiling effects) and failures to correct for response bias. We revisit the effect of attention in OSM by again using a set-size manipulation. We use different stimuli to those of DiLollo et al (2000) and Argyropoulos et al (2012) for the target and distractor items (digits rather than boxes with a missing side). Set-size was either 1 (i.e. target alone) 6 or 12 items. Our results are strikingly different to those of Argyropoulos et al (2012). Set-size was found to have a substantial effect on OSM: masking strength (as indexed by the effect of mask duration) increased significantly with set-size. Further research is currently being conducted in an attempt to elucidate the key determinants of when set-size is a critical factor in OSM in order to explore the clear disparity between our findings and those of Argyropoulos et al (2012).

The influence of urgency on perspective taking ability under working memory load: An eye-movement study

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Recent research has demonstrated a link between perspective-taking and executive functions. Here we examined whether the urgency to take another's perspective – in terms of time and accuracy – modulates the effects of working memory (WM) on perspective-taking ability using a modified 'Keysar task'.

Across two experiments participants moved target objects around a grid based on instructions from an avatar. In a 'listener privileged' condition, an alternative target object could only be seen by the participant. In a 'speaker privileged' condition, there was an indication of a potential target available only to the speaker. In a control condition, both objects were available to both participant and speaker. Working memory load was manipulated within each condition. In Experiment 2 (N=31), but not Experiment 1 (N=36), participants received financial reward for quick and accurate responses which required earlier use of the avatar's perspective.

When there was no urgency, listeners were equally distracted by the alternative target object in the listener privileged condition and the control condition ($p > .05$). Furthermore, WM load only impacted the control condition, where listeners were slower to fixate on target objects under high load compared to low load ($F = 7.83, p < .01$). When there was urgency, listeners fixated on the target object sooner under low load than under high load ($F = 12.75, p = .001$), with fixations to target in the high load condition comparable with the control condition (both high and low load). Across both experiments, listeners' fixations were not influenced by the speaker's potential knowledge about an alternative target.

These results show that holding privileged knowledge about objects interferes with our ability to take another's perspective when there is no urgency to do so. Furthermore, the ability to ignore distracting objects is ameliorated when there is some urgency but only under low load conditions. This highlights that successful perspective taking is cognitively effortful.

Minding the children: Mental state talk at 3 predicts behavioural adjustment at 10

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Children's early conversations within the family are a primary context for social development. In particular research shows that parent-child conversations facilitate children's understanding of mind (e.g., Ruffman, Slade & Crowe, 2002). Despite

the importance of mental state conversation for children's early understanding of the mental world, we know very little about the role of MST in other developmental outcomes such as emotional and behavioural adjustment into middle childhood. In the current study longitudinal data were collected from 83 mother-child dyads from middle-class families in the South East of England. In the first wave of data collection children (40 boys; 43 girls) were 3 and 4 years old with the second wave taking place 6 years later when children were 10 years old. Mental state talk was measured at wave one and wave two during mother-child interaction. At wave two mothers also completed strengths and difficulties questionnaire (SDQ; Goodman, 1997) from which two subscales of adjustment were derived: prosocial behaviour and total difficulties. Results show significant cross sectional correlations at wave two between MST talk and total difficulties ($r = -.36, p < 0.05$) and prosocial behaviour ($r = .29, p < 0.05$). Furthermore, we found a longitudinal correlation between mother MST at wave one and total difficulties at wave two ($r = -.29, p < 0.05$). Our results suggest that the presence of MST can act as a protective factor against adjustment problems extending from the preschool period into preadolescence.

You're doing it wrong: Does efficacy of observed behaviour influence innovation?

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Whilst children gain much from their collective culture, theoretical models of cultural evolution and empirical evidence suggest that it is not always adaptive to learn socially. Acquiring reliable information often necessitates payoff- or success-biased evaluations of its content and source, prompting trade-offs in social and individual learning strategies. From infancy, children assess the quality of demonstrated information, and are known to alter imitation fidelity of functional and non-functional behaviour throughout development, in line with learning outcomes, social motivations, and a variety of contextual factors. Yet at what age do children judge it futile to imitate *unreliable* information, in the form of a visibly inefficient or suboptimal demonstrated task solution, and, importantly, deviate from potential unsatisfactory outcomes? That is, when do children explore and discover alternative novel methods of goal achievement? The current study addresses these questions with the introduction of a novel puzzle box task, designed to allow multiple innovation opportunities differing in the level of complexity and cumulative build-up of techniques they allow. Children aged 3- to 8-years-old were assigned to conditions in which eight social demonstrations of a reward retrieval method were provided, with each condition differing incrementally in terms of the model's level of success from 0 to 100%. By manipulating the reliability of the demonstrations,

variation in when, if at all, children opt to shift their learning strategies (from desisting from copying the observed behaviour to trying something new, i.e. innovation) could be determined. Biographic information and theoretically-relevant personality factors information was collected with the aim to establish interrelations with innovation and assist in a model of the characteristics that define innovators in early life. Data collection is on-going, and results will be presented at the conference in September.

Predicting dyslexia using pre-reading skills: The role of sensorimotor and cognitive abilities

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It is well established that phonological processing is a key cause of reading difficulties. However, much of the evidence comes from group difference studies, which may mask possible individual differences in deficits. When White et al., (2006) examined incidence of individual deficits in dyslexic children, they found that only half of them showed phonological awareness deficits. Pennington et al., (2011) argues that dyslexia is caused by a combination of multiple deficits, with dyslexic children showing two or more of a range of possible deficits.

In order to examine this hypothesis in a larger, representative sample of poor readers, we tested 455 children at school entry on a wide range of measures associated with dyslexia, including phonological awareness, visual search, auditory processing, rapid naming, short term memory, motor planning and vocabulary. Children were retested one, two and three years later and poor readers compared to the rest of the sample. Poor readers were more likely to have deficits in all areas except motor planning and postural stability, and all but two of the poor readers showed deficits in at least one area, but there were no areas of deficit shared by the majority of poor readers. Print awareness and auditory difficulties were the most common deficits shown. The results fit with Pennington et al.'s multiple deficits view.

The relationship between the development of attention and foundation literacy skills

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There is a growing interest in the role of attention skills as indicators of school readiness with limited evidence from studies examining the longitudinal relationship between children's attention as predictors of their literacy and numeracy outcomes. Data will be reported from the first phase of a longitudinal study investigating the development of attention and early reading skills for a sample of 83 children aged 4-5 years old. The sample completed a set of tasks measuring visual and auditory attention (selective attention, sustained attention and attentional control) and measures of early

reading- related cognitive-linguistic skills (letter-sound knowledge, early word reading, phoneme awareness, vocabulary and RAN).

The results of the first phase of this research will be presented.

The effect mechanism of social competence and sense-making coping on loneliness among migrant children in China

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That children migrate with parents from rural area to cities gradually becomes a common phenomenon nowadays. Regarding this phenomenon, stressful situations, problems in mental health, and developmental issues of these socially disadvantaged children are concerned. Knowledge concerning the protective factors and their mechanism is of great significance with important implications.

This study aims to explore the protective roles of perceived social competence and sense-making coping, as well as the mechanism of how these factors affect adjustment outcomes among migrant children in China.

A total number of 201 migrant children aged from 9 to 15 year-old were recruited from two primary schools in Beijing. The demographic information (e.g. gender, grade, and age), frequency of stressors, perceived social competence, sense-making coping, and loneliness were collected in self-report questionnaires.

Results showed that 1) all the variables mentioned above were significantly correlated with each other (specify the results) except that there was no significant correlation between stressors and sense-making coping; 2) with ANOVA, significant gender difference was observed in the sense-making coping that girls reported better performance than boys; 3) via Model 4 and Model 59 in regression with PROCESS Procedure (Hayes, 2013), a mediated-moderation model in the pathway from stressors to loneliness was demonstrated: firstly, social competence partially mediated the relationship between stressors and loneliness, also, sense-making coping moderated the direct relation between stressors and loneliness, furthermore the indirect relation between stressors and loneliness through perceived social competence is conditional on sense-making coping. The moderated mediation model revealed that the mechanism exist only for migrant children with medium- and high-level sense-making coping.

In summary, perceived social competence serves as an important mediator in the relationship between stressors and loneliness, and sense-making coping effectively buffers the negative influence of stressors on the adjustment outcome. This finding suggests that sense-making coping and perception of social

competence are important protective factors for environment adaption and adjustment outcomes among migrant children, providing applicable information for future studies and practical issues.

Do children jump to conclusions?

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The jump to conclusions (hereafter as JTC) bias has been well researched in the literature especially in terms of its role in delusions (Garety, Hemsley and Wessely, 1991; Fine, Gardner, Granigie, and Gold, 2007). However, its developmental course has rarely been investigated. This research explored the prevalence and possible developmental changes of the JTC bias in primary school children using the Beads task (Philips & Edwards, 1966; Huq, Garety and Hemsley, 1988). The relationship between the JTC bias and the children's understanding of probability was also examined.

350 children in Years 5 and 6 completed a computerised Beads task alongside questions designed to examine their understanding of probability. In addition to the number of beads chosen, the time taken to reach their decision in the Beads task was also measured.

The prevalence of the JTC bias was found to be high in the sample with over 80% of the children chose one or two beads in the Beads task. The difference in the number of beads chosen and the time taken in the Beads task between the two year groups was less than straightforward. There was a wide range of within group difference in terms of the time taken to complete the Beads task. Even though most children chose one or two beads in the Beads task, some of these children's decision was certainly not made in haste. The time it took them to reach their conclusion with one bead in the Beads task was much longer than their non-JTC counterparts who chose many more beads. The children's understanding of probability was the most reliable predictor in predicting the JTC bias in regression models. There was also an unexpected school factor confounding the age trends observed.

These findings will be discussed fully in terms of the methodology used and the role of children's confidence and understanding of probability. The validity of the Beads task as a tool to measure the JTC bias in school children will be addressed.

Maturation of reward-driven decision-making in typical and atypical adolescent development

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Foresighted adaptive behaviour matures slowly, alongside the development of self-regulatory processes, such as cognitive flexibility, motor inhibition, and impulse control. Adolescence in

particular is a developmental period characterised by hallmarks of impulsive behaviour such as risk-taking and novelty-seeking, and is associated with a disproportionately high risk of psychopathological morbidity. Current neurodevelopmental models suggest that this profile is due to the delayed maturation of prefrontal regulatory regions, which lags behind significant functional and structural changes in subcortical areas and neurochemical systems that mediate responsivity to motivational, emotional, and social cues. This combination conspires against coherent regulatory control during adolescence. In our work, we use functional and structural neuroimaging, behavioural testing and computational modelling to study the neural and psychological processes that underlie the idiosyncratic adolescent decision-making “phenotype”. Specifically we ask how decision-making under ambiguity and inter-temporal decision-making mature into what we recognise as foresighted, self-controlled adult behaviour. Data from our group and others supports a key role for the maturation of prefrontal cortico-striatal circuit function. More recent evidence from our work suggests a qualitative distinction in the neural and psychological mechanisms engaged by adolescents and adults in different decision-making situations. This evidence highlights the importance of mechanisms that shape decision-making but are only peripherally related to reward processing, such as non-specific exploratory drive and reduced risk-related anxiety, which have been described in both human and animal adolescents. We propose that these characteristics can significantly affect real-world decision-making, by driving exploration irrespective of available rewards, or dampening the effects of negative consequences in high-vigilance or ambiguous situations. These considerations may enrich simplistic developmental models restricted to the putative conflict between regulatory and affective networks. This line of thinking requires a dynamic systems approach to the study of development, and needs to be informed by the evolutionary imperatives that drive maturational processes.

Adaptation and validation of the MacArthur-Bates CDI Gesture Scale for the UK

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The MacArthur-Bates Communicative Development Inventory: Words and Gestures (CDI-WG) is a parental report research tool that has greatly contributed to the study of language development in young children aged 8-18 months throughout the world. CDI-WG is a checklist of vocabulary and gesture items which parents complete according to their child’s current communication profile. A Gesture Scale is included as the development of gesture is key to early communication, may

contribute to later language development, and may help identify children at risk of language delay.

There is currently no standardised version of the CDI-WG for the UK. Language development research in the UK has used various non-standardised British adaptations of the MacArthur-Bates CDI-WG. Exclusive authorisation was granted to produce this UK adaptation, which will become the first standardised UK-CDI for parents of children from 8-18 months.

This paper describes the piloting and development of the Gesture Scale. During the pilot phase of this study, UK parents (n=100) of children 8-18 months completed the UK-CDI. The content validity of the gesture scale was established by selecting gesture items from 3 existing gesture checklists: MacArthur-Bates CDI-WG, Communication and Symbolic Behavior Scales Developmental Profile Infant/Toddler Checklist (Wetherby & Prizant, 2001) and a previous adaptation of the MacArthur-Bates CDI-WG in the UK, with reference to the developmental literature.

In addition, although previous versions of the CDI have included extensive validation of the vocabulary sections, this has not been the case for the gesture sections – not even for the original US version. Validation of the Gesture Scale in our study involves correlation of scores against children’s performance on laboratory tests of gesture and object use.

We discuss the validation and construction of the Gesture Scale, comparing its measurement properties to those of the vocabulary sections and to previous versions of the Gesture Scale from other settings.

Reading difficulties highly correlate with cluster discrimination difficulties: Evidence from Italian

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Most children with reading difficulties report a certain variety of phonological deficits. Recently, it has been shown that English children with reading difficulties struggle in the repetition of phonological clusters when they are in the onset of unstressed syllables. Interestingly, the authors found the result to be significant only for clusters in medial syllables, and they interpreted the result as the activation of a psycholinguistic principle which requires more resources to be spent on initial syllables. To understand if their findings predict performance in other languages, a specifically designed task has been performed on 34 Italian children aged 8;03 to 10;01.

In this task children listened to pair of words, which could be identical or differ for just one phoneme, and were asked to judge about their similarity pressing two buttons. All words contained clusters. The nature of the clusters was manipulated on stress (i.e. the cluster could be in a stressed or in a

non-stressed syllable) and on word position (i.e. the cluster could be in initial or medial position).

The results show that overall reading performance correlates highly with cluster discrimination. Both stress conditions correlate with reading performance, with words with unstressed clusters leading to a stronger correlation. At the same time, multiple regression analysis shows that while non initial syllables contribute to the model, initial syllables do not. This result stands for a cross-linguistic validation of the findings, claiming that first syllable clusters are not good predictors of reading performance, but that clusters, overall, are excellent tools to evaluate reading disorders. Further, it shows that the difficulties with clusters are extended to input tasks, and not only to production.

Sense of agency: A vicarious agency illusion to unmask age-related differences

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Sense of agency refers to the feeling of control over one's actions and their effects and can be augmented or attenuated by internal processes serving motor control and by external situational cues. Recent studies suggested that contribution of internal and external signals can be modulated by age. In the present study, we directly investigate this hypothesis using a modified version of the vicarious agency paradigm developed by Wegner, Sparrow and Winerman (2004). In this paradigm participants view themselves in a mirror while an experimenter stands behind them, hidden from view. The experimenter's hands are extended on each side of the participant in a body-congruent posture. Participants hear a series of action previews. These previews are either congruent or incongruent with actions subsequently made by the experimenter. Wegner et al. found that the participants' experience of controlling these movements was increased when the previews were congruent with the action the experimenter made. Fourteen younger (average age= 23.0; SD= 4.7) and fourteen older (average age= 64.2; SD=6.2) adults were asked to rate (on a 7-point Likert scale) their sense of anticipation ("To what degree did you feel you could anticipate the movements of the arm?"), their sense of agency ("How much control did you feel that you had over the arm's movements?"), and sense of ownership ("To what degree did the arm feel like it belonged to you?") during congruent and incongruent conditions. Our results showed that both groups showed a significantly higher sense of anticipation during the congruent condition, suggesting a successful manipulation of the experimental conditions. However, only younger adults showed a significant higher sense of agency and ownership during congruent compared to incongruent condition. We concluded that the illusion of vicarious agency was less pronounced in

the elder group, suggesting a reduced sensitivity to external cues in older adulthood.

Threat or food: Survival processing and location memory

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It has been suggested that human memory is 'tuned' to process and retrieve information relevant to our survival (Nairne, Thompson & Pandeirada, 2007) and there is mounting evidence indicating that the 'survival processing' benefit is more effective than a number of traditional memory-enhancing techniques, such as pleasantness ratings and intentional learning paradigms (Nairne et al., 2008; Nairne & Pandeirada, 2010). Despite this, few studies have explored survival processing in memory for location and those that have report conflicting findings (with Nairne et al. (2012) demonstrating a survival processing effect in location memory and Nairne et al. (2010) reporting no effect of location). The aim of the current study is to investigate the survival processing effect in location memory by exploring whether the nature of the target item (food vs. threat) affects the accuracy of location memory judgements. Forty participants were randomly assigned to a group and asked to read either a survival or a leisure scenario. Eight greyscale images were presented in individual trials each depicting the location of a single target item (4 food and 4 potentially dangerous animals) in relation to the participant's campsite/hotel (marked at the centre of the screen). Participants were asked to rate each item with regards to their survival prospects or success in the leisure scenario using a Likert scale (1-9), after which they completed a surprise recall task where they were asked to indicate the recalled location of the target items via a mouse click. The results indicated that the participants were significantly more accurate at locating the target objects in the survival scenario, but demonstrated no significant difference between the threat and food items with regards to recall accuracy. This provides further evidence for the survival processing effect in location memory, demonstrating greater accuracy when items are rated relevant to survival.

The effect of set size on non-symbolic comparison task performance

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The Approximate Number System (ANS) is a universal cognitive system present in animals, children and adults that allows the comparison, addition and subtraction of quantities without counting them (Dehaene, 1997). Dot comparison tasks are a common method of measuring the ANS, involving the comparison of two non-symbolic visual arrays of dots. Despite general acceptance of

this measure within the field, the cognitive processes involved in completing dot comparison tasks are poorly understood. According to the analog-magnitude model of the ANS (Dehaene, 1997) only the ratio difference between the quantities represented in the two arrays should influence task accuracy. However, others have suggested that the ANS may not be involved in dot comparison task performance at all (Gebuis & Reynvoet, 2012). This study aimed to investigate how the visual characteristics of the dot arrays used in comparison tasks influence performance. Forty-four children aged 7-9 years and 12 adults completed a dot comparison task including four image types and four set sizes. The image types were characterised by different visual characteristics including individual dot size and the area the arrays encompass. We found that as set size increased, accuracy scores significantly decreased. Furthermore, odds ratios calculated through a binary logistic regression analysis show that participants' accuracy was more influenced by dot size in smaller set size trials, and envelope area in larger set size trials. The numerosity between the arrays in each trial was invariably an important predictor for all set sizes. This work suggests that dot comparison tasks do involve the ANS but performance can be manipulated through the visual characteristics of the stimuli.

The development of colour-object associations

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Colour is a fundamental aspect of our visual environment. For example, it helps us to identify objects (e.g., Tanaka & Presnell, 1999) and it provides signals for behaviour (e.g., Elliott & Maier, 2012). For colour to be used in these ways, stable colour-object associations need to be formed. Previous research has found that infants as young as 6-months look longer at objects that are congruently coloured (e.g., yellow banana) than incongruently coloured (e.g., blue banana), and it was argued that infants at this age can form colour-object associations (Kimura et al., 2010). However, a lack of stimulus control and methodological limitations cast doubt on these findings. The current study replicates Kimura et al.'s study, testing both infants (5-8 months) and adults, but with stricter colorimetric control over the stimuli. The hue of a naturally coloured face stimulus was manipulated systematically to produce 3 incongruent face colours (blue, green and purple) that were the same lightness and saturation as the natural face. An achromatic version of the face was also produced. The five face stimuli were paired against each other in a preferential looking task and eye-movements were recorded. Patterns of looking varied across development, with only the older infants and the adults looking longer at the naturally coloured face

relative to the incongruently coloured faces. The study provides new information about the age at which colour-object associations are learnt and how these associations develop.

The biological underpinnings of mental toughness

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The U.K. is the centre for research in mental toughness. Much of this research has related to toughness scores with performance. More recent work is examining the cognitive underpinnings of these performance enhancements. Another strand of research is reliant on a biological explanation. This current research is described here. Mental Toughness is most often conceptualised as a personality trait, and therefore like other personality traits should have a biological basis and its variance in the population should reflect morphological variance in certain brain structures. A study was carried out using Voxel-Based morphometry to correlate scores of mental toughness and its 6 sub-components, measured using the MTQ48 with grey matter volume values extracted from three dimensional MRI scans. Several clusters of significant correlations between MT48 scores and grey matter volume values were found in several regions of the brain cortex. Most notably, grey matter volume values in the precuneus showed predominant associations with all MTQ 48 sub-components and the total score. The prominent role of structural variance in the precuneus appears to be central in influencing individual degrees of mental toughness. Gerber et al., in Switzerland, measured salivary cortisol, heart rate and perceived stress in response to a stressful situation in order to examine the biological base of mental toughness. Students with high and low mental toughness revealed similar cortisol and heart rate responses, yet their psychological reactions were markedly different. It is argued that differences in psychological stress reactivity may explain why individuals with high mental toughness report fewer depressive symptoms when exposed to high stress. Finally, Horsburgh et al. (2009) showed a clear genetic link to mental toughness, using a sample of monozygotic and dizygotic twins. The implications of these findings for the measurement and development of toughness will be discussed.

Reading a novel in your second language: A comprehensive eye tracking study

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Models of eye movements during reading exclusively focus on monolingual reading, even though most people are bilinguals. Until now, few studies examined eye movements in bilinguals and none investigated sentence processing. They examined eye movements on a single embedded

target word without taking into account changes in global eye movement behavior that L2 reading might entail.

The aim of this project is to establish a comprehensive description of eye movement behavior in bilingual reading. We examine a large-scale data corpus that we collected from 13 English monolinguals and 19 Dutch (L1)/ English (L2) unbalanced bilinguals of intermediate to high L2 proficiency. Participants read an entire novel while their eye movements were being tracked (Bilinguals read half in Dutch, half in English)

Sentence reading times of translation equivalent sentences were fitted within a linear mixed model. Analysis were done both on the entire stimulus set and on a restricted set of sentences matched across the two languages for number of words per sentence, average word length, thus controlling for differences in density between the two languages, and average word frequency. Differences between these results indicate the impact of language density on eye movements during reading and provide new insights into previous experiments not taking into account these factors.

Irrespective of language density L2 sentence reading times were longer than L1 reading times. An extra word per sentence slowed down sentence reading times, even more so when reading in L2. When analyzing the number of fixations per sentence within the same linear mixed model, the same interaction was found. Analysis of average fixation durations revealed no such effect. We conclude that the larger rise in L2 sentence reading times when a word is added to a sentence is due to a larger number of fixations, not to the length of those fixations.

List length and output order effects in the immediate free recall of non-verbal stimuli

Cathleen Cortis, Geoff Ward

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Recently, Ward, Tan, and Grenfell-Essam (2010) have shown that participants tend to initiate the free recall of short lists of words with the first word in the list, resulting in primacy effects, whereas they tend to initiate recall of longer lists of words with one of the last four words in the list, resulting in recency effects. We examined whether we could observe similar findings when participants were asked to recall, in any order, lists of between 1 and 15 visuo-spatial dots or squares. We were interested in whether the recall of non-verbal stimuli would be similar to or different from the recall of verbal stimuli. In particular, we were interested in whether the Ward *et al.* findings reflected the use of a language-specific mechanism, such as a verbal short-term memory store. Contrary to this view, we found that the recall of visuo-spatial stimuli was similar to the recall of verbal stimuli: with short sequences, recall was more likely to be initiated with the first item, but with longer lists, recall was

more likely to be initiated with one of the last four presented items. The findings imply that there are more similarities than differences between verbal and visuo-spatial immediate memory when the methods of testing are equated, and that, more specifically, the Ward *et al.* finding is not limited to language, but represents a more general tendency to replay short sequences of events of any modality in forward order.

Reference: Ward, G., Tan, L., & Grenfell-Essam, R. (2010). Examining the relationship between free recall and immediate serial recall: the effects of list length and output order. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, 36,1207-1241.

Emotion recognition as social cognition: Is there a link with executive function?

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Research has shown the role of executive functioning (EF) in the development of social cognition (Sabbagh, Xu, Carlson, Moses, & Lee, 2006). However, little is known about the interconnections between emotion recognition - an important component of social cognition - and EF in childhood in normative samples, even though an association between facial emotion recognition and EF capabilities has already been found, for example, in children with attention deficit hyperactivity disorder (Sjöwall, Roth, Lindqvist, & Thorell, 2012) or in old age (Circelli, Clark, & Cronin-golomb, 2012). Therefore this investigation aimed at researching the importance of EF for emotion recognition appropriate to certain situations in the preschool age, since both competencies emerge at this developmental stage. Sixty-eight 4 ½-year-olds were assessed using Emotion Recognition Questionnaire (Head Start REDI, 2004; Ribordy, Camras, Stefani, & Spaccarelli, 1988) and Dimensional Card Change Sort (Zelazo, 2006). We found that emotion recognition correlated positively with EF. However, in the regression analysis controlling for the effect of IQ and language, EF emerged as a marginally significant predictor, while language achieved significance. This investigation confirms previous findings showing the importance of language for emotion recognition (Rosnay, Pons, Harris, & Morrell, 2004) and point to the relevance of continuing to study the implications of EF for the recognition of emotions associated with certain situations.

Mind-Mindedness in an adult population: Appropriate (but not inappropriate) mental-state language relates to Theory of Mind understanding

Jessica Cotney, Lance Slade

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Previous research has reported robust links between maternal mind-mindedness, mental-state language and children's understanding of minds (de Rosnay &

Hughes, 2006). However, it is unknown how these may relate to understanding of minds in adults. To address this, this study investigated relations between mind-mindedness and theory of mind (ToM) performance in a sample of undergraduate students ($N = 40$, 29 females, mean age = 25.38). Minded-mindedness was operationalized in two ways: as the general proclivity to engage in mentalistic descriptions of others and as the tendency to use appropriate mental-state language when describing short clips of children and adults interacting. ToM was measured using a range of tasks (perspective-taking, faux-pas understanding, the "reading the mind in the eyes" task and self reported empathy). Participants also completed the Autism-Spectrum Quotient (AQ) to measure levels of autistic traits. There were no links between any measure of ToM and general proclivity to use mentalistic descriptions or use of inappropriate mental-state talk. In contrast, appropriate mental-state talk showed significant positive correlations with performance on perspective-taking and the eyes task. The AQ correlated positively with inappropriate mental-state talk (but did not correlate at all with appropriate mental-state language). Results therefore support an association between ToM understanding and mental-state talk but suggest that only the appropriate use of mental-state language is underpinned by individual differences in mentalizing ability. This research increases our understanding of adults that use appropriate mind-related talk and re-emphasises the importance of considering appropriateness in mind-mindedness research.

Number knowledge matters most: Explaining individual differences in primary arithmetic

Richard Cowan

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Explanations of the marked individual differences in primary school mathematical achievement and mathematical learning disability (MLD or dyscalculia) have involved domain-general factors (working memory, reasoning, processing speed and oral language) and numerical factors. Numerical factors range from single-digit processing efficiency to multi-digit skills such as number system knowledge and estimation. This study of Year 4 children ($N = 258$) finds both domain-general and numerical factors contribute independently to explaining variation in three significant arithmetic skills: basic calculation fluency, written multi-digit computation, and arithmetic word problems. Estimation accuracy and number system knowledge show the strongest associations with every skill and their contributions are both independent of each other and other factors. Different domain-general factors independently account for variation in each skill. Numeral comparison, a single digit processing skill, uniquely accounts for variation in basic calculation. Subsamples of children with MLD (at or below 10th percentile, $n = 29$) are compared with

low achievement (LA, 11th to 25th percentiles, $n = 42$) and typical achievement (above 25th percentile, $n = 187$). Examination of these and subsets whose difficulties persisted over a year supports a multiple deficits view of number difficulties: most children with number difficulties exhibit deficits in both domain-general and numerical factors. The only factor deficit common to all persistent MLD children is in multi-digit skills. These findings indicate that many factors matter but multi-digit skills matter most in primary arithmetic.

Multisensory processing for own-body perception develops until 10 years

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Work on adults and children has shown that multisensory information from vision, touch and proprioception is used to identify and locate the bodily self. The long period of physical growth from infancy to adolescence presents a challenge for this system. Using the rubber hand illusion we examine the changes in multisensory inputs to own-body perception from 4 to 13 years of age (4-5, 6-7, 8-9, 10-11, 12-13 yrs and adults, $n=30$ in each age group). In this paradigm, the participant views a fake hand while their own is hidden from view. The fake and real hands are stroked with a paintbrush. In a between-subjects design, stroking is synchronous or asynchronous, to provide congruent or incongruent visual-tactile information about hand position. Following this, hand location is measured using intermanual pointing, and the sense of body ownership is measured using questionnaire responses. We found that across the age range, children were as sensitive as adults to visual-tactile synchrony cues for hand position and hand ownership. Therefore, visual-tactile cues emerge early in childhood as an anchor for hand position and a sense of body ownership. These cues are used in a similar manner from 4 years through to adulthood. However, the use of purely visual cues concerning the hand gradually declines across the age range: regardless of synchrony cues, young children's pointing was more captured by the fake hand than adults. Therefore, young children rely heavily on vision for hand localisation, and this reliance declines steadily until adolescence. Together these findings demonstrate two dissociable processes underlying body representation in early life: an early-maturing visual tactile process controlling hand localisation and ownership, and a later-developing visual-proprioceptive process controlling localisation only. The results indicate significant developmental changes during this period which should be taken into account in discussions of the emerging self-concept.

Longitudinal study of scaffolding errors and their impact on children's strategy choice in reading

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Scaffolding errors (errors preserving the initial and final phonemes) have been found to be accurate predictors of children's later reading performance (c.f., Savage & Stuart 2001; Savage, Stuart & Hill, 2001). Therefore, in emergent reading it is expected that there would be a shift towards making greater proportion of scaffolding errors on words that the children are still reading incorrectly over time. It was also predicted that scaffolding errors would be associated with the greater use of lexical strategies as the boundary letters in a word can aid word recognition (c.f., Pitchford et al., 2008). Thirty-one children participated in the study. The study used a repeated measures design over one academic term with 15 children from Year One (mean age 5.8 years, SD =2.8 months) and 16 children were from Year Two (mean age of 6.7 years, SD=3.5 months). The children took part in single word reading task on five occasions and were asked to give a self-report of strategy use after reading each word. Children's reading errors were coded in line with the classifications by Savage and Stuart (2001). The children followed the predictions and by time five there had been a shift in errors made and they were making significantly more scaffolding errors than at time one. These scaffolding errors were also found to be predominately associated with the use of lexical strategies. This suggests that the children were making scaffolding errors by retrieving the word from memory. They were striving to be able to read the words by sight, but are not getting this correct on all occasions.

Cognitive control in solo and ensemble musicians

Lucy Cragg, Jennifer Roberts

University of Nottingham

Playing a musical instrument has been linked to a variety of cognitive benefits including enhanced cognitive control, the ability to regulate and manage thoughts and actions. This study investigated the additional benefits of playing within a musical ensemble, which places greater demands on monitoring and adjusting one's attention and performance. 165 musicians completed a musical history questionnaire and the attention and inhibition subscales of the Adult Temperament Questionnaire. They were also given a new questionnaire to measure their cognitive control within the context of a musical ensemble. Ensemble musicians had higher self-reported levels of attentional and inhibitory control. Attentional control, but not inhibitory control, was better in those who played more instruments or had played them for longer. It was also higher in those who reported being better able to control their playing

or singing within an ensemble. Attentional control did not differ between those who currently played in an ensemble and those who had previously played but now stopped. In contrast, inhibitory control was enhanced only in those currently playing in an ensemble. These findings suggest that singing or playing an instrument is related to increased attentional control. Playing in an ensemble is linked to increased inhibitory control, but only if maintained through regular practice.

Patterns of mathematics difficulties in very preterm children

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Previous research has found that children who are born early have difficulties in school with many academic subjects but show particular difficulties with mathematics. However this work has been unable to identify the nature of their mathematics problems due to a reliance on general standardized measures. This study aimed to identify specific areas of mathematics difficulty in very preterm (VP; < 32 weeks gestation) children. Eighty-seven VP children (aged 8-10 years) and 70 term-born peers, matched for age, gender and ethnicity, completed tasks measuring a range of mathematical skills. This included standardized measures of mathematical reasoning and arithmetic as well as experimental tests of numerical representations, factual, procedural and conceptual knowledge of arithmetic. Control children outperformed VP children on the standardized measures, counting tasks, number line estimation, speeded recall of addition facts and strategy use. However, there was no significant difference between the groups on symbolic and nonsymbolic comparison tasks, digit recognition or conceptual understanding. This work reveals that VP children's mathematics difficulties do not resemble a typical profile of dyscalculia, rather VP children appear to struggle with procedural and factual aspects of mathematics. It is therefore likely that VP children will benefit most from interventions which build on their areas of preserved abilities.

The development of perceptual and response interference control in mid-childhood

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Ignoring distractions involves a number of processes, including filtering out incoming perceptual information as well as suppressing the automatic tendency to respond to it. Research with adults has suggested that these are separable processes that rely on different neural circuits. Interference control, the ability to ignore distractions, improves throughout development yet

the extent to which this depends on overcoming perceptual and/or response-based interference remains unclear. In this talk I will present data from two studies which aimed to address this question using i) a flanker task and ii) a priming paradigm in which interference from irrelevant stimuli and competing responses could be dissociated. The patterns of results were task-dependent but showed different developmental trajectories for perceptual and response interference. This supports models from adult cognitive neuroscience which propose separate neural mechanisms for perceptual and response interference. Moreover, it suggests that these mechanisms may develop at different rates.

The inclusion of neutral primes in the priming study allowed facilitation effects to be studied alongside interference. Facilitation of response priming decreased with age, mirroring the changes in interference control. This suggests that the ability to benefit from helpful cues in the environment reduces during mid-childhood, and raises the possibility that greater susceptibility to interference in childhood may be a consequence of a greater capacity to learn from helpful cues in the environment. This idea will be discussed within the context of group and individual patterns of performance.

Does a mindfulness intervention improve children's attention skills?

Dominic Crehan, Michelle Ellefson

University of Cambridge

Mindfulness meditation practices (MMPs) have been applied to a variety of settings to promote heightened and receptive attention to moment-by-moment experiences. Previously published studies have investigated their effects on the alleviation of pain, anxiety and depression and the promotion of health and well-being in adults and children. This work has usually involved clinical populations; very few have investigated the effects of MMPs on children's cognitive or attention skills.

The current project investigates the influence of MMPs on three functionally distinct aspects of attention: alerting (sustained attention), orienting (selective attention) and executive attention (monitoring and resolving conflict). These areas are thought to influence children's cognition and learning. There is growing evidence that some cognitive skills can be improved through training interventions; however, it is not known whether MMPs will produce improvements. MMPs might be an appropriate practical, low-cost alternative for classroom- and lab-based interventions.

The current project is a quasi-experimental study examining the effects of MMP on children's alerting, orienting and executive attention abilities. Thirty 10-year-old children were randomly assigned to one of two groups. The difference between the groups was the timing of the intervention, either autumn or spring term. This wait-list design was used to

compare attentional gains as well as intervention timing. Mindfulness, alerting, orienting and executive attention were measured by the CAMS-R and ANT tasks. Data were collected at three time points to evaluate the intervention's impact and whether any cognitive or attentional gains were maintained post-intervention. After the intervention, there were significant improvements in executive attention in both groups, $F(1,28)=11.626$, $p<.05$, but the differences for the alerting and orienting measures did not reach significance. These gains were maintained for a short period after the intervention finished. Thus, there is some cognitive benefit of MMP interventions and further work should explore the effects of a longer intervention.

The development of spelling and reading strategies and children's sensitivity to word type

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Previous work, in reading and spelling, has examined global changes within young children's strategy choice supporting the application of the Overlapping Waves theory of cognitive development to non-algorithmic domains (Farrington-Flint et al 2008a, 2008b, Lindberg et al 2011). However there has been less consideration of developmental changes in word-specific orthographic representations and how this influences the choice of reading or spelling strategies within older children. The current work examined patterns in children's reading and spelling strategies across older age groups and across more complex word types incorporating a selection of regular (e.g. 'wedding') irregular (e.g. 'island') and nonword items (e.g. 'brinth') so as to consider changes in orthographic representations on later strategy performance. Sixty children, aged between 7-9 years, were given experimental reading and spelling trials and asked to provide retrospective verbal reports of the strategies that they employed. The individual reports were then analysed to code for patterns of lexical and non-lexical strategy choice across the two domains. Results showed that children were highly variable in the type of strategies they employ when reading and spelling but that reliance on particular strategies is dependent on year group and orthographic features of word type. As children become more sophisticated in their reading and spelling ability, they show greater adaptation when selecting appropriate strategies, which is sensitive to word type and reflects the development of the underlying orthographic representations.

Morphological spelling abilities in children with language impairment

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When spelling morphemes children with Specific Language Impairment experience particular difficulties with inflectional regular past tense and plurals and make frequent omission errors at text level (Mackie & Dockrell, 2004). Derivational morphemes have received less attention although phonological/orthographic shifts from the base word (Silliman et al, 2006) do appear problematic. Furthermore while previous work has suggested that it is reading ability and not oral language ability that is predictive of spelling (e.g. McCarthy et al. 2012) in language impaired children this has not been tested specifically for morphological spelling. The present study aimed to elucidate the inflectional and derivational spelling abilities of children with SLI using single-word spelling tasks and examined underlying oral language predictors. Thirty-three children with SLI (10-11 years), chronological age (CA) matches and a younger language and spelling age (LA) matched group (aged 6-8 years) were given 24 inflectional words and 18 derivational words. Analyses were conducted on the number of morphemes spelled correctly while spelling errors of the morphemes, were categorised as omitted, non-phonologically plausible or phonologically plausible. When spelling inflectional morphemes the SLI group and LA matches were similarly accurate and significantly worse than CA matches but there were no major differences in error type. However when spelling derivational morphemes the SLI group were less accurate and made more, less sophisticated errors than both control groups. Furthermore different oral language measures (phonological and morphological) related to and/or predicted inflectional and derivational spelling abilities across the three groups. The specific difficulty with derivational morphology and the mediating influence of reading between oral language and morphological spelling abilities are considered.

Coaches' perceptions on mental toughness and its development in an English Premier League soccer academy

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Mental toughness has been commonly construed as an important resistance resource during confrontations with stress and in times of adversity but is also important to sustaining effort and maintaining standards when things are going well. Researchers have begun to examine how mental

toughness develops but little attention has been afforded to those responsible for developing and preparing players for the psychological challenges of transition periods. Football academies are considered challenging and stressful environments that provide an ideal setting to understand mental toughness with less than 5% of academy players gaining professional contracts. The purpose of this study was to understand coaches' perceptions of mental toughness and its development in an English Premier League soccer academy. Semi-structured interviews were conducted with eight key coaching staff responsible for a range of different roles in the development of players. Interviews averaged 58 minutes with data recorded and transcribed verbatim. Each member of the research team independently analysed interview transcripts prior to meeting to discuss and agree emergent themes. Coaches perceived mental toughness in the academy setting to include focus on winning, single-mindedness, independence, discipline, self-assertion, self-confidence, physical toughness, resilience, and courage in the face of environmental adversity. Behaviours that characterised mentally tough players included high work rate, impression management, and consistent on and off-field behaviour. Staff reported organising environmental challenges to foster independence and resourcefulness as pivotal to developing mental toughness which was broadly similar to an autonomy-supportive approach to coach-athlete relations. Senior players were used as mentors for aspiring professionals. Attention to the psychological development of players was reported to be inadequately addressed in comparison to other aspects of performance (i.e., technical skill or physical conditioning). Consistent with previous studies concerning the development of mental toughness, coaches reported a greater emphasis on manipulating environmental factors rather than formal mental skills training.

Why is phonological awareness so important for early reading? An analysis of task demands

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Classic phonological awareness tasks (e.g., say "bat" without the "b") are highly predictive of reading ability. Different phonological accounts of reading implicate three aspects of phonological awareness tasks that drive this relationship; a) the linguistic nature of the stimuli (words or nonwords), b) the complexity of the stimuli (words can be segmented into phonemes), and c) the verbal nature of the response. Yet, it is uncertain which of these task characteristics drive the relationship with reading as they are typically confounded. We created a set of novel measures, based on the same task structures used in classic phonological tasks: the child either isolates, repeats or deletes sounds from a sequence. For each structure, we created matched tasks with

linguistic or non-linguistic stimuli (a sequence of phonemes vs. pure tones), with complex or simple stimuli (words vs. individual phonemes), and requiring a verbal or nonverbal response (spoken or touch-screen response). We aim to use these novel measures to isolate the separate influence of each task characteristic on children's ability to decode written text. Tasks were administered to 570 Year 2 children along with standardized tests of regular word and nonword reading. Structural equation modeling was used to compare the influence of each task characteristic. Both linguistic and non-linguistic stimuli significantly predicted reading. Similarly, both complex and simple linguistic stimuli were predictive. However, nonverbal response type did not predict unique variance, over and above the influence of verbal response type. We hypothesise that the prediction of reading by phonological tasks is driven by the verbal nature of the response and not the linguistic nature or complexity of the stimuli. Findings highlight the importance of phonological output processes to early reading skills.

Why can't children innovate tools?

Nicola Cutting, Clare Williams, Ian Apperly, Jackie Chappell, Sarah Beck

University of Birmingham

Children have great difficulty in innovating simple tools to solve novel problems. The majority of children under 8 years fail to make a hook by bending a pliable wire to retrieve a bucket from a tall tube. In two studies we investigated this problem solving difficulty by exploring which elements of tool innovation are particularly difficult for 4- to 7-year-olds.

In experiment 1 (N=58) half of the children first chose between a hook and a straight pipecleaner to retrieve the bucket, while the remaining children did not participate in this phase. All children were then given an innovation version of the task requiring them to bend a straight pipecleaner into a hook. The vast majority (90%) of children chose the hook first (binomial, $p < .001$) in the choice experiment and all children used the hook to retrieve the bucket, demonstrating an understanding it was the required tool. Children were more successful in innovating a hook if they had previously chosen and used one ($p < .001$, Fisher's Exact).

In experiment 2 different aspects of tool making were highlighted to children (N=110). Properties of the materials were highlighted to half of the children through bending practice prior to engaging with the innovation task. If unsuccessful on the innovation task, children were shown a readymade pipecleaner hook. Older children successfully innovated a hook after seeing the target tool only if they received bending practice, ($p = .002$, Chi square). Older children without bending practice and all younger children performed at floor.

Together these experiments suggest that young children's difficulty is not the result of a simple lack of knowledge. Children's difficulty on tool-innovation tasks is likely to be due to their ill-structured nature. Tool innovation is difficult due to the need to bring to mind the relevant knowledge and then coordinate that knowledge into a useful solution.

Children's handling of epistemic and physical uncertainty: Are children's guesses confident?

Catherine Darnell, Sarah Beck

University of Birmingham

Children's handling of uncertainty is dependent of the type of uncertainty being presented. Under physical uncertainty (when an event has yet to happen) children acknowledge that there are multiple possibilities, yet under epistemic uncertainty (when the event has occurred but remains unknown) they behave as if they 'know' the outcome (1). They also prefer to guess under epistemic uncertainty (2). The imagination account suggests this 'sureness' under epistemic uncertainty is driven by a feeling of confidence caused by children mistaking a vividly imagined outcome as true (3). We tested this prediction by asking children to rate explicitly how confident they felt whilst guessing what number a die would land on both before (physical) and after (epistemic) it was rolled. In Experiment 1, 92 5-7 year olds were allocated to either a rating or non-rating group, where only the latter rated confidence (on a 4-point scale). After 2 epistemic and 2 physical trials children were allowed to choose when they would like to guess. Within the non-rating group, a preference for guessing under epistemic uncertainty was found ($p < 0.001$). However, the rating group showed no preference ($p = 0.25$) and no difference in confidence ratings between epistemic and physical trials (ANOVA, all $p > 0.25$). In Experiment 2 (N=121), the numbers of trials were reduced (1 epistemic, 1 physical and 1 choice trial) as repeatedly rating confidence may have inadvertently removed any preference by repeatedly reflecting on their confidence. Indeed, a preference for guessing under epistemic uncertainty was found both within the rating ($p = 0.005$) and non-rating group ($p = 0.05$). However, again children demonstrated no difference in confidence ratings between epistemic and physical trials (ANOVA, all $p > 0.37$). Against the predictions of the imagination account, children were no more confident under epistemic than physical uncertainty. Thus, children's preference for epistemic uncertainty is not driven by feelings of explicit confidence.

Lessons from modelling serial and free recall

Eddy J. Davelaar

Birkbeck, University of London

In recent years, researchers have highlighted how despite similarities between serial and free recall

procedures, the performance patterns are very different. One line of inquiry is the search for procedural different cognitive processes triggered by the procedures. Results from that approach suggest that performance differences are due to procedure-dependent retrieval processes. Another line of inquiry leads to the view that the same processes are used in both serial and free recall, as when confounding variables are controlled for, the two procedures produce identical results. In this talk, I will argue that both approaches are not to be pit against each other and instead provide evidence that constrain formal models of episodic memory. I will illustrate this influence by showing how a model of free recall is updated to account for serial recall. In this process of theory development, the theory provides answers to such thorny questions as why it is beneficial to maintain multiple items and why there a strong upper limit to working memory capacity: answers that have hitherto not been provided using formal models of episodic memory.

Can music improve pro-sociality and problem solving?

Rie Davies, Madeleine Ohl, Anne Manyande
University of West London

This study replicates the original research by Kirschner & Tomasello (2010) who reported that music significantly improved pro-social behaviour. The current study sought to identify the effects of music making on both pro-social behaviour and problem solving in four year old children. Twenty-four pairs of boys and girls were randomly assigned into either a 'Music' or 'No music' condition. The children were filmed and assessed while playing two games specifically designed for the purpose (Kirschner & Tomasello 2010) and additional observations were made in order to test for problem solving abilities. Data were analysed using the Pearson's chi-square test. Sex differences were also investigated for all three abilities. Results demonstrated that music making improved helping behaviour in children ($\chi^2(1) = 10.97, p < .01$), particularly in girls ($\chi^2(1) = 7.54, p < .05$), however, further investigation is required to determine levels of helping behaviour in boys. Music making was found to improve cooperative behaviour in children of both sexes ($\chi^2(1) = 4.20, p < .05$), particularly in boys ($\chi^2(1) = 10.88, p < .001$). Problem solving behaviour did not achieve significance, although odds ratios suggest that boys were four times more likely to problem solve after music making. This suggests that there may be a possible evolutionary link between vocalization and problem solving through spatial reasoning skills. Findings are discussed in the light of recent theories from Evolutionary Musicology and sex differences found in the results lead to the proposal of a gender specific theory of music evolution.

Does the strength of orthography-to-semantics connections predict the size of the age-of-acquisition effect in word naming?

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There is increasing interest in individual differences in the reading performance of typically developing adults. We focused on word naming and (1) whether the effect of item attributes (like age-of-acquisition, AoA) on naming latencies varied among typically developing readers (2) whether that variation could be explained by variation in the characteristics of the reading system, in particular, the strength of orthography-to-semantics (OS) mappings.

To examine OS mappings, we asked 71 adults to perform semantic category judgments to word stimuli in a task based on the Bowers, Davis, & Hanley (2005; JML, 52, 131-143) 'hat in that' test. We presented 119 critical and 119 filler targets. Items belonged to eight categories and category labels were presented prior to targets. The critical items were letter strings (supersets e.g. that) that included smaller words (subsets e.g. hat). The key comparison was between the incongruent condition, where the superset did not but the subset did belong to the category (e.g. clothing - t(hat)), and the congruent condition, where both the superset and the subset words did not belong (e.g. clothing-t(horn)). Readers are usually slower to categorize targets in the incongruent condition.

The effect of congruity in the categorization task suggests that readers are able to access semantics directly from orthography. We were interested in whether the size of that congruity effect interacted - in the same readers - with the effects of item attributes in word naming. Naming latencies were faster to more frequent, earlier-acquired, words for a sample of 410 items. Critically, the AoA effect (later-acquired words elicit slower RTs) was stronger for participants exhibiting stronger congruity effects in categorization. We suggest this interaction links the AoA effect to the strength of OS mappings. Our findings show how experimental reading tasks can be combined to probe individual differences in the architecture of the reading system.

Does reliance on phonological coding in visual word recognition diminish through reading development from childhood to adulthood?

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There is increasing interest in individual differences among typically developing readers. We focused on visual word recognition and variation in reliance on phonological coding to access the lexicon. In the lexical decision task, participants must distinguish between letter strings that are words or made-up

nonwords. It is more difficult to distinguish letter strings as nonwords if they can be pronounced to sound the same as real words. This pseudohomophone effect indicates the automatic activation of phonology following orthographic processing of a letter string. Such activation implies a reliance on orthography-to-phonology-to-semantic mappings for lexical access. Recent connectionist simulations suggest we should expect to see readers rely increasingly less on phonological coding and more on direct orthography-to-semantic mappings as they develop.

We examined the possibility that reliance on phonological coding diminishes through development in a comparison of 140 typically developing readers aged 9 to 51 years. We presented 60 critical words, 60 pseudohomophones, 60 non-pseudohomophonous nonwords (non-PSH nonwords), and 60 filler words. Non-PSH nonwords were matched to pseudohomophones, and words were matched to nonwords, on length, orthographic neighbourhood size and bigram frequency.

Lexical decision responses were slower and less accurate to pseudohomophones compared to non-PSH nonwords. Younger readers were slower and less accurate than older readers. The pseudohomophone effect on response latencies was not modulated by age, word or nonword naming skill. However, the pseudohomophone effect on accuracy was (1.) significantly smaller for older readers but (2.) significantly larger for readers more skilled in word naming. Adult word recognition speed shows a reliance on phonological activation, similar to that seen in children, when readers encounter new words (as in nonwords). However, increased experience diminishes the impact of phonology on the accuracy of distinguishing words from nonwords while increased word naming skill means, sometimes, that nonwords will incorrectly be accepted as words.

Semantic interference effects during rapid visual perspective-taking: An ERP study

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Theory of Mind (ToM) denotes our ability to understand the mental states of others. fMRI investigations have identified specific brain regions that are active during ToM judgements; however, temporal information is critical to our understanding of how different cognitive and neural processes interact to allow us this ability in real time. Through the recording of event-related-potentials (ERPs), the aim was to extend previous findings, where we evidenced multiple ToM processing stages in a single study of visual perspective-taking (VPT; McCleery et al., 2011). In this study, we replicated our previous ERP effects in

a middle latency component peaking between 350 and 425ms over temporal-parietal cortex that indexed sensitivity to whether participants judged their own perspective or that of a cartoon avatar. In addition, we also identified a broad central ERP component peaking at approximately 400ms which exhibited effects of semantic interference, including sensitivity to both semantically matching versus mismatching stimuli and the consistency of self versus other perspectives. The latter finding is consistent with automatic semantic interference effects in perspective taking. These results provide further evidence that posterior ToM network activity is involved in the early social-cognitive calculation of visual perspectives, rather than visual attention.

“The World of the Veggiefruties”: Increasing children’s fruit and vegetable consumption

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Worldwide the number of overweight children rises dramatically. One way to prevent overweight is by creating healthy eating habits from a very young age. This talk presents an intervention designed to improve children’s diet via likable characters and interactive shared reading.

“The World of the Veggiefruties” is a health intervention program intended to stimulate young children (4-6 years old) to taste and eat more fruit and vegetables. The intervention is based on a 4-year research project conducted at the University of Amsterdam and Radboud University Nijmegen. The intervention is developed in collaboration with Bitescience and with support from the Dutch Science Foundation. It will be launched in 2014 in the Netherlands and the United States.

“The World of the Veggiefruties” makes fruit and vegetable consumption more appealing through storytelling methodologies. Specifically, a group of animated animal characters—the Veggiefruties—who love to eat fruit and vegetables come to life in stories via a multimedia environment (ebooks, app, and interactive website). The main principles of the project are: character-product congruence, interactive shared reading, message relevance, character bonding, and product tasting. During the BPS symposium, we will discuss these principles based on our 4-year research project in which we explored whether and how children’s fruit and vegetable choices can be stimulated by cartoon characters. We will also present our plans for the school intervention and home intervention.

Adults' knowledge of children's symbolic development, in typical and atypical conditions

Paola De Fabritiis

Assacci, Italian Association for the study of Callosal Anomalies and InGenio-Regione Lombardia

Adults' knowledge of child care practices has been investigated widely, while adults' knowledge of typical and atypical symbolic development has been relatively overlooked. This work aims at ascertaining what lay people know about developmental milestones in language and drawing, and about possible influential factors.

Seventy-three Italian adults, were administered a semi-structured interview with open questions and probes, regarding typical and atypical acquisition of linguistic and graphic representational abilities. Answers were coded with respect to behaviour indexes and influential factors.

To summarize the results, respondents' knowledge varied significantly according to the developmental condition and phenomenon to be considered, revealing to be much poorer for graphic development than for typical language development. Causal attribution also varied according to developmental condition and phenomenon, suggesting that typical development is explained more by inner, or spontaneous developmental processes, whereas atypical conditions are more often explained either by environmental or by organic factors processes.

The result concerning limited adults' knowledge about developmental phenomena is not new: that knowledge is little influenced by adults' direct experience with children, e.g. parenthood (see Goodnow, 1989). Nor it is new the discrepancy between adults' explicit representation of developmental processes and adults' informal educational practices (Bornstein, 2001, Girolametto et al, 2003). However, these results are the first ones allowing to compare adults' representation of different areas of children's symbolic acquisition. It seems remarkable that even 'artifact' production like drawing is not conceived as a form of cultural literacy, especially in a high iconic cultural system like westerner, something children would not engage if unprompted. Further cross-cultural studies should be needed as we are far from understanding the relation between adults' representations and practices. Nevertheless, these results could be useful to understand how to better plan experimental educational interventions, as they inform us about the cognitive scenario to move from.

The key corpus callosum role is developmental rather than functional. Evidence from a longitudinal study of a single case with congenital callosal malformation

Paola De Fabritiis

Assacci, Italian Association for the study of Callosal Anomalies

The relation between cognitive functions and corpus callosum (CC) is attracting a renewed interest. Much is known about the role CC plays in warranting inter-hemispheric transfer, which is dramatically disrupted in split-brains. Seminal studies pinpointed to a further role of CC: it would allow for the acquisition of higher cognitive skills at an optimal level (Dennis, 1981). In support of this view, cases with isolated congenital callosal malformation (AgCC) and normal IQ were documented to perform suboptimally in different cognitive areas with distinctive developmental rates (motor, morpho-syntactic, pragmatic skills, see Brown et al., 2005).

This developmental pattern draws attention on the CC's role in modulating cortical development in relation to experience and developmental demands (Caleo et al., 2007, Hinkley et al. 2012), maybe implying its involvement in initial phases of cognitive acquisitions.

Such a view is the theoretical frame of the present work. From 19 cases with isolated AgCC and some clinical signs, a single case with normal IQ, seemingly asymptomatic was selected and assessed at 12 and 15 years. Overall results confirmed that CC malformations yield multiple, rather than focal, and often subclinical, rather than frank, deficits, emerging with the predicted rates. Differently from split-brains, inter-hemispheric transfer was not impaired but persistently sub-optimal, likewise motor coordination, which nevertheless improved along development. The boy was informally reported to suffer from reading deficits from 10 years. The assessment at 12 revealed serious deficits in reading and morpho-syntactic tasks and mild pragmatic deficits. However, two years later, without rehabilitation, reading and morpho-syntactic impairments were largely compensated, pragmatic performances stayed lower than controls but not saliently.

Results are discussed on the basis of Dennis' model on CC function, and it is also underlined that AgCC is a high risk condition, exactly because of the crucial role of CC in modulating brain development.

Adults' knowledge of risk and protective factors and possible remediation for developmental dyslexia

Paola De Fabritiis, Cristina Guarnaccia

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Research advances in the study of developmental disorders such as dyslexia (DD) are widely acknowledged and often covered in popular, non specialist, newspapers. On the contrary, it is largely unknown what sort of information lay people hold about developmental reading disorders, which might aid their recognition, management or prevention (Hinshaw, Cicchetti, 2002).

Thirty-six parents and 30, non-parents Italian adults, were administered a semi-structured interview with open questions and probes, regarding typical development and dyslexia. Answers were coded with respect to behaviour indexes, possible causes and treatments in DD.

Results suggests that people's knowledge of DD reveal scarce and confused. 20 % of adults could not answer as 'they had no idea', 45 % gave incorrect answers, stating that DD is a difficulty in pronouncing sounds in spontaneous speech, only 12 % of them can properly identify dyslexia as a reading impairment. As to possible causal factors, respondents mentioned biological 'brain-related' damages more frequently than individual differences or inappropriate adult-teacher stimulation (34 %, 23% and 8% respectively). Early book reading was never mentioned as a protective factor, whilst it was conceived of as an adequate practice only for 'endowed children' to widen further their vocabulary (0% vs. 10% in dyslexia and talented children, respectively). Interventions focusing on language were not mentioned, whilst interventions on mood problems were considered. As misconceptions about risk factors for DD and poor knowledge of professional intervention were common in parents and non-parents, the opportunity to better disseminate scientific information about reading development is discussed. Cross-cultural studies could also deserve further investigation.

Interhemispheric transfer and pragmatic abilities in developmental dyslexia

Paola De Fabritiis, Cristina Guarnaccia

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Inter-hemispheric transfer (IHT) difficulties are often documented in developmental dyslexia (DD), both at behavioural and anatomical level. Two lines of evidence are available, lending support to the hypothesis that the corpus callosum, the major structure connecting the hemispheres, might be involved in DD. On the one hand, DTI and fMRI studies, show that callosal connectivity is disrupted

in DD (von Plessen et al. 2002), likewise, some studies on IHT tasks involving non-verbal stimuli, attest to inefficient transfer in DD, either too fast or too slow (Davidson et al. 1990). On the other hand, children with congenital callosal malformation, i.e. callosal agenesis (AgCC) have been described to share phonological and reading impairments with DD children (Temple et al., 1990).

However, AgCC is a condition in which not only IHT is permanently inefficient but also the abilities to infer non literal meaning, i.e. pragmatic abilities, are affected, emerging as salient deficits from the second decade of life (Brown et al., 2003).

This study verifies the coexistence of IHT and pragmatic deficits in a sample of preadolescents with DD. 18 children with DD (mean age =134 months) and 29 controls were administered routine reading tests, a tactile IHT test, and three pragmatic tests of increasing difficulty: idiom, verbal and visual metaphor comprehension tasks (de Fabritiis et al., 2005). Results showed that DD children performed worse than controls in the tactile task. In pragmatic tasks, controls scored higher than DD, however differences did not reach statistical significance in the easier task (verbal metaphor), but did so in the pragmatic tasks that takes longer to be mastered.

Results are discussed on the basis of recent works that credit the CC with a developmental function, as it modulates cortical development in relation to experience and developmental demands (Caleo et al., 2007, Hinkley et al. 2012).

Motor activation during action observation: The effects of visual, motor, and visuomotor experience

Carina C.J.M. de Klerk, Mark H. Johnson, Victoria Southgate

Birkbeck College, University of London

Although perceptual-motor couplings have often been assumed to be innately specified, recent studies with adults suggest that they may instead develop through associative learning during the simultaneous observation and execution of actions (ASL hypothesis, Heyes, 2010). However, these studies do not provide direct evidence for the hypothesis that associative learning also underlies the initial formation of perceptual-motor couplings in the infant brain. In this talk we will present the results of a study investigating how visual, motor, and visuomotor experience with a novel action influences infants' sensorimotor cortex activation when they observe others perform the same action.

Thirty 7-9-month-old infants were encouraged to perform stepping movements on a special infant treadmill while they either observed their own real-time leg movements (contingent training), or the previously recorded leg movements of another baby (non-contingent training). Infants in the control group did not receive any training. Before and after the training or control period we measured the

infants' sensorimotor alpha suppression (6-9Hz) when they observed videos of other infants' stepping actions. We found that all groups showed more sensorimotor cortex activation at post- than pre-test. However, we found no differences between the groups, suggesting that the visual experience of the pre-test alone was sufficient to result in sensorimotor cortex activation. These results suggest that, sometimes, visual experience alone can result in greater sensorimotor cortex activation during action observation

Visual experience facilitates action prediction in 7-9-month-old infants

Carina De Klerk, Mark Johnson, Victoria Southgate
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A popular idea in cognitive neuroscience is that in order to predict others' actions observers need to map those actions onto their own motor repertoire. If this is true, adults and infants should be unable to predict actions for which they have no previous motor experience. However, recently it has been suggested that observational experience might facilitate prediction and shape the sensorimotor regions of the brain in a similar manner as physical experience does (Cross et al., 2009). In this talk we will present evidence for this idea from looking time and electrophysiological studies with 7-9-month-old infants.

In one study we compared looking times when infants were predicting visually familiar and unfamiliar actions, i.e. upright and inverted stepping actions. To measure prediction we used an occlusion paradigm in which videos of the upright and inverted stepping actions were briefly occluded followed by either a correct (time-coherent) or an incorrect (time-incoherent) continuation of the action. Preliminary analyses demonstrated that infants looked significantly longer at the incorrect compared to the correct continuations of the upright but not the inverted stepping actions. As the infants in this study were not walking yet, this suggests that visual experience alone can be sufficient to accurately predict an ongoing action. We will also discuss the results of electrophysiological studies investigating the neural mechanism underlying action prediction. These studies demonstrate that the sensorimotor cortex is involved in predicting events, irrespective of the infants' motor experience with these events.

Embodied decision-making? Choosing optimal visuomotor strategies in childhood

Tessa Dekker, Marko Nardini
University College London

In everyday life children continuously encounter risks when making perceptual-motor decisions, from deciding when to cross a busy road to aiming where to kick a ball in a well-guarded goal. Such risky decisions involve an interplay between children's awareness of their own developing

sensorimotor skills and "cost" variables linked to their action outcomes. How embodied decision-making develops is currently unclear, but sub-optimal visuomotor strategies could contribute to the high rates of childhood accidents. To study the development of visuomotor decision-making under risk, we employed an economic decision-making framework that describes adults' behavior in a rapid pointing task (Trommershäuser et al., 2003). We asked 6- to 11-year-old children and adults to earn points by rapidly touching a target on a screen, whilst avoiding a partially overlapping penalty region. Values assigned to penalty and target regions and spatial configurations of those regions were varied. To choose the aiming point that would maximize gain for each condition, subjects must combine information about the reward structure with information about their own visuo-motor uncertainty. In line with previous findings, adults chose movement strategies that came close to maximizing expected gain in response to changes in penalty location and size. While children changed their strategy when the gain-landscape was varied, they made choices that were far from optimal and could be described as risk seeking, even at 11 years. Children of all ages significantly under-corrected for their own visuo-motor uncertainty, consistent with overconfidence in their own precision and underestimation of negative outcomes. As a result, they scored lower than they could have in the most challenging condition, given their visuomotor abilities. This suggests that the ability to take visuomotor uncertainty into account when maximizing gain in a rapid visuomotor task takes a surprisingly long time to develop, and continues to mature until after age 11 years.

Resting quietly after learning boosts memory over the long term

Michaela Dewar
University of Edinburgh

The degree to which new memories endure over the long term is dependent upon many factors, divided broadly into encoding, consolidation and retrieval. Psychologists have explored in detail how cognitive conditions during encoding and retrieval affect memory retention, manipulating e.g. levels of processing and context specificity.

Consolidation, the stage that occurs following encoding, has received considerably less attention. However, consolidation could also be affected by cognitive conditions, and this could impact memory retention.

Research suggests that sleep provides favourable conditions for consolidation, leading to improved memory retention. But it is likely that new memories have to be consolidated during wakefulness as well, not least to preserve them for later sleep-related consolidation. In this age of information overload we are often bombarded with

stimuli during wakefulness. Does this impede the consolidation of recently acquired memories?

I will discuss work from our lab showing that people remember new information better if they rest quietly for a few minutes immediately after new learning (minimal sensory stimulation) than if they attend to other new material immediately after new learning (sensory stimulation). Moreover, I will show that this memory boost via minimal sensory stimulation is long-lived, persisting for at least 7 days. I will discuss these findings with reference to 'offline replay', proposing (i) that new memory traces can be replayed more often during conditions of minimal sensory stimulation than during conditions of sensory stimulation, and (ii) that long term retention is affected substantially by the cognitive activity that occurs shortly after new learning.

Can children with language impairments explain actions in terms of intentions?

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Children's ability to explain actions in terms of people's intentions to achieve particular outcomes (e.g., He took out a pencil because he wanted to draw) involves a complex interplay between linguistic and socio-cognitive development. The study reported here investigated whether children with language impairments are able to produce these "intentional mode" explanations. An elicited production task was presented to two groups of 5- to 7-year-old children: a group with primary language impairments (LI) and a typically developing group (TD). The children were shown pictures of an action and an outcome and were asked to answer why questions, to complete and imitate because and so sentences and to produce full causal sentences. When the LI group attempted to produce intentional mode explanations, they made significantly more errors than the TD group. This finding was as expected, since producing well-formed intentional mode explanations is linguistically demanding. In addition, the LI group made significantly fewer attempts at producing intentional mode explanations than the TD group (irrespective of whether or not these attempts were linguistically well-formed). This apparent reluctance to try to explain actions in terms of intentions is perhaps surprising in the light of evidence that understanding of intentions plays a salient role in development from infancy onwards (Tomasello, Carpenter, Call, Behne & Moll, 2005). On the other hand, our findings are consistent with evidence suggesting that although the deficits that characterise language impairment are by definition primarily linguistic, they may sometimes be associated with subtle deficits in social understanding (Farrant, Fletcher & Maybery, 2006). Nevertheless, almost all the children in the LI group made at least occasional attempts at producing

intentional mode explanations. This has important practical implications in that it identifies a foundation from which intervention could build.

Decision making under risk conditions in adolescents: The role of probabilistic reasoning ability

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Despite making advantageous decisions under risk conditions (i.e., in situations with explicit and stable rules for gains and losses as well as fixing winning probabilities) seems to be related to cognitive ability (e.g., Brand et al., 2006), no studies have yet explored the underlying cognitive mechanisms that could play a role in regulating this relationship. The aim of the present study was to ascertain the mediation role of probabilistic reasoning ability in regulating this relationship among adolescents.

Participants were 282 high school students (77% Males, Mean Age = 16.78 years, *SD* = 1.50). The *Game of Dice Task* (GDT, Brand et al., 2005) was administered to measure decision making. Participants were instructed to maximize a starting capital of 1000€ within 18 throws of a single die. Before each throw, they had to choose between four alternatives: a single number, or combinations of two, three, or four numbers. If the number thrown corresponded to the number chosen or was included in the combination selected, they earned a specific amount of money, otherwise they lost the same amount. The first two options had the lowest winning probability and were related to the highest amounts of gain/loss. The last two options had the highest winning probabilities and were related to the lowest amounts of gain/loss. A net score was calculated so that higher scores corresponded to advantageous decision making. Participants also completed the *Set I* of the *Advanced Progressive Matrices* (APM-Set I; Raven, 1962; Chiesi et al., 2012) and the *Probabilistic Reasoning Questionnaire* (PRQ, Chiesi et al., 2011).

Results evidenced that probabilistic reasoning ability mediated the relationship between cognitive ability and decision making, i.e. cognitive ability was positively related to normative probabilistic reasoning, which in turn increased advantageous choices.

The findings suggest practical implications to promote advantageous decision making under risk among adolescents.

Preschoolers' episodic future thinking skills

Tsyvata Donova, Teresa McCormack, Aidan Feeney
Queen's University Belfast

Three experiments examined the development of episodic future thinking: the ability to think ahead about novel future situations (Atance & O'Neill,

2001). Each experiment used three novel tasks similar to the Blow Football task used by Russell, Alexis and Clayton (2010). In each there was a different tabletop divided into two sides.

Children played a game on one side of a table, and then were asked to choose a tool to play with a similar game on the other side of the table the next day. For example, children used a toy fishing rod to catch magnetic fish on one side of the table; playing the same game from the other side of the table required a different type of fishing rod. At test, children chose between 2 or 3 tools: a) the tool they used today, b) the tool suitable for the other side and c) a distractor tool, which was not suitable for either side.

In Experiment 1, 24, 4-year olds selected 1 out of 2 tools for tomorrow. Children selected the correct item above chance level in all tasks ($p < 0.001$).

In experiment 2, in which children were not allowed to look at the apparatus when choosing, 21, 3-year olds selected 1 out of 2 tools for tomorrow. This group also selected the right tool above chance level ($p < 0.001$).

The results for Experiment 1 and 2 imply that 3- and 4-year olds might indeed show episodic foresight. However, they could also have also selected the right tool by default. To control for this a third tool distractor was introduced in Experiment 3. This time, 3-4 year olds did not perform above chance level, suggesting that there is an alternative explanation as to why they performed so well in the previous two experiments.

Linguistic and cultural effects on counting and number understanding; the case of Hong Kong

Ann Dowker, Winifred Mark

University of Oxford

The relative transparency of the Chinese counting system has been used to explain Chinese students' relative superiority in cross-cultural comparisons of mathematics achievement. It is difficult, however, to tease apart linguistic and general cultural effects. Hong Kong provides an opportunity to compare children within the same culture who attend Chinese medium versus English medium schools.

Three groups of primary school children with varying degrees of exposure to the Chinese language and counting system were tested. They included 56 UK pupils with no exposure to Chinese; 50 Hong Kong children attending a Chinese medium school, who spoke Chinese both at home and school; and 51 Hong Kong children attending an English medium school, who spoke English at home but Chinese at school. Each language group was further divided into a younger group (mean age 6.85) and an older group (mean age 8.8). They were given counting tasks where they counted aloud from 1 to 30, and then backwards from 30 to 1; Arithmetic (British Abilities Scales Basic Number Skills test); and a 2-digit number comparison task.

Analyses of variance showed that Hong Kong Chinese medium school pupils were better at Arithmetic than Hong Kong English medium school pupils, who were in turn better than the UK pupils ($F(2, 132) = 41.98, p < 0.001, \eta^2 = 0.29$; post hoc tests showed all group differences to be significant). Chi-square tests showed significant school effects in the same direction on Backward Counting in both younger children ($X^2(2, N=73) = 9.45, p = 0.009$) and older children ($X^2(2, N=66) = 7.14, p = 0.028$). For Forward Counting, only the older group showed a significant effect of school ($X^2(2, N=66) = 9.82, p = 0.007$). There were no differences between schools on 2-digit Number Comparison. We discuss implications for linguistic and cultural effects on mathematical development.

Mathematics attitudes, implicit and explicit anxiety and performance in an undergraduate sample

Ann Dowker, Sarah Parker

University of Oxford

56 Oxford University undergraduates, 28 male and 28 female, aged between 18 and 22 participated in this study. 14 of each sex were studying arts subjects and 14 science subjects. They were given an arithmetic test: Test 2 of Hitch (1978)'s Tests of Numerical Abilities, which measures fraction and decimal arithmetic. They also answered several questionnaires about their attitudes to mathematics: Aiken's (1974) Mathematics Enjoyment scale; a modified version of the Fennema-Sherman Mathematics Attitude Scale (Doepken, Lawskey & Padwa, 2009) and Evans' (2000) Situational Attitude Scale. They were also given a dot probe task, constructed for the purpose, which involving pairs of neutral words, positive-neutral word pairs, negative-neutral word pairs, and mathematical-neutral. The target words were the maths-related, negative or positive words in the maths-related-neutral, negative-neutral and positive-neutral word pairs and a randomly assigned neutral word in the neutral-neutral word pairs. Analyses of variance, with gender and subject type as the grouping factors, showed no gender differences in maths performance or attitudes towards maths were observed. Subject type was a significant factor: those who studied science subjects performed better on the maths test showed more positive attitudes to maths than those who studied arts subjects. Correlational analyses showed that maths performance was positively related to considering maths as useful and negatively to explicit maths anxiety. The implicit maths anxiety test did not predict mathematical performance or explicit attitudes. Further research should investigate whether it might predict performance and attitudes in a less selected group with lower mathematical achievement and/or higher mathematics anxiety. The lack of gender differences contrasts with findings in early studies but is consistent with those in more recent studies.

Are early neurophysiological markers of ASD syndrome-specific? Preliminary results from a cross-syndrome study

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ASD is a neurodevelopmental disorder characterised by impairment of social interaction and communication. It is not diagnosed until age two or three. As a consequence, little is known about the early development of autism. The British Autism Study of Infant Siblings (BASIS) has begun to bridge this gap by studying younger siblings of children already diagnosed with ASD (*Sibs*), 20% of whom will go on to an autism diagnosis. Their goal is to identify early markers of autism. However, before a measure can be said to be an early marker of ASD, it is crucial to determine whether it is syndrome-specific.

To determine whether BASIS measures yield syndrome-specific or syndrome-general findings, other genetic syndromes (39 infants/toddlers with Down syndrome (DS), 12 with fragile X syndrome (FXS), and 33 with Williams syndrome (WS)) were tested on the same battery of tasks. Here we present preliminary event-related potentials data from one of these tasks – *speech/pitch discrimination*. Sounds were presented oddball: 70% of the sounds were /u/ vowels (standards), 15% were /u/ vowels with a different pitch to the standards (pitch deviants) and 15% were /i/ vowels with the same pitch as the standards (speech deviants). The data were compared with data from 37 *Sibs* and 25 controls.

The usual P150 and mismatch negativity (MMN) brain responses to speech and pitch deviants were abnormal in all experimental groups, reflecting atypical sound encoding and discrimination. The P3a component (attentive orientation) in response to speech deviants was attenuated in both FXS and *Sibs*, reflecting reduced attention to speech changes. However, unlike FXS, *Sibs* were able to discriminate speech deviants albeit atypically. These data are preliminary, but they hint at the identification of an early marker of autism, one that occurs as early as 14 months of age and is syndrome-specific.

Social and non-social choices in relation to Autistic traits

Indu Dubey, Danielle Ropar, Antonia Hamilton
University of Nottingham

It is commonly observed that children with autism avoid eye contact, and a recent theory suggests that the motivation to socially engage with others is reduced in autism (Chevallier, Kohls, Troiani, Brodtkin & Schultz, 2012). However, there are currently no simple behavioural ways to test these

claims. The aim of this study was to determine if social motivation can be evaluated and if the social motivation is related to the autistic traits assessed by the Adult Autism Spectrum Quotient (Baron-Cohen, Wheelwright, Skinner, Martin & Clubley, 2001) in the typical population. Fifty typical adults were given a behavioural paradigm to evaluate their preference for social (direct gaze), social (averted gaze), and non-social video clips in relation to the cost (number of mouse clicks) required to watch each. The results showed that the typical adults prefer to watch social stimuli over non-social stimuli and also prefer to watch stimuli requiring fewer clicks. Typical adults also prefer direct-gaze videos to averted gaze videos. The preference for social stimuli was weaker in participants with higher levels of autistic traits, measured on the autism spectrum quotient. The preference for direct gaze was not related to autistic traits. Overall, our study shows that social motivation can be quantified using a straightforward behavioural paradigm, and that social seeking behaviour follows typical economic principles used for any other appetitive stimuli. Our data also demonstrate important links between autistic traits and social motivation, which we aim to follow up in future studies.

Effectiveness of a combined reading and language intervention for children at-risk of dyslexia

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Interventions for children at family risk of dyslexia have, to date, been delivered before the onset of formal reading instruction, and tend to show short-term effects on phoneme awareness and letter-sound knowledge but limited transfer to reading. We report a randomised controlled trial of an intervention delivered to 56 6-year-olds at risk of dyslexia, owing to family risk and/or pre-school language impairment. The intervention was delivered on a daily basis by trained teaching assistants and combined a phonics-based approach to teaching reading with training in oral language (phonological, vocabulary and narrative skills). Children who received 9 weeks of daily intervention made greater progress than waiting controls on phoneme awareness, word reading, phonetic spelling and expressive vocabulary. A longer course of intervention (18 versus 9 weeks) had ongoing benefits for literacy skills (word reading and phonetic spelling). Children with weaker initial literacy skills showed greater benefits. Phoneme awareness and letter-sound knowledge predicted response to intervention as measured by growth in word reading, confirming the importance of these skills as the foundations of literacy.

Neurocognitive development of social cognition and cognitive control during adolescence

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Previous developmental fMRI studies of social cognition have employed tasks that involve explicitly thinking about other people's mental states (theory of mind or mentalising). However, everyday life may require the use of theory of mind in a much more implicit and online way, as well as in combination with executive function processes of goals management and action selection. We employed paradigms that combine executive function and social cognition demands to investigate the development of the domain-specific and domain-general neural correlates of social and cognitive control mechanisms during adolescence.

In study 1, participants needed take another individual's perspective into account to select the appropriate action to perform in an online communicative task. In study 2, the paradigm tested relational integration, i.e. the process of jointly considering several structured mental representations, or relations, of either social or non-social information. Each study included a group of adolescent participants (11-16 years old) and a group of adult participants (21-31 years old) who performed the paradigms in a 1.5T fMRI scanner. Participants were typically-developing females matched in terms of general abilities.

Results showed that the processing of social vs. non-social information was associated with medial prefrontal cortex (MPFC) and precuneus activation in both studies. In addition, there was evidence that in adults, but not adolescents, MPFC activity was further modulated by increasing social information processing demands, either in terms of perspective taking (study 1) or comparison of social traits between individuals (study 2). Activity in lateral fronto-parietal regions was associated with domain-general processes and was modulated by age group in study 1. These results highlight the importance of controlling for the general processing demands of social cognition tasks to identify neural correlates specific to social information processing in adulthood and during development.

Near or far away? A proximity and emotion, not size and emotion effect using Russian dolls

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The size and emotion effect is the tendency for children to draw people/objects with a positive emotional charge larger than those with a negative or neutral charge. Here we explored the novel idea that drawing size might be acting as a proxy for depth (physical or perceived), in a 2D environment.

Forty-two children (aged 3-11 years) chose, from 2 sets of Matryoshka dolls, a doll to represent a person with positive, negative or neutral charge, which they placed in front of themselves on a sheet of 3A paper. We found that the children used proximity and not perceived depth or size, to indicate emotional charge. This is consistent with the notion that, in drawings, children may be using size as a proxy for physical closeness (proximity) as they attempt, with varying success, to put positive charged items closer to, or negative and neutral charge items further away from, themselves.

Neural correlates of selective attention differ in those with high levels of autistic traits

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Individuals with autism and those with high levels of autistic traits demonstrate atypical selective attention when compared to typically developing individuals / those with lower levels of autistic traits. Decades of research has shown that these atypicalities are pervasive in autism spectrum conditions, however the neural basis of them remains unknown. We used EEG to investigate event related potentials (ERP) which reflect the allocation of spatial attention (N2pc), target processing (NT) and distractor suppression (PD) in individuals with high or low levels of autistic traits.

Neurotypical students with either high or low levels of autistic traits as measured via the Autism-Spectrum Quotient (Baron-Cohen et al., 2001) were recruited to participate in one of two experiments. In experiment 1, the N2pc (spatial attention) ERP component was elicited and compared between groups. Experiment 2 elicited the N2pc, the PD and NT.

Participants with more autistic traits had significantly larger N2pc amplitude than participants with fewer autistic traits in both experiments. In experiment 2 those high in autistic traits also showed an attenuated distracter positivity (PD).

These results suggest that the allocation of spatial attention, especially to distracter stimuli, differs in those with more autistic traits compared to those with fewer autistic traits. These data may therefore provide insight into the neural basis of atypical selective attention in individuals with autism.

Unsupervised categorization in a population with Traumatic Brain Injury

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Swansea University

Category learning is an essential part of making sense of the world around us, by organising information most efficiently. Disruptions in this ability to form categories have demonstrated a disruption in the ability to learn (e.g., Demetras, Post, & Snow, 1986; Bott, Brock, Brockdorff,

Boucher, & Lamberts, 2006). It is therefore important to study categorization abilities in several different populations, and this includes people with traumatic brain injury (TBI). Studies of supervised categorization have demonstrated a limited ability in a TBI population to learn the categories (Wayland & Taplin, 1982). However, little work has been done which explores how a TBI population would perform when given an unsupervised categorization task. The present study explores unsupervised categorization using two different task difficulties 'Easy' and 'Difficult' for a TBI population. The findings demonstrate that the TBI group found it more difficult to categorize the easy and difficult sets, as compared with a control group. The results of this study are discussed in the context of the mechanisms underlying over-selectivity in a TBI population.

To the letter: Children's developing trust in the written word

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Children have many opportunities to learn about the world through the testimony of others. As well as spoken claims, they are constantly exposed to written sources. How does children's trust in these two media compare? We assessed young children's developing trust in print-based versus oral instructions to guide their actions on a novel apparatus. Children aged 3- to 6-years (n =147) were shown a Y-shaped tubular apparatus with one open and one blocked arm. On successive trials – each involving a differently coloured pair of opaque arms – children decided down which arm to drop a marble so that it reached the bottom. They were advised by two puppets: One supplied only oral advice (e.g., "I say blue. Choose the blue one") whereas the other puppet consistently and explicitly based his advice on a printed instruction (e.g., "This says red. Choose the red one"). Children's basic reading ability on a word-colour matching task was also assessed to examine whether pre- and early readers differed in the extent of their trust in text. We found that children's response varied as a function of their reading ability. Early readers preferred to follow the print-based instructions whereas pre-readers were indiscriminate in their trust. An ANCOVA with reading status as a between-subjects variable and age in months as a covariate revealed a main effect of reading status, but no effect of age. Further support from a follow-up control will be presented. The results suggest that when children learn to read they rapidly regard the written word as an authoritative source of information about how to act in the world. The clear developmental change between pre- and early readers suggests that children's first-hand experience of extracting meaning from print underlies their trust in this medium; pre-readers'

experience of observing others gain knowledge in this way is insufficient.

Evaluating temperament's role in associations between motor and language development

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From across the fields of psychology, occupational therapy and medicine, recent studies have examined the role of motor development in the emergence of infant communication. More recently the question of gross motor development's role has been under investigation. This association has been drawn from walking increasing infants' opportunities to learn about their environment, and may as a result facilitate language learning (Eaton, 2011). Other theories have suggested that the anatomical proximity of the motor cortex to critical language areas may suggest a relation between the two. A third branch of theories on motor and language development are founded on changes in parent attributions of intentionality, as well as temperamental individual differences driving both motor and language skill acquisition.

In this study the Continuous Unified Electronic (CUE) diary method (Ellis-Davies et al., 2012) is applied in examining the hypothesis that gross motor development predicts language development. More specifically, aspects of motor development were predicted to facilitate later vocabulary. Additionally, temperament was assessed to evaluate the role temperament may have in observed motor-language associations. We hypothesized that gross motor development would predict productive vocabulary, and that temperamental differences would be partially implicated in such an association.

To test this hypothesis, 29 mothers were trained to observe the onset of fine and gross motor behaviors of their infants from birth to eighteen months. Mothers also completed the Communicative Development Inventory (CDI) at regular intervals from 12 to 18 months, and the ECBQ measure of infant temperament.

Pointing and walking were found to be a stable predictor of language development. Temperamental differences were found to have specific associations to motor and language development. Such findings are relevant for a discussion of social motivation for engagement's role in facilitating motor and language development.

Bilingualism enriches the poor: Enhanced cognitive control in low-income minority children

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Living in poverty is often accompanied by conditions that can negatively influence cognitive development. Is it possible that being bilingual might counteract these effects? Although previous research has shown that being bilingual enhances executive functioning in middle-class children, less is known about how it affects lower income populations. This study was the first to explore whether the cognitive advantage associated with bilingualism in executive functioning extends to young immigrant children challenged by poverty and, if it does, which specific processes are most affected.

A total of 80 second graders from low-income families participated in the study. Half of the children were first or second generation immigrants to Luxembourg, originally from Northern Portugal, who spoke both Luxembourgish and Portuguese on a daily basis. The other matched half of children lived in Northern Portugal and spoke only Portuguese. Children completed measures of vocabulary and visuospatial tests of working memory, abstract reasoning, selective attention, and interference suppression. Two broad cognitive factors of executive functioning—representation (abstract reasoning and working memory) and control (selective attention and interference suppression)—emerged from principal component analysis. Although the bilingual children knew fewer words than their monolingual peers, and did not show an advantage in representation, the bilinguals performed significantly better than did the monolinguals in cognitive control. These results demonstrate, first, that the bilingual advantage is neither confounded with nor limited by socioeconomic and cultural factors and, second, that separable aspects of executive functioning are differentially affected by bilingualism. The bilingual advantage lies in control but not in visuospatial representational processes.

This is the first study to show that, although they may face linguistic challenges, minority bilingual children from low-income families demonstrate important strengths in other cognitive domains. The study therefore informs efforts to reduce the achievement gap between children of different socioeconomic backgrounds.

Role-modelling, rewards and repeated tasting: The Food Dudes programme in special schools

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Children in Special Schools often find it harder to eat healthily than do their peers in mainstream schools. They are more likely to show change-resistant behaviours, such as idiosyncratic eating patterns and reluctance to try new foods, and to develop diet-related health problems and obesity. The Food Dudes Programme for Special Schools employs the key behaviour change principles that have been identified in the research literature as effective with this population, including modelling and guidance; scaffolding; specific/concrete goal setting; setting up stimulus control; and facilitating generalisation.

We piloted this programme in a Special School in Coventry in 2011, and in several schools across the West Midlands in 2012. The children were first presented with eight target fruit and veg at snacktime over 16 days, then given special containers to bring their fruit and veg from home. They watched video episodes of the Food Dudes - superhero characters who enjoy eating fruit and veg - winning their battles against General Junk and his Junk Punks. The children were gradually encouraged to hold, smell, lick, taste, and finally eat their fruit and veg - this sequence was tailored for individuals and we celebrated their successive steps towards healthy eating with praise and Food Dude rewards. Children who initially did not eat solids were given pureed or juiced replacements for their target foods.

We measured their eating directly and via parental diaries, at school and at home, before and after the programme. Our results showed that children's consumption of fruit and veg increased dramatically following the programme, and that these effects were long lasting. Children learned to accept and enjoy eating new fruit and veg and these healthy foods replaced some of the unhealthy fatty and sugary snacks in their diet. In addition, these effects transferred to their homes and families.

Non-target utterances during verbal task switching: Evidence for a beneficial effect of overt rehearsal

Fiona Essig

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Task switching is the rapid change between responding to one task and then another. Verbal task switching using the Continuous Series II task (Gurd 1995) involves making switches between different word production tasks. This type of verbal task switching is memory reliant, with no externally presented cues or stimuli. During task switching inner speech has been noted as a self-cuing device,

particularly in older populations (Kray, Ebr & Lindenberger, 2004; Kray, Eber & Karbach, 2008). Completion of the Continuous Series II often results in the production of erroneous non-target utterances, perhaps evidence of this self-cuing process. Interruptions (as posed by these utterances) to complex task completion have been noted to result in a resumption lag (Altmann & Trafton, 2007), but it is not clear what effect such interruptions have on the nature of subsequent responses. In the current study, content analysis was used to classify these interrupting non-target utterances, identifying a clear distinction between rehearsal for the task and declarations of memory loss. An analysis was carried out to identify what type of response (correct, error etc.) followed these two types of utterance, testing the hypothesis that rehearsal would be beneficial for subsequent task completion. This was found to be the case and the results are discussed in light of the self-cuing process and benefits of overt verbal rehearsal during switching.

Changing the game: Infants' reactions to violations in early social games

Valentina Fantasia, Alessandra Fasulo, Alan Costall
University of Portsmouth

Although play has been widely recognized for its importance in development (Vygotsky, 1933; Winnicott, 1947; Piaget, 1951; Bruner, 1976; Trevarthen 1986), not many studies have explored its role in cooperative interactions (Trevarthen, 1979; Huble and Trevarthen 1979; Ross and Lollis, 1987). Nevertheless, playful interactions may be framed as early shared cooperative activities, in which children learn how to deal with someone else's goals, intentions and expectations, and improve their understanding of others' actions. In this sense, to cooperate is -at the same time- a goal and an instrument through which development occurs. We propose that altering joint routines, i.e. violating expectations (Phillips et al, 1992) may be a fruitful way to exploring how cooperation engenders a sense of mutual commitment and awareness of others' directedness towards a shared goal.

We observed play variations in established early social games between 20 three-months-olds and their mothers. Mothers were first asked to play a game they usually played at home with their baby, then to perform the same game without any sound, and then again without any gesture (the order of violations was counterbalanced). We compared infants' reactions to each of these violations in terms of gaze, facial expression and number of body movements. Results indicate a marked decrease in body movements and differences in infants' gaze direction and facial expression (i.e. smiling less and frowning more) during both no-sound and no-gesture conditions compared to normal play. This may suggest that infants (i) possess a basic awareness of the mother's actions and (ii) have

expectations about maternal behaviour, displaying an emergent sense of mutual commitment in routine early social games.

Imitation and social engagement in children with and without autism

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University of Dundee

One of the key markers of the autistic spectrum disorder (ASD) is considered to be a striking deficit in socio-emotional functioning, which is also reflected in imitative behaviour. While imitation of simple actions in individuals with autism and well-matched typical populations is considered to be comparable, ASD might affect the imitative style (R.P. Hobson & Hobson, 2008). More specifically, identification with the person, whose behaviour is to be imitated, and identification with their attitudes is limited in individuals with ASD. The aim of the present study was to compare imitative strategies between typically developing children and children with ASD in three conditions: spontaneous play, goal directed play, and 'bizarre' actions (non-goal oriented play). Overall, 28 children participated in the study (14 with ASD and 14 typically developing). Nine tasks were administered (3 tasks for each condition), each starting with the experimenter playing with the assigned toy in front of the child, followed by the child interacting with their own set of identical toys, provided by the experimenter. The results showed that (1) children with ASD imitated significantly less, (2) they showed less exact imitation, (3) while many of their responses were slightly or very different from the original modelled behaviour. (4) Additionally, children with ASD had a longer response time in the spontaneous imitation condition and (5) showed less enjoyment at every task. (6) The level of enjoyment showed a significant, positive correlation with imitation in the entire group. These results suggest that children with autism not only show deficient imitative behaviour both in structure and style but also point to the importance of intact social engagement system that supports imitation.

A cross-syndrome comparison of navigation abilities; can individuals with Down syndrome and Williams syndrome find a short cut?

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Typically developing children aged 5 to 11 years (TD, N=93), individuals with Down syndrome (DS, N=29) and individuals with Williams syndrome (WS, N=20) were asked to learn routes and to find a novel short-cut in two virtual environments (VE). Results showed that participants were able to learn novel routes, with poorest performance in the DS

group, but that the ability to find a short-cut was limited across all three groups. That is, 55/93 TD participants successfully found the shortcut on at least one of two VEs, compared to 3/29 participants with DS and 7/20 participants with WS. Executive Function (EF) tasks were employed to determine the underlying EF components that drive the ability to learn a novel route or find a short-cut. Sustained attention and selective attention were the best predictor variables for the TD children. For the DS group, attention switching best predicted route learning, whilst for the WS group no EF measures correlated with route learning, but non-verbal ability correlated significantly. The results suggest, first that individuals with DS and WS rarely develop knowledge of the configural structure of environment when navigating (i.e. they do not have a cognitive map), but rely on the use of landmarks and associated turns when learning their way around, and second that the ability to learn a route is driven by differing underlying mechanisms for each group, TD, DS and WS.

Cognitive Flexibility, Theory of Mind and Hyperactivity/Inattention

Brad Farrant

The University of Western Australia

The ability to focus attention and regulate behaviour is a key determinant of scholastic achievement and occupational success. Indeed, these self control skills are viewed as desirable by parents, teachers, and employers alike and high levels of problems with focusing or sustaining attention and regulating behaviour are core clinical features used to diagnose attention-deficit hyperactivity disorder. However, many children with symptoms of hyperactivity and inattention do not meet the criteria for a formal diagnosis and parents and education professionals are confronted with the challenge of working with these children.

It has been argued that the development of cognitive flexibility enables children to control their attention and behaviour in a relatively top-down fashion and that theory of mind development mediates the relationship between cognitive flexibility and attention and behaviour regulation skills. However, there is a lack of research with typically developing children designed to test these hypotheses.

The present study analysed the concurrent and longitudinal relations among cognitive flexibility, theory of mind, and hyperactivity/inattention in a sample of 70 typically developing children (M age = 61.4 months, SD = 8.3 months). Mothers and teachers reported on children's hyperactivity/inattention using the Strengths and Difficulties Questionnaire, cognitive flexibility was measured using the dimension change card sort task and theory of mind was assessed using a battery of tasks.

Cognitive flexibility and theory of mind scores were found to be significantly negatively correlated with the level of hyperactivity/inattention at both time points. Furthermore, year 1 cognitive flexibility score was found to be a significant predictor of year 2 hyperactivity/inattention score after controlling for child age, gender, and year 1 hyperactivity/inattention score. Directions for future research include training studies which would further our understanding of these relationships and allow more effective interventions.

Ageing and temporal clustering in episodic memory

Simon Farrell

University of Bristol

A recent theory (Farrell, 2012) proposes that continuous experience is segmented into discrete episodes in memory, and that this applies to both short-term memory and episodic memory. Following a history of work examining effects of grouping on serial recall, a new study is reported examining the effects of grouping on immediate free recall. The study was also used to test the theory's account of ageing effects on episodic memory, that temporal clusters from successive lists are more difficult to tell apart in older adults. In line with the predictions of the theory, the difference between older and younger adults' recall was primarily traced to the number of unique groups accessed. Interestingly, older and younger adults showed no difference in their preferred strategy to access groups.

Tracking the time-course of perspective-taking: Evidence from eye movements

Heather Ferguson

University of Kent

Conversation is a form of social interaction whose success relies heavily on speakers and hearers being able to anticipate or infer the mental states of others. In typically developing children, the ability to predict other peoples' behaviour based on their mental states emerges around the age of 4 years old. Prior to this, children are biased to interpret events according to their own knowledge of reality. Given the frequency with which adults engage in conversational interactions, one might assume that we can perform the relevant tasks effortlessly. However, psychological evidence has revealed that predicting other peoples' behaviour is more difficult than simply considering our own perspective, and that even healthy adults continue to suffer interference from their own point of view.

In this talk, I will review a series of sensitive eye-tracking tasks that use the visual-world paradigm to explore the role of Theory of Mind (ToM) in shaping our expectations about forthcoming language. In particular, I will assess the time-course with which listeners are able to infer and use knowledge about others' perspectives online, and will evaluate the

automatic versus controlled nature of these processes in adults.

The effects of normal cognitive ageing on surface-feature and location binding

Simon Fernyhough, Jane Elsley, Andrew Johnson
Bournemouth University

Binding is an important determinant of visual short-term memory (VSTM) performance, yet the effects of normal cognitive aging on binding in VSTM are not yet well understood. Existing studies suggest that surface-feature binding (e.g. between colour & shape) seems to be relatively unaffected by age (e.g. Parra, Abrahams, Logie & Della Sala, 2009); while there is some limited evidence that location-binding deficits manifest in older adults (e.g. Cowan et al, 2006). These two classes of bindings have previously been distinguished on both developmental (e.g., Oakes et al., 2006) and neurological grounds (Piekema et al., 2006). This study directly investigated a potential distinction between location binding and surface-feature binding in the context of normal cognitive ageing. Memory was assessed for individual features (colours, shapes and locations) and bindings between these features (colour-shape; colour-location; shape-location) in a sample of younger (aged 18-30 years) and older (aged >65 years) adults in an adapted change-detection paradigm (Brown & Brockmole, 2010). Each trial briefly presented an array consisting of three visual stimuli (250ms) followed by a pattern mask (150ms) and short delay period (750ms). A single probe item then appeared and the task was to indicate whether the probe item had been present in the preceding array of three items. Each condition focused on a different to-be-remembered feature or combination of features. Comparisons between single feature conditions and binding conditions allowed us to assess whether our older sample was especially impaired in binding. Articulatory suppression (repetition of a two digit number) was used throughout each trial to ensure visual processing of to-be-remembered stimuli. Initial data suggest that older adults performed similarly to younger adults in terms of their colour-shape and shape-location binding but were particularly impaired in binding colours to locations. This is in spite of relatively preserved colour, shape and location single feature memory.

The mirror mechanism in early facial communicative exchanges in nonhuman primates

Pier Francesco Ferrari
University of Parma

Face-to-face interactions between mothers and infants during the infants' first year are common in humans. During such interactions infants often imitate caregivers' facial gestures, and this extraordinary capacity has been proposed to foster

reciprocal regulation of feelings and interests. Despite differences in physiology, behavioral ecology and cognitive ability, neonatal imitation has been found also in macaques, thus suggesting an evolutionary continuum and an adaptive role of such early communicative exchanges in early social and cognitive development.

From a neurobiological perspective, the capacity to match facial gestures at birth represents a critical challenge in order to understand whether supramodal brain representations are involved and/or whether learning processes might occur and shape the infant's response, without the necessity of any particular hard-wired neuronal system at birth. Alternatively, we have proposed that a mirror mechanism is operating very early in life and involves cortical sensorimotor circuits. Thus, the observation of particular gestures activates similar motor programs in the brain, thus facilitating the expression of the same gesture. We have recently tested this hypothesis and used electroencephalography (EEG) in newborn macaques.

We found that specific frequencies in the neonates' alpha band (5-7 Hz) are desynchronized (the so called mu-rhythm) for facial gestures, both during imitation and observation of facial gesture. In another series of experiments in the adult monkey involving simultaneous recording of mirror neurons (MN) and scalp EEG, we found that the activity of MN contributes to the desynchronization of the signal in the alpha band.

This supports the idea that the mu-rhythm, under certain controlled conditions, could be a reliable indirect signature of the MN activity. Lastly, we found that mother-reared infant macaques have higher suppression of the mu rhythm than nursery-reared infants, thus demonstrating that early adverse life events affects the capacity of the brain to decode social information.

What processes underlie the shape and function bias in TD children and children with ASD?

Charlotte Field, Melissa Allen, Charlie Lewis
Lancaster University

Children often use simple heuristics to help them label new objects, such as noting similarity in shape (the 'shape bias', e.g. Landau, Smith & Jones, 1988) and/or function (the 'function bias', e.g. Diesendruck, Markson & Bloom, 2003) to previously seen artefacts. According to the *shape-as-cue* account (e.g. Bloom, 2000) these biases are controlled through understanding the referential intent of the objects' creator. By contrast, the *attentional-learning-account* (e.g. Smith & Samuelson, 2006) proposes that they simply involve associating the new objects familiar form or role with the novel word. Two experiments investigate the shape and function bias in 'typically developing' (TD) children ($N = 20$), children with Autistic Spectrum Disorders (ASD) ($N = 48$) and children

with other developmental disorders (DD) ($N = 29$). As children with ASD have difficulties understanding intention, studying these children helps determine the underlying processes controlling the biases. All groups of children showed a shape bias when generalising a novel label from an original object to either a shape match, colour match or texture match test object. However, they chose at chance between the shape match and function match test objects when the function of the objects was demonstrated. Performance on the shape and function bias tasks were not correlated with each other for any of the groups, implying that they rely upon different processes or that children are unable to override their strong attention to shape in favour of function when naming. The fact that children with ASD possess a shape bias supports the *attentional learning account*. However, although the TD children performed better on the shape bias than the function bias, the younger DD children ($N = 21$) and children with ASD ($N = 24$) did not. This supports the idea that word learning may be delayed, rather than deviant within atypical development.

Using eye-tracking to test theories of irony processing

Ruth Filik, Alexandra Turcan

The University of Nottingham

Irony is a common communicative tool, however, little is known about how people process and understand ironic utterances. The present research uses eye-tracking while reading to discriminate between leading cognitive theories of irony processing. A limited amount of empirical work has tested these theories, and to date, most studies have simply compared processing of ironic vs. non-ironic statements. A key aspect of the Graded Salience Hypothesis, distinguishing it from more traditional accounts like the Standard Pragmatic View and the Direct Access View, is that it predicts differences between processing of familiar and unfamiliar ironies. Specifically, if an ironic utterance is familiar (e.g., "That's just great!"), then the ironic interpretation should be available without the need for extra inferential processes, whereas if an ironic utterance is unfamiliar, the literal interpretation would be computed first, and a mismatch with context would lead to a re-interpretation of the statement as being ironic. In Experiment 1, we recorded participants' eye movements while they were reading familiar and unfamiliar ironies, compared to non-ironic controls. Results showed more disruption to eye movements during reading for unfamiliar ironies only, supporting the predictions of the Graded Salience Hypothesis. In Experiment 2, we contrast the predictions of the Graded Salience Hypothesis and the Implicit Display Theory. The Implicit Display Theory predicts that when the speaker's expectation regarding the outcome of a situation is explicitly stated in the context, then ironic comments should take less or

equal time to process compared to literal ones, whereas when the expectation is only implicit, ironic comments should take longer to read, independent of their familiarity. Finding that reading times are primarily influenced by familiarity would provide further support for the predictions of the Graded Salience Hypothesis, whereas finding that expectation is a more important cue would support the Implicit Display Theory.

What drives set-size effects in cognitive flexibility?

Lily FitzGibbon¹, Daniel Carroll¹, Lucy Cragg², Danielle Matthews¹

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When switching between two conflicting tasks (such as matching stimuli according to their colour or their shape), adults and children are slower and less accurate on trials where the task rule changes, than on trials where the rule stays the same. Interference between tasks is reduced when the tasks have a larger set-size (i.e. when there are many exemplars of each dimension), compared to when tasks have a smaller set-size (Kray et al., 2012). This study explores two possible explanations for this effect. The set-size effect either comes about because it establishes a particular mindset when the task rules are represented or it comes about because of trial-to-trial factors. In this study there were initial 'pure' blocks where the task rules were represented. These were followed by 'mixed' blocks during which the switch costs occur. These had multiple switches between tasks. By varying the set-size in the pure and mixed blocks independently it is possible to determine whether the set-size effect is driven by the initial rule representation or trial-to-trial effects. 249 children between 5 and 11 years completed one of four versions of a novel switching task with a larger or smaller set-size in the pure and mixed blocks. Consistent with previous findings, there were significant switch costs when the set-size was smaller ($p < 0.001$), but not when the set-size was larger ($p > 0.05$). Switch costs did not differ between children with smaller or larger set-sizes during the pure blocks. However, children who had a larger set-size in the mixed blocks had significantly smaller switch costs than those who had a smaller set-size ($p < 0.05$). These findings suggest that switch costs do not arise as a result of the initial rule representation. Instead, it is likely that set-size affects performance trial-to-trial.

Examining the relationship between auditory temporal discrimination and phonological segmentation

Tim Fosker, Ciara Laverty, Aoife O'Laoide, Natasha Chada, Christopher Russell

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It is well established that the ability to discriminate and segment speech sounds within words (phonological awareness, PA) is important for

developing proficient reading skills. It has been proposed that the development of PA ability is likely to be mediated by an individual's perceptual sensitivity to acoustic cues. Those temporal acoustic cues that characterize different phonological units and signify boundaries between these units within words are specifically thought to be relevant for PA. However there is much debate over which acoustic cues are most important for the development of PA and thus reading. Although a range of differences exist in the acoustic tasks found to be associated with PA skill, a fundamental debate exists between two key theoretical positions in terms of the most important acoustic parameters. One established theory emphasizes the importance of rapid temporal changes in pitch, while a contrasting key theory emphasizes comparably slow changes in intensity as most important for phonological skill development. Here we examined the relationship between phonological awareness of different sized units (phoneme, onset-rime and syllable) and auditory discrimination at different rates of pitch and intensity change. Provisional results from 30 7-9 year-old typical readers and 30 (5-6) year-old beginning readers suggest that: (a) sensitivity to rates of pitch and intensity change develops with age; (b) associations between phonological awareness and auditory discrimination depend on the size of phonological unit being segmented. Overall these results suggest that developing sensitivity to temporal acoustic changes (both rapid and comparably slow) may be more important to the acquisition of phonological awareness than developing sensitivity to changes in pitch or intensity per se.

Inhibition and short-term memory: Which role in typical language development?

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Inhibition, attention and working memory are fundamental processes that are constantly involved in everyday life. More and more studies aim at a better understanding of their role in cognitive development in children. The goal of this study is to assess the contribution of attentional and executive functions to language acquisition. More specifically, we intend to test the role of a specific aspect of inhibition measured through a speech-in-noise perception task on the one hand, and that of more general aspects of inhibition on the other.

In this perspective, we designed an experiment in which 53 4-to-6 year-old, French-speaking children were asked to perform an experimental speech-in-speech-noise perception task, as well as a number of other inhibition tasks (Stroop-like task and "Statue" sub-test of the Nepsy), working and phonological memory tasks (digit span, word span, and pseudo-word repetition), and language tasks (phonological, lexical and grammatical production and comprehension). The matrix subtest of the WPPSI-III was used as a control task.

The results show that after controlling for nonverbal intelligence and age, there are significant correlations 1) between inhibition tasks and performance at several language tasks and, 2) among inhibition tasks. Furthermore, performance in inhibition tasks (speech in speech interferences Stroop interferences) predicts language skills: 23.4% of the variance of the language factor (convergent factor computed on the basis of the various language scores) are explained by inhibition tasks in multiple stepwise regression analyses.

These results suggest that both specific and more general aspects of inhibition are involved in language acquisition in children.

Fluid intelligence and cryptic crossword expertise

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Expertise relates to domain-specific performance, skill-sets, or knowledge, which is reproducibly superior to that of most others who are active in the domain. Cryptic crossword solving is a hitherto under-researched domain of expertise. Solving cryptic crosswords involves a good vocabulary, an understanding of cryptic clue construction and the ability to think laterally and not be misled by 'red herrings'. As cryptic crossword solvers tend to be educated to at least degree level, often in mathematics and science related disciplines, it is plausible that as a group they have higher than average fluid intelligence ('thinking on one's feet'), with experts' being even higher. The aim of the present study was to investigate such a link between cryptic crossword expertise and fluid intelligence.

Twenty-eight crossword solvers (18 objectively defined experts, and 10 non-experts) solved a bespoke cryptic crossword and completed the Alice Heim tests of fluid intelligence (AH5), a timed high-grade test, measuring verbal & numerical (Part I) and diagrammatic (Part II) reasoning abilities. In the 45 minutes allowed, 17 experts and 2 non-experts correctly finished the crossword (times ranging between 11 and 40 minutes).

All participants scored highly on the AH5 (both overall and for Part I) compared to test norms (for university students and graduates), suggesting that cryptic crossword solving has a high entry threshold. The experts scored significantly higher than the non-experts ($p < .04$), both overall and on Part I. The Part I AH5 scores for those who finished the crossword correlated significantly with their finishing time ($p < .02$): faster finishing time associated with higher AH5 scores.

The experts and non-experts did not differ in experience, so the data suggest that fluid intelligence differences between the groups can account to an extent for differences in cryptic crossword solving performance.

Time and intervention as cues to causal structure judgments in children and adults

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Understanding the relationship between cause and effect is an essential aspect of children's development of scientific thinking. Existing accounts of children's causal structure judgments heavily emphasize the role of covariation information (Gopnik et al., 2004) and have neglected the role of other information in influencing children's judgments. We have previously demonstrated the importance of temporal information in making these distinctions between different causal structures, such as causal chains i.e., A causes B and B causes C, or common causes i.e., A causes both B and C (e.g., Burns & McCormack, 2009; Frosch, et al., 2012). We will present two experiments in which we examined the ability to utilise intervention information, and the temporal information associated with it, to make such judgments. The results once again highlight the importance of temporal information and demonstrate that children have difficulties in utilising the statistical information provided by interventions. Our findings suggest that models of causal structure learning need to consider the weighting given to temporal cues versus statistical cues, and how that weighting may change developmentally.

Cognitive, perceptual and affective factors predicting delusional ideation in adolescence

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Delusional beliefs represent one of the most serious symptoms of schizophrenia, however, milder (subclinical) forms of delusional belief can be found across the non-clinical population too (e.g. Keefe & Warman, 2011). Numerous factors have good empirical support as potential causes of delusions (hallucinatory perceptual experiences, cognitive biases and affect; Freeman 2007). Although adolescence is a particularly sensitive period for the development of schizotypal behaviours like delusional ideation (Walker and Bollini, 2002), there is relatively little research on which factors best predict these beliefs at this stage of development. We surveyed 392 school children aged 11-16, with a battery of materials measuring social functioning, negative schemas about the self and others, anxiety, a jumping to conclusions (JTC) bias, hallucinatory perceptions and delusional ideation. It was found that anxiety and schemas about other people mediated the relationship between hallucinatory experiences and paranoid beliefs, anxiety and schemas about the self mediated the relationship between hallucinatory experiences and

schneiderian and grandiose beliefs. Furthermore, a JTC bias moderated the relation between anxiety and delusional beliefs, such that high anxiety children had higher delusion scores than low anxiety children, but this effect was significantly more pronounced in those who also displayed a JTC bias. Social functioning was not a predictor of delusional ideas, and interestingly nor was age. The data provide evidence for the different psychological variables which predict different delusional themes during the formative adolescent period. This data may be useful in assessing the risk for delusional schizotypy in adolescence. Implications for theoretical accounts of delusions and for future longitudinal research will be discussed.

Who has the priority for transplantation? Adolescents' moral reasoning on bioethical issues

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Current developments in medicine and biotechnology have raised debates about their implementations in our life. The moral dilemmas about the limits of human intervention in life and death are directly influenced by a value system, which is strong enough to shape attitudes in favour or against those bioethical dilemmas. Organ allocation is one of the most important moral issues that arise in the field of organ donation and transplantation. The number of available solid organs is constantly smaller than the number of the patients with organ failure. Which is the fairest way to construct a recipient's waiting list?

The current research explored the development of moral reasoning in Greek adolescents, between 12 and 19 years of age, in relation to their stage of moral reasoning, their altruistic orientation, their empathy and some demographic variables.

One hundred fifty one students participated in the study (61 males and 90 females). Participants were presented with a moral dilemma about organ allocation and were asked to choose from a list the criteria that they would consider if they had the opportunity to choose who should have priority in a recipients' waiting list. Then they were asked to prioritize the chosen criteria from the most to the least important for them and to justify their choices.

The results showed that Greek adolescents adopt a social perspective when they argue about a bioethical dilemma, but they also consider emotional factors. The list that was constructed included a variety of criteria. Age, proximity, family status and time in the waiting list were evaluated as the most important criteria.

The statistical analysis of the data showed that altruism and empathy could motivate moral

decisions; but only a slight effect of age, gender and stage of moral reasoning was found.

Individual differences in auditory-verbal short-term memory capacity and rehearsal timing

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Auditory-verbal immediate serial recall capacity is related to performance on a number of language and intelligence tasks, but the source of variation between individuals is not known. The ability to recall a sequence of spoken items in correct serial order may relate to the temporal precision with which spoken material can be encoded and maintained in short-term memory. To test this, we developed a task that measures the temporal variability of subvocal rehearsal. In each trial, participants were asked to silently rehearse a sub-span list of digits at the presented rate and were probed for the item they were currently rehearsing after an unpredictable delay. Temporal variability was operationalized as the average circular standard deviation of serial positions in response to each of the rehearsal delays. 40 undergraduates completed the rehearsal timing task and the forward digit span test of immediate serial recall, as well as measures of non-verbal intelligence and visuospatial immediate recall memory. The rehearsal temporal variability measure was significantly negatively correlated with digit span scores, meaning higher variability in rehearsal timing was associated with lower auditory-verbal short-term memory capacity. The absence of correlations between rehearsal timing and the control measures suggests that the observed association between the timing of subvocal rehearsal and memory span cannot be explained in terms of more general variation in short-term memory, intelligence, or attention. We are currently investigating rehearsal timing precision in adults with dyslexia and children with language difficulties, as this finding may have implications for word learning and language disorders.

Parenting predictors of child executive function and oppositional behaviour

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A growing body of evidence suggests there are significant relationships between parenting factors and child executive function (EF) and behaviour. Most research has concentrated on parent factors such as warmth, sensitivity and involvement and have linked these factors with child inhibitory control and disruptive behaviour such as aggression. Less research has investigated the role of parental attributions on children's developmental outcomes. The current study aimed to examine these relationships in a large sample of children aged 7-10 years (N=80). Parent practices and attributions were assessed in mothers using standardized

questionnaires while teachers completed the Strengths and Difficulties questionnaire providing an index of child oppositional behaviours. Children performed a Stop Signal test from the CANTAB battery to provide a measure of inhibitory control. The findings of the study revealed that parent attributions and practices predicted both aspects of child behaviour and EF. Specifically, parent attributions about inattentive behaviour predicted child inhibitory control. Findings are discussed in terms of their contribution to the literature and their potential practical implications.

Effects of ageing on the rate of visual information processing: A time-accuracy function analysis

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Age related decline has been observed for a number of different types of processing speed (Salthouse, 2000), including psychophysical processing speed (the speed at which a representation of a physical stimulus can be formed). Although ageing influences speed-accuracy trade-off (Starns & Ratcliff, 2010), rarely have estimates of psychophysical processing speed been derived from studies using a time-accuracy function methodology which is not influenced by speed-accuracy trade-offs. In three experiments a time-accuracy function design was used that required identification of gabor patch orientation after differing amounts of stimulus exposure. Modelling time-accuracy functions enabled estimation of the rate of visual information processing in a task with a single stimulus (Experiment 1), distracting stimuli (Experiment 2) or two stimuli with the target being post cued on stimulus offset (Experiment 3). Older adults displayed deficits in visual information processing, primarily when interfering items were present, suggesting difficulties with inhibiting distracting items and encoding and maintaining multiple distinct object representations.

Developmental pathways involved in the onset of autism symptomatology

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The study of infants at high-risk for autism (because of having an older sibling with this condition) aim at discovering early markers for this disorder, thus allowing for earlier targeted intervention that is today possible. These studies also have the potential to dramatically change our understanding of developmental disorders. The British Autism Study of Infant Siblings follows infants at high-risk and controls from the first months of life until 3 years of age, when a diagnosis can be made. I will review findings from this study, which reveal a complex time-course of symptom emergence, suggestive of a continuous interplay between different neural

systems and the social environment. I will show that some atypicalities, previously considered core to this disorder (i.e. poor social orienting) only onset later in the second year of life, and are preceded by atypicalities in more general abilities, like sensory and motor processing. Some of these early markers predict later autism diagnosis while others are only differentiating high-risk infants from low-risk controls. The view of autism that emerges from these studies is that of a multi-factorial disorder and calls for a shift away from identifying early markers for autism towards building statistical models that allow for additive and multiplicative interactions between developmental pathways. Results from one such attempt to model how attention and social understanding interact to predict later autism symptoms will be presented.

Children's interpretation of verbal probabilities: Use of directionality and pragmatic cues

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We showed in two experiments that children's interpretation of verbal probabilities (e.g., *It is likely*) relies on the positive or negative linguistic nature (i.e., directionality) and on their knowledge of the speaker's intention. In Experiment 1, four verbal probabilities were used, which varied in directionality (positive or negative), and in their level of likelihood (high or low). Forty-seven children made likelihood judgements, expected value judgements and decisions based on those expressions. Their likelihood judgements reflected a use of directionality only, judging positive expressions as conveying a higher likelihood than negative expressions. Expected value judgements and decisions showed no use of directionality or of likelihood. In Experiment 2, the same four verbal probabilities were given twice to 48 children: in one case, they were presented as told by a benevolent speaker, and in the other case, as told by a malevolent speaker; these conditions were counterbalanced. As in Experiment 1, children used only directionality, not likelihood. This was the case in all tasks: when the verbal probabilities were positive, likelihood judgements and expected value judgements were higher, and more risky decisions were made; when the expressions were negative, likelihood judgements and expected value judgements were lower, and less risky decisions were made. This was however in interaction with the known intention of the speaker, such that these effects only occurred when the speaker was benevolent; when the speaker was malevolent, judgements and decisions were made at chance level, suggesting that children judged randomly. We propose to account for children's use of only directionality in terms of cognitive demands, with directionality imposing less of such demands than likelihood. We also suggest that the differential use of directionality based on speakers' intentions

support that directionality fulfils a pragmatic function in verbal probabilities.

Follow Buzzy Bee: The effects of arrows, eye gaze and finger pointing cues on saccadic orienting in infants

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Little is known about the developmental trajectory of saccadic orienting caused by eye gaze, finger pointing and arrow cues in young children, although many studies have shown that adults' attention and saccades are facilitated in the direction of these cues even when uninformative. We have developed a pro-saccade task designed for children. Children were instructed to ignore cues presented at fixation and saccade towards a cartoon bee (the target) which appeared randomly to the left or right of fixation irrespective of the direction of the non-predictive central cue. Thirty-six children aged 4 to 10 years completed 56 trials. A mixed-measures ANOVA showed an interaction between Age, Cue type and Congruency ($F_{4,66} = 3.75, p = .008$) with 4-5 year old children displaying a 70ms congruency advantage for pointing cues, but no advantage for eyes or arrows. Children aged 6-7 and 8-10 years showed cueing effects for all three cues. Linear regression revealed that Age was a significant predictor of cueing effect for pointing cues. These findings suggest that pointing is an influential cue in young children, but that automatic orienting to arrows and gaze does not develop until age 6 years.

Temporal Isolation Effects in Immediate Serial Recall and Immediate Free Recall

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The *temporal isolation effect* (TIE) is the recall advantage for items that are temporally isolated at encoding and thus are more easily discriminable from their immediate neighbours. There are two classes of theories that attempt to account for the TIE: *time-based* theories which predict that TIEs should occur, and *event-based* theories which predict that TIEs should not occur unless processes like selective encoding, rehearsal or consolidation, are able to occur. Our research has been interested in whether two immediate memory tasks; Immediate Serial Recall (ISR) and Immediate Free Recall (IFR) should be explained by unitary or separate memory mechanism(s). The TIE is of particular interest since TIEs have been found to be present in IFR, but have been both present and absent in ISR. We wanted to ascertain whether this difference between the two tasks was due to true task differences or the different methodologies used. Participants performed one of three tasks: IFR, ISR-standard, and ISR-free under identical methodologies. Each list contained seven words. Temporal isolation of the words was achieved by a

digit shadowing task which consisted of gaps of 0, 1, 3, and 7 digits randomly distributed between each item. We did not find the typical TIE; increasing the total temporal isolation of an item did not increase its probability of recall. However, the temporal isolation gap did have an effect in the recency portion of the serial position curves; performance increased with larger gaps before the item, but with smaller gaps after the item. We relate our results to Farrell's (2012) grouping theory. Large gaps before an item cause the item to be perceived as the start of a new group, and small gaps after an item help the item be perceived as belonging to the same group as the preceding item.

Understanding of group decision-making in adolescence

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The study focused on the adolescents' understanding of group decision-making and how it is related with the experiences within participative schools and civic engagement. The study was conducted in Slovenia on the samples of the elementary school adolescents (mean age 12.5 years; $N=246$,) and high-school adolescents (mean age 17 years; $N_{HS}=622$). The study followed the mixed method design. The qualitative measure of understanding group decision making which represents the hypothetical dilemma story on solidarity with two class mates who could not go to the trip with the class because of the lack of money (the socio-economic status of the class mates vary in two version of the dilemma, low vs. high). The adolescents answered the open-ended questions about their resolution of the problem, the proposed solidarity decision, the participation of target persons in the decision-making, the tolerance towards the insulting statements and the acceptability of group decision-making at the school. The answers were coded in thematic categories, then combined into 2nd order categories based on perspective taking. The scales were constructed for measuring the inclusive school climate, classroom cohesiveness, perceived communicative competences for public negotiation and the experiences with giving a voice in public. The results show substantial age differences in the inclination for group decision-making and reasoning about different aspects of this process between the group of young and middle adolescents. The differential social perspective taking underlie the reasoning about group decision-making which is individually oriented in younger and group oriented in middle adolescents. The socio-economic status of the target persons in dilemma stories moderates only the resolutions about solidarity, but not the reasoning about the conditions of group decision-making. More participative school and classroom climate and also higher communicative competences were related to the group

perspective-taking in the reasoning about the decision-making process in the peer group.

Auditory processing and language in children with mild to moderate sensorineural hearing loss

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Impaired auditory processing has been proposed as a primary deficit in developmental dyslexia and specific language impairment. However, it remains uncertain whether deficits in auditory processing are causally related to the language problems seen in these groups. We compared auditory processing and language skills in children with mild to moderate sensorineural hearing loss (MMHL; $n = 49$) and typically developing controls ($n = 41$), aged 8-16 years. Auditory processing abilities were assessed using child-friendly psychophysical techniques. Thresholds were obtained for stimuli spanning three different timescales (μ s, ms, seconds), and across three different levels of complexity, from simple nonspeech tones (frequency discrimination, frequency modulation detection, rise-time discrimination), to complex nonspeech sounds (assessing discrimination of modulations in formant frequency, fundamental frequency, and amplitude), and speech sounds (/ba/-/da/ discrimination). A battery of language assessments including phonological processing, reading, vocabulary, and grammar was also administered. As a group, children with MMHL performed significantly more poorly than controls on all of the measures of auditory processing apart from amplitude discrimination of a complex tone. In addition, they also scored more poorly than their peers on the tests of phonological processing, vocabulary, and grammar but, marginally, not on tests of word and nonword reading. Scores on the oral and written language assessments were used to divide the MMHL group into those who performed within normal limits on these tests (MMHL-normal; $n = 34$), versus those who did not (MMHL-low; $n = 15$). Whilst both MMHL subgroups performed more poorly than controls on the same measures of auditory processing, there were no differences between the MMHL-normal and the MMHL-low groups on these tests. These findings provide evidence for a dissociation between language and auditory processing in children with MMHL. Our results challenge the proposal that deficits in auditory processing are sufficient to cause developmental disorders of language.

Factors underlying visual perspective taking in children and adults with autism

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The ability to consider what another person can see (visual perspective taking, VPT) depends on more basic social and spatial abilities. Here we report two studies which probe how children and adults with

autism spectrum conditions represent and engage with the human body.

In the first study, 18 adults with autism spectrum condition and 18 age and IQ matched typical adults performed a mental rotation task and a task drawing on egocentric body representations with closely matched stimuli. The participants with autism were slower on both tasks, with a larger discrepancy on the egocentric tasks. This suggests that adults with autism find it hard to use the self as a reference.

In a second study, 30 children with autism and 30 IQ matched typical children completed tasks assessing visual perspective taking, mental rotation, theory of mind and matching of body postures. Replicating previous results, we found an interaction between diagnostic group and performance on the VPT / mental rotation tasks. Furthermore, we found that typical children's performance on the VPT task was predicted by their ability to match body postures. In contrast, autistic children's VPT performance was predicted by their ability to mentally rotate objects. This suggests that typical and autistic children draw on different cognitive mechanisms to solve perspective taking tasks.

Together, the results of these studies give new insights into the basic spatial and social mechanisms underlying perspective taking, and emphasize the role of body representations in social cognition.

The role of the home literacy environment in the early literacy development of children at family-risk of dyslexia

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Although reading is a substantially heritable trait, recent behavioural genetic studies indicate shared environmental influences in the earliest stages of literacy development (Byrne et al., 2005; Samuelsson et al., 2005). One likely source is the Home Literacy Environment (HLE) that children experience, particularly during the preschool years. Sénéchal & LeFevre (2002) found that meaning-focused and code-focused activities in the home were differentially related to children's emergent literacy, predicting oral language and print knowledge respectively.

The current study assessed the HLE of 116 4-year-old children with a family history of dyslexia (FR) and 72 typically developing controls (TD) as part of a longitudinal family-risk study of language and reading development. Parental reports of literacy-related activities in the home were comparable between the two groups, but TD parents scored more highly than FR parents on a checklist measure tapping storybook exposure. Children's exposure to storybooks in the home predicted receptive language at school entry, while direct instruction in

the home predicted letter knowledge, and these relationships were stronger in the FR group. However, for a subgroup of the FR children who also exhibited a language impairment, no associations were found between HLE and emergent literacy at school entry. These results are discussed in terms of multiple risk factors in developmental disorders.

Atypical attention during mental state recognition in Williams syndrome

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Individuals with Williams syndrome (WS) are known to have a pro-social drive and a reduced sense of 'stranger danger' (Porter et al., 2007). Eye-tracking studies have shown syndrome-specific patterns of social attention in WS which relate to this social phenotype (prolonged attention to faces/eyes; Riby & Hancock, 2008). We conducted a study exploring attention during mental state recognition in WS, given the role that understanding others' mental states plays in the development of stranger danger. Participants (WS N = 19; Aged-matched N = 17; Verbal ability matched N = 14) were presented with stimuli involving a girl portraying different mental states (taken from Back, 2007) and were required to make a forced-choice judgement on each mental state. Eye movements were recorded while participants viewed the stimuli.

Accuracy of mental state recognition in WS was poorer in comparison to the aged-matched comparison group, but at a similar level to the verbal ability matched group. Eye-tracking data revealed atypical attention patterns for the participants with WS in comparison both control groups. However, these atypical patterns were not in line with previous research. Our participants with WS displayed reduced eye gaze, indicating a more heterogeneous pattern of social attention in WS than previously reported and highlighting important within-syndrome variability in terms of sociability. The implications of these findings will be discussed.

Reading and spelling abilities of deaf adolescents with cochlear implants and hearing aids

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Early progress in reading and spelling among deaf children of primary school age appears to have been improved by the provision of cochlear implants. However, it is less clear that these improvements continue into secondary school. This study assessed 86 deaf children, aged between 12 and 16 years. Approximately one third used hearing aids, one third had received a cochlear implant before 42 months and one third had been implanted later. The three sub-groups were matched for age and nonverbal IQ and all had an unaided hearing loss of at least 85dB. Assessments revealed mean reading

ages that were several years below chronological age for all three groups. However, participants in the hearing aid group performed best. Reading levels were not predicted by age of diagnosis or degree of hearing loss but there was a relationship between reading level and presence of phonetic errors in spelling, suggesting that literacy attainment is underpinned by phonological coding for both deaf and hearing children. There were also differences in educational setting, with the great majority of children in the hearing aid group in a school for the deaf and relatively more of the children with cochlear implants being educated in a unit or mainstream setting. The implications of these findings for the support of deaf pupils in secondary schools are discussed.

Generalisation of word-picture relations in children with autism and typically developing toddlers

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Symbolic understanding of pictures involves generalising labels from depicted objects to their 3-dimensional counterparts. Children with autism can have difficulty with this skill, but are significantly more likely to generalise labels to objects depicted in highly-iconic colour photographs than less-iconic pictures. The present study investigates whether this ability is guided by similarity of shape, similarity of colour, or both. Low-functioning children with autism and ability-matched typically-developing children (aged 2-5 years) were taught novel words paired with highly-iconic colour photographs of unfamiliar target objects, and were required to sort items into two buckets according to whether or not they were also referents of the newly-learned labels. Sorted items included real target objects, differently-coloured variants of target objects, other unfamiliar objects that were colour-matched to target objects, familiar objects, and pictures of each object. Results showed that children with autism extended labels to real target objects at ceiling rates, and also generalised to both differently-coloured variants (matched on shape) and other unfamiliar items matched on colour (but not shape). By comparison, typically developing children extended labels to target objects and differently-coloured variants at ceiling rates, and almost never generalised to pictures and objects that were differently-shaped. Thus, low-functioning children with autism do not possess a mature symbolic understanding of word-picture-object relations. While typically developing children generalise words from pictures based on similarity of shape, the best indicator of symbolic relatedness, children with autism also extend labels based on similarity of colour, a relatively poor indicator of symbolic relatedness.

Effects of rhythm on memory for spoken sequences: a model and tests of its stimulus-driven mechanism

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Immediate memory for spoken sequences depends on their rhythm - different patterns of error are seen according to the way in which items are spaced in time. Current models address these phenomena only partially or not at all. We investigate the idea that temporal grouping effects are an emergent property of a general serial ordering mechanism based on a population of oscillators locally sensitive to amplitude modulations on different temporal scales. Two experiments show that the effects of temporal grouping are independent of the predictability of the grouping pattern, consistent with the model's stimulus driven mechanism and inconsistent with alternative accounts. The second experiment reports detailed and systematic differences in the recall of irregularly grouped sequences that are broadly consistent with predictions of the new model. We suggest that the bottom-up multiscale population oscillator (or BUMP) mechanism is a useful starting point for a general account of serial order in verbal behavior.

Children's developing theories of motion: Subjectivity and shift

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Recent research with primary school children has indicated that while younger children believe a light ball will roll down an incline faster than a heavy ball - matching their beliefs about horizontal motion - older children believe the heavy ball will roll down faster - matching their conceptions about fall. This work makes tentative suggestions regarding the cause of this age shift. However, it remains open about this, and instead offers further questions that need to be considered. Do children perceive the disparity between speeds for a heavy and a light ball down an incline to be as great as for horizontal motion or fall, and how might this change with age? Moreover, are there unidentified thresholds? Do children at a particular age perceive speeds to be the same for a heavy and a light ball? Or is indeed the physical incline height the cause of this conceptual shift, and does this height threshold change with age? The current project aims to investigate these questions through an investigative study with primary school children. The methods are based on those applied in the previous research that has raised the questions, with certain modifications to allow for the additional tasks to be carried out. The importance of this work lies in contributing towards clearer models of how commonsense theories of motion develop, particularly where the interaction of dimensions is concerned, as is the case for incline motion. This, in turn, bears implications for curriculum structures

and teaching approaches in the primary science classroom.

Developmental changes in the consolidation of new word meaning

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According to a dual-systems account of vocabulary acquisition, new information is initially stored separately from existing knowledge and integrated over time, particularly during sleep (Davis & Gaskell, 2009). This fits with child (Henderson et al., 2012) and adult data (Dumay & Gaskell, 2007) showing that novel words (e.g., *biscal*) only compete for recognition with existing words (e.g., *biscuit*) after a period of sleep. However, evidence on the influence of semantic information on the time course of lexical integration is lacking and a previous study with adults suggests that immediate integration effects may occur when novel words are taught with their meanings (Leach & Samuel, 2007). Here we present data from the visual world eye tracking paradigm with 42 adults and 40 children (aged 7-8) to investigate the time-course of lexical integration for novel word-picture pairs. Novel word-picture pairs learned immediately prior to testing and those learned on the previous day exhibited significant lexical competition effects: Namely, when participants were asked to “Click on the biscuit” they showed increased looks to the trained competitor “*biscal*” than compared to untrained distracters. However, this effect was significantly stronger for words learned the previous day for children, but not for adults. Furthermore, there was no evidence that components of sleep architecture related to competition effects in the consolidated condition for adults. These results suggest that novel word-picture pairs can be integrated with existing knowledge immediately after training (without sleep), but that children demonstrate an enhancement following overnight consolidation that was not evident for adults. In stark contrast, explicit phonological memory for the novel words (as indexed by cued recall) benefitted significantly from offline consolidation for both adults and children. The results are consistent with recent research suggesting that sleep boosts some aspects of learning for children than compared to adults (Wilhelm et al., 2013).

Verbal fluency and executive skills in children with specific language impairment

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This study examined the precise nature of verbal fluency problems in children with language difficulties. It also assessed whether aspects of executive functioning (executive-loaded working memory, inhibition, switching, planning) could account for variation in verbal fluency performance

among children with and without language difficulties.

Semantic and phonemic fluency tasks were carried out by 41 children with specific language impairment (SLI), 31 children with milder language difficulties, and 88 typically developing children. Various measures of response output, errors, clustering and switching were obtained. Assessments of executive-loaded working memory, inhibition, switching and planning were also included.

Children with SLI showed considerable difficulties with semantic and phonemic fluency; virtually every aspect of performance, including measures of output, error rates, and size of clusters, involved some limitations relative to typical children. Children with milder language difficulties showed less severe performance difficulties. Two key EF variables (executive-loaded working memory and planning) explained significant portions of the variance in measures of fluency *output* and number of *switches* for both semantic and phonemic fluency. The findings relating to *error rates* were more complex: the EF variables of inhibition and planning explained significant portions of the variance in phonemic fluency; whereas executive-loaded working memory explained significant portions of the variance in semantic fluency.

Children with language difficulties have significant problems with verbal fluency tasks regardless of which measures of performance are examined. The current findings also suggest that verbal fluency performance is related to several aspects of EF, including executive-loaded working memory, planning and inhibition.

Investigating the motivational mechanism underlying young children’s spontaneous helping behaviour

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Here we present two studies which investigated young children’s prosocial motivation in response to viewing another person needing help.

In study 1, 64 2-year-old children watched videos while their gaze and changes in sympathetic arousal (i.e., pupil dilation) were measured. Half the children saw an adult stacking objects until two dropped to the floor, one relevant object (similar to the ones previously stacked) that the adult needed to finish his task and one irrelevant object. These children then saw another adult hand either the relevant or the irrelevant object to the first adult. The other half of the children saw a non-social control condition, in which the physical characteristics of the scene were identical to the social condition but no person was present. Results

revealed that in the social (but not the control) condition, children looked longer at the relevant object before either object was returned, $p < .001$ (first trial analysis, f.t.a.). Furthermore, children whose sympathetic arousal initially increased showed greater pupil dilation when the irrelevant object was returned in the social compared to the control condition, $p < .05$. In addition, the longer children looked at one object prior to an object being returned, the greater their pupil dilation (i.e., their surprise) to viewing the other object being returned, $p < .05$ (f.t.a.).

In study 2, 49 children were presented with a live situation where an adult needed help. We measured children's pupil dilation prior to helping as well as the latency to act. The results showed that children's pupil dilation was negatively correlated with their latency to help, $\rho = -.3$, $p = .052$ (f.t.a.).

These findings suggest that (1) young children expect others to be helped appropriately, and (2) pupil dilation is a sensitive measure of their motivation to see others helped.

Literacy and dyslexia in oral deaf children

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Whilst it is widely acknowledged that many deaf children have reading difficulties, diagnosing dyslexia in deaf children is difficult due to a lack of normative data. We report findings from a study investigating literacy achievement and dyslexia in a large UK sample of oral deaf children age 10-11 years. 79 oral severe/profoundly deaf children (10-11 year olds) and 20 hearing dyslexic children participated. Children were administered a large battery of standardised literacy, language and phonological tasks. Deaf children's scores were compared with dyslexic scores in order to identify a deaf dyslexic profile. Standard scores on all measures were skewed towards the lower scores. Deaf children were categorised into good (average), poor (below average) and extremely poor deaf readers based upon hearing norms. A substantial proportion of deaf children achieved average scores for reading (more than have been identified in previous research), however, almost half were poor readers and of these, 9% were extremely poor deaf readers. There were no significant differences in literacy skills between deaf children with cochlear implants and hearing aids. Across the whole sample of deaf children, strong links were found between several of the phonological awareness tasks (including spoonerisms and phoneme deletion), expressive vocabulary and decoding skills. Our findings show that some measures sensitive to dyslexia in the hearing population also discriminate among the poorest deaf readers.

Disambiguating Arabic homographic verbs during reading

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Arabic vowel sounds are conveyed by diacritics, which allow for accurate word pronunciation. Predominantly, modern Arabic is printed without diacritics. Readers typically use context to disambiguate homographs, with diacritics assigned to otherwise ambiguous words. We investigated the time course and effects of accessing diacritics-based phonology to disambiguate homographic verbs which are heterophonic in active compared to passive voice (e.g. ضرب /daraba/, hit; ضرب /doriba/, was hit). We tracked the eye movements of 25 native Arabic readers while reading these sentences in 5 conditions: active, or passive, fully- or non-diacritised, or with verb-only diacritisation in passive. Without diacritics on the verb, readers would not be able to discriminate the passive voice from the active until they reach a prepositional phrase (one word e.g. بـ يد /bijad/, by the hand of) later in the sentence. Results will be discussed detailing the impact of verb-only and full sentence diacritisation, including evidence that readers effectively extracted the phonological information conveyed by diacritics on the verb: Early looking times on the disambiguating region were significantly reduced in the verb-only diacritisation condition. By accessing passive verb phonology, the readers avoided mis-parsing the verb as active (which, in all likelihood, is their default parsing preference).

Bilinguals demonstrate similar strategies in word learning but are superior in foreign label recall

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Young children apparently assume nouns are mutually exclusive. In the 'disambiguation task', children reliably choose an unfamiliar object (e.g., whisk) rather than a familiar object (e.g., apple) as referent for a novel word ('hinkle'). In previous research, we added pragmatic information ('puppet is hungry') strongly indicating the familiar object. Children only took this into account from the age of four years; success was associated with metacognitive development. The present study compared performance of monolinguals, bilinguals, and monolingual children exposed to another language. Bilinguals repeatedly face multiple labels and their strategies to disambiguate are of special interest. We also examined whether groups differ on recall of newly learned words.

46 children (mean age = 48m, SD = 9m) were given standard disambiguation tasks and the novel Pragmatic Cue task described above. Novel words were presented either as English words (implicitly), or explicitly as words in an unfamiliar foreign

language. Performance on the Pragmatic Cue tasks was strongly associated with the performance on the False Belief task for all groups and did not differ between novel and foreign labels. However, bilinguals recalled significantly more foreign language words than novel words after hearing them only twice. Groups did not differ on additional tasks assessing working memory, mental rotation and inhibition.

In Study 2 these findings were replicated and bilinguals recalled significantly more foreign language words than monolinguals and children exposed to another language. Overall the findings support the development of a specific metalinguistic understanding emerging with other metacognitive abilities equally for children regardless of language exposure around the age of 4. Bilinguals additionally demonstrate a more fine-tuned ability to recall foreign language labels than their monolingual peers.

What children know about substances: Judging the intensity of mixtures

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When sugar dissolves in liquid, 4-year-olds know that invisible particles continue to exist in the mixture. But older children have much difficulty with mixture intensity, e.g., when dark and light liquids combine, 10-year-olds think the result is darker than the darker of the two. Do children insufficiently differentiate intensive and extensive properties of substances? Or do they merely overgeneralise additive change of extensive properties on some occasions? Here we studied intensity judgments without combination of liquids, but when a single coloured/sweet liquid was created.

Children in Hong Kong, aged 4-5, 6-7, 8-9 (17+ per group) and adults judged, on a graphic scale, expected colour intensity/sweetness when different amounts of tea powder/sugar would mix with different amounts of water (3x3x2 within-subjects, order counterbalanced). Judgments should increase with amount of tea/sugar, decrease with amount of liquid. If, in addition, children know that mixture intensity depends on the solid to liquid ratio, the curves should diverge. But if children think all properties add extensively then judgments might incorrectly increase with amount of liquid as well.

As expected, solid, the direct quantity, affected judgments more than liquid, the inverse quantity. However, even the youngest age showed some liquid effect. Moreover, some divergence as expected under the solid/liquid model appeared from age 4/5 in the sugar task. We thought children would do better with tea, providing colour information about intensity, but found the

opposite: Additive errors² appeared only in the tea task.

Results confirm the protracted development of intensive quantity understanding noted by previous workers, but our methodology uncovered some early understanding, with implications for educational potential. That the tea task was less advanced may reflect difficulties discriminating high colour intensities, which appear with highly concentrated food/paint powders. Observation then may falsely suggest that the inverse variable has no effect, compounding cognitive difficulties.

A novel tool for assessing visuo-motor attention and its relationship to classroom performance

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Introduction: The abilities to sustain and divide attention, inhibit response and selectively direct visual attention are skills that predict academic performance levels in children. To date, no standardised psychometric test is capable of objectively measuring these aspects of attentive performance with the brevity and detail required to ensure such a tool is viable as a population-level screening assessment.

Methods: We developed a 15min visuo-motor task suitable for use with adults and children that measures attentive functioning using a tablet-screen computer. Participants track moving targets on the screen moving with a stylus, these targets oscillate in patterns similar to those produced whilst handwriting. They do this under single-task (following one target) and a variety of dual-task conditions (following one of four simultaneously displayed moving targets and intermittently switching to track a different target in response to a secondary cue presented in the visual periphery).

Results: Experiment 1 established that manipulation of attentional load on the cue-detection component affected adult's (19-50 years) and children's (8-12 years) accuracy and tracking variability, even after adjusting for motor-control differences. In Experiment 2, outcomes on the task were validated against the Gordon Diagnostic System (a standardised test of sustained attention) and parental reports of children's attentiveness (measured using two standardised questionnaires). Experiment 3 investigated relationships between the task, academic performance and performance on a standardised measure of visuo-motor integration (the Beery VMI test) in a sample of >400 Bradford school-children.

Conclusions: These results suggest our visuo-motor task has great potential as a population level screening tool for objectively measuring attentive functioning. This finding will be discussed in the context of our ongoing collaborative work with the Born in Bradford longitudinal birth cohort, where

performance on this visuo-motor task can be related to genetic, health and educational data on the children and parents.

Eye-tracking face recognition in children: effects of age, familiarity, and orientation

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Face recognition is one of the most important visual skills and adults are experts at processing faces. Children do not tend to reach adult levels of face recognition expertise until adolescence. Potentially this is due to children not employing the expert face recognition system as indexed by the face-inversion effect (where inversion disproportionately affects the recognition of faces) or due to an immature general processing and encoding system, potentially indexed through eye-movements. We present one of the first eye-tracking studies of face recognition in children. Employing a standard old/new recognition paradigm, 42 6- to 12-year-old children viewed and subsequently recognised upright, inverted own-age faces that were either familiar or unfamiliar to them while their eye-movements were recorded. While we found that recognition accuracy of faces increased with age, we also found that children under 9 years of age did not show the traditional face-inversion effect. Eye-movement differences were also noted between these groups, with fewer fixations to the eyes and more mouth fixations in the younger age group than the older age group. These effects were diminished when children were viewing familiar faces. These results are interpreted as supporting the view that children employ an inefficient encoding strategy when recognising faces and this results in a failure to engage the expert face processing system unless the face is familiar to them.

It sinks because it's heavy! Relations between parent-child explanatory talk and solutions to scientific problems

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Children's conversations outside of school provide support for their developing understandings about the physical and natural world (Callanan & Jipson, 2001). Many studies have identified ways that explanatory talk might help children's learning (e.g., Crowley & Fender, 2007; Tare et al., 2011). In order to enhance understanding of how conversations might link to development, the current study was designed to examine how explanation in conversation related to in-situ decisions about scientific tasks families were faced with.

Participants were 64 children (32 7-year-olds and 32 10-year-olds) and one of their parents. Pairs were provided with a book, including four hands-on science tasks that will be the focus here: two biological concepts (Sensitivity and Flavour) as well as two physical science concepts (Density and

Gravity). Parents were requested to work with their children to discuss the tasks as they might normally.

Transcribed interactions were coded in terms of the outcomes achieved in two ways: conceptual principle (scientific, partial, or abandon) and scientific method (scientific, partial, or 'no test'). In addition, transcripts were coded for explanatory talk: Law (noncausal statement about how things work), Causal (statements using causal language), among other features.

Parents' uses of Laws were related to Sensitivity and Density Principle as well as Method in Density. Child use of Laws was related to Density Principle. Parent causal statements were correlated with Flavour Method and Sensitivity Principle, whereas child causal statements related to Gravity Principle. Results will be further detailed and elaborated upon to provide a sense of the complex relationship between the ways that dyads come to decisions about different types of tasks and the explanatory tools they use.

Divergent thinking and motor skills in 1-year-olds

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Creativity is critical for culture to evolve through advances in science, the arts, and industry. It is widely recognised as important in education from nursery through university. One component of creativity, divergent thinking, measures the generation of several ideas within one problem space. The Unusual Box test was recently validated as the first test to measure divergent thinking in 2-year-olds. Children play individually with a novel toy and novel objects, and divergent thinking is scored as the number of different actions performed. In the current study, we measured test-retest reliability of the Unusual Box test in 26 toddlers from 13 to 23 months by testing toddlers twice, two weeks apart. We also examined whether motor skills age related to divergent thinking. Toddlers' average divergent thinking scores were 14.9 actions ($SD = 5.8$, $range = 6-28$) on the first assessment and 15.8 ($SD = 4.7$, $range = 6-23$) on the second assessment. No differences were found between assessments ($t = 1.00$, $p = 0.323$), and both assessments were positively correlated ($r = 0.623$, $p = .001$), indicating good test-retest reliability. No age differences were found, and no interactions were found between age and assessment time. Therefore the Unusual Box test can be used with toddlers as young as 13 months. Parents' reports of their toddler's motor skills age (Infant Development Inventory; Child Development Review, Ireton, 1994) correlated with toddlers' divergent thinking scores ($r = .591$, $p < .001$). Thus either increased motor skills allow toddlers to increase their divergent thinking, or motivation to explore increases toddlers' motor skills, or both. By being able to test divergent thinking as young as 13 months, we can further

identify which factors initially affect divergent thinking, which could increase our understanding of cultural evolution and innovation in society.

Can children extend facts to other objects from the same category?

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Waxman & Booth (2000) argued that facts could be retained following minimal exposure but were not systematically extended to similar objects from the same category. In contrast, children could and would systematically extend count nouns learnt from minimal exposure. They proposed that this was a crucial difference between learning words and facts, suggesting that learning words may still utilise some domain specific cognitive abilities, counter to Markson and Bloom's claims (1997). However, Waxman & Booth (2000) introduced pre-school children to a novel linguistic fact ("my uncle gave this to me") that is not generalisable. More significantly, there is no clear prevailing rule about how such a fact would and should be extended, unlike the extension rules surrounding words. Perhaps children can systematically extend another more generalisable fact to objects beyond the individual in a similar way to object labels.

Seventy 3- and 4-year-olds were introduced to a word- or fact-object link: either a novel object label or a novel fact referring to a novel object. There were two types of facts: 'my uncle gave it to me' (fact specific condition, where the fact was unlikely to be extended) and 'it's from a place called Modi' (fact general condition, where the fact was more suited to generalisation, identified from pilot testing). The participants were tested for comprehension of the word- or fact-object link shortly after. As expected the children fast mapped the link between the novel word or fact and the novel object at levels significantly above chance: 83-91%. These 61 participants, who correctly chose the target during the comprehension assessment, went on to be tested for extension using the procedure devised by Waxman & Booth (2000).

The extension results demonstrated that children extended the generalisable fact ("it's from a place called Modi") at a significantly better rate than a more specific fact ("my uncle gave it to me") and at a similar rate to object labels.

Investigating collaboration in children with autism using a multi-touch tabletop computer

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Children with Autistic Spectrum Conditions (ASC) are said to lack awareness of self and others. Such awareness is a necessary prerequisite for joint action and, according to Moll & Tomasello's (2007) Vygotskian Intelligence hypothesis, joint action is a

driving force of individual cognitive development. This study investigated other-awareness in ASC children working together supported by Separate Control of Shared Space (SCoSS) software. SCoSS was previously found to facilitate other-awareness in pairs of ASC children collaborating on a task using a laptop and so was adapted for use on the multi-touch tabletop computer. 10 boys aged 4 – 10 years diagnosed with ASC and learning difficulties worked in pairs. Each pair played two picture-sorting tasks where the rules of the game differed i.e. one game - pictures need only match to progress through the activity and the other game pictures need to match and be correctly categorised.

The children's interactions were videotaped and later coded for other-awareness: 1) active: action is related and contingent to their partner's, 2) attentional: action is related to their partner's. ASC children were found to display a significantly higher mean rate of combined other-awareness when playing the task with one rule ($M = 4.24/\text{min}$), compared to two rules ($M = 3.62/\text{min}$), $F = (1,7) = 10.50$, $p < .05$. With children displaying slightly higher rates of active other-awareness $M = 2.48/\text{min}$ with one rule compared to two rules, $M = 2.29/\text{min}$. Qualitative analysis of the strategies used by individual children to collaborate found that children used more strategies in an attempt to solve the task when two rules were in place and further that flexibility in strategy use led to successfully collaborating to solve the task. This study provides further evidence that SCoSS can facilitate other-awareness in ASC children and that successful collaboration may support cognitive development.

Mirror Talk: Alignment in the natural conversations of children with autism

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In a turn-taking task, verbal children with autistic spectrum conditions (ASC) spontaneously converge syntax with a conversational partner, to the same extent as typically-developing children. This suggests that the conversations of ASC children, which can be poorly coordinated, may yet display convergence at the linguistic level. The present study asked whether linguistic convergence occurs in non-experimental interactions, since a turn-taking task cannot wholly represent natural dialogue. 16 ASC children and 16 mental age-matched controls were recorded with a peer conversing on a pre-determined topic. Transcripts of these conversations were then analysed, and convergence was compared between groups. The results of the study are used to determine whether a simpler, priming-based account might better explain conversation in autism than the theory of mind.

Developmental changes in the balance of disparity, blur and looming/proximal cues to drive ocular alignment and focus

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Accurate binocular vergence and accommodation are necessary for viewing near objects, so are important for the development of fine motor coordination. Accurate focus on a task may be important for any developmental experiment. We measured longitudinal changes in the accuracy of simultaneous ocular accommodation and vergence responses to targets at different depths in infants when combinations of blur, binocular disparity, and change-in-size cues to depth were made available. The data for infants was compared with data collected under the same conditions in older children and young adults. We predicted that sensitivity to different cues would change during development. Mean infant responses to the condition in which all cues were available were not significantly different from those of adults at the earliest age tested for accommodation (6-7 weeks) and by 8-9 weeks of age for vergence. Manipulation of proximity cues produced the largest changes in vergence and accommodation responses in infants less than 14 weeks of age, with more adult like responses when proximity cues were available, and a large reduction in response when these cues were removed from the target. Sensitivity to proximity declined after this age. Between 12 and 28 weeks of age infants were equally sensitive to blur, disparity and proximity cues, while in older children and adults manipulation of disparity cues resulted in the greatest changes in vergence and accommodation, with removal of the disparity cue resulting in a large reduction in response. Blur remained a weak cue. Our results suggest that sensitivity to different cues to depth changes over the first 6 months of age in typical infants such that, at any age, infants are sensitive to at least some cues to depth. During infancy, vergence and accommodation responses are not dependent on the development of specific depth cues, but make use of any cues available to drive appropriate changes in response.

How picture books facilitate the introduction of vegetables into children's diets

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Research has shown that food liking and consumption is determined by the frequency with which it has been tasted. To establish healthy eating behaviour in children, parents should therefore provide repeated opportunities for them to taste healthy foods. Little is known about the process of introducing new foods in the home environment, however, except that parents find it very difficult. This project set out to understand the challenges parents face when introducing healthy foods, by

documenting the pattern of rejection and acceptance toddlers display when they are offered a daily taste of a new or disliked food. We also explore how prior visual familiarity with a food, administered via a picture-book intervention, facilitates its introduction into the child's diet.

Parents of 126 toddlers identified one fruit and one vegetable they wanted their child to eat ('target foods'). Families were randomly assigned to either a 'fruit book' or 'vegetable book' group, who looked at a book about their target fruit or vegetable every day for two weeks, or to a control group, who received no book. Parents in all three groups then offered both target foods to their child every day during a two-week taste-introduction phase. Analyses of parental questionnaires collected at baseline, after the intervention and at a 4-month follow-up confirmed that liking of the target foods increased in all three groups following the taste exposure phase, and that prior exposure to vegetable books provided an additional boost to children's liking and consumption of the target vegetable. We will additionally present analyses of the detailed diary records parents kept of their experiences during the taste-introduction phase; these will elucidate the difficulties parents face when introducing healthy foods and clarify how picture books served to facilitate this process.

The influence of familiar tunes and rhymes on the development of toy preferences

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Music is a highly-effective tool for inducing positive emotions in adults (Westermann, Spies, Stahl & Hesse, 1996). The popularity of songs and rhymes in parent-toddler interactions and TV programs aimed at toddlers (Johnason, 2007) suggests that music also holds positive associations for this age group. We explored the possibility that music might shape children's developing preferences, by examining the impact of familiar songs and rhymes on children's interest in simultaneously-presented toys.

22 toddlers (mean age = 25 months) took part in a preferential-looking task comprising three phases. In a *baseline test phase* (4 trials), children were shown two distinctive teddy bears side-by-side on screen for 10 seconds, and were instructed to "Look!" This was followed by an *exposure phase* (8 trials), in which one of the bears was presented on screen for 10 seconds. One bear was always accompanied by a piece of music that was familiar to and liked by the child (such as the theme tune to their favorite program or a nursery rhyme they enjoyed), while the other was accompanied by an unfamiliar song or rhyme. Children looked significantly longer at the toy when they heard familiar, liked music than they did when they heard unfamiliar music, showing that familiar music sustains children's attention to simultaneously-presented stimuli. In the following *test phase*, a

replication of the baseline phase, no preference was seen for the toy associated with the familiar music. However, in a 'real toy' preference check that took place outside the preferential-looking booth, children were significantly more likely to select the toy associated with the familiar music to play with, showing that the music had enhanced its appeal.

Results therefore demonstrate that liked music enhances toddlers' attention towards concurrently-presented pictorial stimuli and engenders a preference for these that generalizes to the actual objects depicted.

Are beliefs biased by logic? The effect of a secondary load and complexity on belief and logic based judgments

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Dual-Process accounts claim that responses to reasoning tasks often default to automatically cued belief-based responses. However, recent findings show that when participants are instructed to evaluate the believability of a conclusion, its logical status interferes with their judgment. This finding is inconsistent with the view that belief based judgments are cued automatically.

In this paper we present the results of three experiments that examined the impact of a secondary task (random number generation) on belief and validity judgments. Experiment 1 examined simple modus ponens arguments, experiment 2 included disjunctive syllogisms and experiment three employed a blocked presentation design.

In line with previous research belief judgments took longer and resulted in more errors than validity judgments. However, in general, RNG impacted more on validity than belief based judgements. These findings suggest that both belief and logic judgements require effortful processing but draw upon different types of executive resource.

The role of Working Memory in arithmetic differs by strategy

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Previous research has demonstrated that working memory plays an important role in arithmetic. Different arithmetical strategies rely on working memory to different extents, for example verbal working memory has been found to be more important for procedural strategies, such as counting and decomposition, than for retrieval strategies. Surprisingly, given the close connection between spatial and mathematical skills, the role of visuo-spatial working memory has received less attention and is poorly understood. Experiment 1 used a dual-task methodology to investigate the impact of a dynamic spatial n-back task on adults'

use of counting, decomposition and direct retrieval strategies for addition. The concurrent working memory demand impaired all three strategies, but particularly counting. Experiment 2 investigated whether this was due to the visuospatial or executive demands of the task and suggested that the central executive is heavily involved when adults solve arithmetic problems. The visuo-spatial sketchpad also played a role but to a lesser extent.

The Impact of binge drinking on emotional face recognition in males and females

Frances Hunt, Julia Townshend, Raffaella Milani, Alison Griffin

University of West London

Previous research has reported that an alcohol dependant population showed impairment in recognition of certain facial expressions, particularly fear (Townshend & Duka, 2003). The aim of the current study was to investigate whether binge drinkers also show impairment in the recognition of previously seen faces with different facial expression. N = 95 (50 female) social drinkers took part in a 2x2x4 mixed design quasi-experiment. The between-subject factors were Binge Group (binge vs. non-binge), Sex (male vs. female) and the within-subject factor was Facial-Expression (Happy, Sad, Fearful, Neutral) recognition. Participants were shown sets of facial images which they were subsequently asked to indicate if they recognised from a larger set that included never-before-seen faces. Initial correlational analysis revealed significant effects, but only for female participants. A negative correlation was found between binge-score and happy faces correctly recognised. Fearful faces only approached significance, but interestingly the direction was also negative. That is, the higher the binge-score the fewer faces recognised. Furthermore, a negative correlation between binge-score and proportion of correctly recognised faces was found. Again this suggests that the higher the binge-score the fewer faces recalled. Most worrying was the finding that the higher the binge-scores the higher the number of false positive responses. A 2x2x4 mixed ANOVA revealed a main effect for Facial-Expression; sad faces were least well recognised while fearful faces were best recognised although this pattern was clearer in non-binge drinkers there were no other significant effects. A 2x2 between-subject ANOVA revealed a significant main effect for Sex, with females making more False Positive errors than males. This clearly warrants further investigation particularly the False Positives that correlated with high levels of binge drinking in females as this has potential implications for areas such as face recognition in eyewitness testimony.

Cognitive implications of early alcohol consumption

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University of West London

The developing brain is vulnerable to the effects of alcohol consumption which can negatively impact on cognitive processes (Alfonso-Loeches & Guerri, 2011). The aim of this study was to examine recall of emotional words and recognition of emotional faces in relation to first reported intoxication experience. Participants were N= 93 social drinkers (44 males) where sex (male vs. female) and 'age-of-first-intoxication' were a between-subject factors (age-group 12-14 (N= 29, 15 males), age 15-17 (N = 47, 20 males) and age 18-21 (N = 17, 9 males)). Memory for emotional words was examined using a free recall task in a 3x2x3 mixed design where type-of-word (positive, negative, neutral) was a within-subject factor. There was a main effect for type-of-words with negative words being less well recalled than either positive or neutral words. There was a significant interaction between 'age-of-first-intoxication' and sex: males age-group 15-17 had the poorest recall, whereas in females it was age-group 18-21 with lowest recall. Face recognition was tested in a 3x2x4 mixed design where facial-expression (sad, happy, fearful, neutral) was a within-subject factor. Participants were asked to recognise previously seen faces from a larger set of images. There was a significant main effect for facial-expression with highest recall for fearful faces and lowest recall for sad faces. There was a significant interaction between facial-expression, sex and age-of-first-intoxication. The male age-group 12-14 recognised fewer sad faces, but conversely more fearful faces, whereas the same pattern was shown in the female age-group 18-21. The findings in respect of 'age-of-first-intoxication' were not as predicted. Particularly with females where it was the older age group had the poorer performance. One possible explanation is that this could relate the age at which individuals start to drink to excess on a regular basis.

Free recall of emotional words: Patterns of alcohol intake and sex differences

Frances Hunt, Julia Townshend, Raffaella Milani,
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Binge drinking has been found to have potentially harmful consequences that have been reported to have an impact on cognitive performance during executive function tasks (Hartley, Elsabagh & File, 2004; Townshend & Duka, 2005). Furthermore, there appear to task dependent differences between males and females (Hartley et al., 2004; Townshend & Duka, 2005). The aim of this study was to investigate whether this extended to long-term memory for emotional words. N = 95 (50

female) social drinkers took part in a 2x2x3 mixed design quasi-experiment. The between-subject factors were Binge-Group (binge vs. non-binge) and Sex (male vs. female) while the within-subject factor was Word-Type (Positive, Negative, Neutral). Participants were shown lists of words containing equal numbers of the 3 word types. After a distractor activity, participants were asked to recall all the words they could remember in any order. Analysis revealed a significant main effect for Word-Type in which negative words were the least well recalled. There was a significant interaction between Sex and Binge-Group. Female binge drinkers performed better than female non-binge drinkers. Conversely, male binge drinkers recalled fewer words than non-binge drinking males. The difference between males and females might be because the overall level of alcohol consumption was higher in male binge drinkers than in females. While poorer performance of binge drinking males was as would be predicted, the better performance of binge drinking females is harder to explain. Whether this is an indication of a bias towards processing emotional words in binge drinking females needs further investigation. Given the differential effects on males and females it is difficult to ascribe causality to the alcohol consumption based on these results. It is equally plausible that there is a pre-existing deficit in processing information or certain bias' that underlie binge drinking.

Judgements of object size by eye and hand under two measures

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An essential aspect of everyday living is our ability to reach for, grasp, and move objects. In order to do this we need to have a capacity for judging size, both to determine whether an object is graspable, but also whether it would 'fit' in a desired location. Previous research (e.g. Wu, et al. 1999) has investigated the relative contribution of visual and tactile information when judging object size. Additionally, other work suggests that size judgements are made in relation to hand size (Linkenauger, et al. 2011). The current study extends such work by exploring size judgements under three modality conditions where the object is viewed by eye, grasped by hand, or both. Perceived size was also measured through direct matching, or through a task involving potential for action (i.e. judgement of 'fit'). Eleven adult participants were asked to estimate the size of opaque spheres (15-46mm) in the three modality conditions under each method of presentation. In direct matching, participants completed an 'on-screen' task, using an adjustment procedure in which they manipulated the size of an on-screen circle until it was considered equal in size to the sphere. In the 'action' task participants estimated when the sphere would

just fit between two vertical surfaces. In each case constant and variable error of the judgement were measured. Surprisingly, no difference was found between the on-screen and 'action' tasks across modalities; however, there were clear differences between unimodal visual judgments and ones where the object was grasped. Participants most accurately judged size of the sphere in the vision-only task. Interestingly, in both the vision & touch and touch condition participants systematically over-estimated the size of the object. We interpret these results in terms of current theories of embodied cognition.

Talking while thinking about other's mind in preschoolers: Direct evidence of getting Vygotskian about social cognition

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Language plays a role in social cognitive development but what the role is about is continuously under debate. The current study was the first to investigate online language use during social cognitive processing in Cantonese-speaking Chinese preschoolers. Forty-five 3- to 5-year-old preschoolers' (M = 54.04 months, SD = 10.31) private speech was observed while they were required to think about other's mind in both competitive and collaborative contexts. During the task, preschoolers were required to hide a treasure which they would later receive as a reward if they successfully hindered or helped a toy character to find it. Task performance was indexed by preschoolers' ability in manipulating other's mind according to the specified context and their understanding of other's mind given the manipulation made. Private speech was coded in terms of task relevance and degree of internalization. Results showed that older preschoolers performed better and showed more task-relevant partially internalized private speech than younger preschoolers. Moreover, preschoolers' private speech was correlated with their task performance. This study provides evidence that language in the form of online semiotic mediation has a facilitative role in social cognitive development.

How difficult is it for 3-year-olds to understand that appearance can be different from reality?

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The current study builds upon previous work by Moll and Tomasello (2012) in a sample of 41 Malaysian Chinese three-year-olds. In Task 1, participants were shown pairs of objects, one real and one fake – for example a real can of tea and an object that looked almost identical but that was

really a telephone! They were asked either to pass the experimenter the real can of tea or the object that only *looks like* the can of tea. In the second task, participants were shown a series of deceptive objects (e.g. a phone that looks like a can of tea) and asked what it really is and what it looks like. The order of task presentation was counterbalanced as was the order of questioning within tasks. As with Moll and Tomasello, children performed better in Task 1 than in Task 2.

The major motivation for the current study was to investigate whether or not the experience of performing well in Task 1 would carry over and facilitate performance in Task 2. Moll and Tomasello's study could not answer this particular question for it was a between groups design. Surprisingly, children gained no benefit from performing Task 1 first: They performed no better in Task 2 whether it preceded or followed Task 1. This might suggest that the test questions in the two tasks, although superficially asking the same thing, are actually asking about different aspects of appearance and reality. Indeed, the errors children make in Task 2 are surprisingly robust.

Moll, H. & Tomasello, M. (2012). Three-year-olds understand appearance and reality – just not about the same object at the same time. *Developmental Psychology*, 48, 1124-1131.

Markedness: An empirical investigation

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Members of antonym pairs can be differentiated by each word's markedness - that distinction attributable to the presence or absence of certain features at a morphological or semantic level. Morphologically marked words incorporate their unmarked counterpart, but with additional morphs (e.g., unlucky vs. lucky); semantically-marked words occur less frequently than their unmarked antonyms (e.g., short vs. long). Despite extensive theoretical scrutiny, the lexical properties of markedness have received little empirical study. The this experiment uses a novel approach to measuring markedness, establishing markedness probabilities for individual words. Furthermore, the markedness probabilities of words are evaluated in conjunction with additional lexical properties (e.g., length, frequency, valence) to delineate the independent and additive effects of markedness on lexical decision times. Regression analyses reveal that markedness probability may be strongly related to word valence, but that it does not appear to be linked to frequency. Analysis suggests that markedness and valence interact on lexical decision times: unmarked words are responded to more quickly when they are negative, and marked words are responded to more quickly when they are positive. We argue that markedness is an independent lexical variable from frequency, but closely related to valence.

Volitional control: A different solution for regulating action in Tourette Syndrome?

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University of Nottingham

Background: Tourette syndrome (TS) is a neurodevelopmental disorder characterized by the occurrence of unwanted motor movements and vocalisations (tics). While the neural basis for tics is unclear, dysfunction in cortico-striato-thalamo-cortical circuits has been suggested. These circuits are implicated in the production of voluntary movements although volitional control of action is typically unaffected, or even enhanced, in individuals with TS. Importantly, tics rarely interrupt volitional movements, even in children who present with very frequent tics and for this reason we have been interested in understanding the functional and neural changes that allow children with TS to control their tics while performing voluntary actions.

Method: ten adolescents with TS aged 11-20 years (9 males, mean 15.3 years) and ten age- and gender-matched control adolescents performed a Go/No-Go task in which they executed manual 'Go' responses using their right index finger. Motor evoked potentials (MEPs) were recorded from the FDI muscle of the right hand and motor cortical excitability during the period preceding a movement was assessed by delivering a single pulse of transcranial magnetic stimulation (110% of RMT) at different points during the reaction time period to left motor cortex.

Results: Adolescents with TS showed equivalent behavioural performance to controls (RT and accuracy). By contrast, while cortical excitability increased significantly during the period immediately preceding movement onset in control participants, this was not the case for the TS group. Similarly, the normal pattern of decreasing MEP variability immediately prior to movement onset was again not observed for the TS group. Finally, the slope values describing change in motor cortical excitability during movement preparation were negatively correlated with tic severity scores.

Conclusion: The results are discussed in relation to the activity of motor circuits during volitional movements and the putative role of frontal cortex in holding motor cortex in check.

The effects of imitative vs. cognitive method on the speech development of children with autism

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This study examined the effects of two speech therapy methods on three verbal behaviours of autistic children including oral speech, listening, organizing, speaking, semantics, and syntax. In this study, thirty 6-8 old children with autism were

assigned to one of two groups, an imitative or a cognitive group. In the first phase of the study, the speech development level of the two groups was measured. Then both groups of children received six months of speech therapy instruction, during which one group was taught with an imitative method, while the other group was working with cognitive method. After the period of six month of treatment, a post test was done, and a correlation analysis based on the data of the two groups revealed a significant difference between results. Overall, the results revealed that after the teaching period, autistic children working with cognitive method have gained a better development in their speech, comparing to those working with imitative method.

Living with teenagers: The development and formative evaluation of a peer-led parenting intervention

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Background: Evaluations of multi-systemic interventions for parents of adolescents with high/complex needs, delivered by highly specialised clinical teams, show significant improvements in child and parent outcomes. Less is known about the effectiveness of lower-intensity parenting interventions delivered in the community. This paper describes the adaptation and feasibility testing of the Empowering Parents, Empowering Communities (EPEC) model of peer-led parenting groups for the parents of teenagers.

Method: The Living with Teenagers programme was modelled and manualised in an iterative process involving distillation of EPEC components; consultations with EPEC peer facilitators and parenting experts; and literature reviews. Initial feasibility work was conducted with seven EPEC peer facilitators and two past participants. Subsequent groups were provided in community locations across the inner London Borough of Southwark, to four cohorts of parents (n=48) seeking support with a child aged 11-16 years. Sessions addressed parenting styles; listening and communication skills; building teenagers' self-esteem; positive parenting and discipline strategies; handling conflict; and understanding social/developmental challenges of adolescence. Outcomes and user satisfaction were evaluated using a mixed-method, uncontrolled cohort design.

Results: Initial findings indicated social validity, user satisfaction and clinical effectiveness, and potential programme adaptations including more sessions, greater handout provision and content tackling issues in the community. Adaptations were incorporated into the subsequent community groups, in which two-thirds of participants completed the programme. Significant pre-post

improvements ($p < 0.05$) were reported in parental concerns, parent-child relationship satisfaction and affective family environment. Non-significant changes in positive parenting and child mental health may reflect a “floor effect” with mean baseline scores below clinical cut-offs. Parents reported high overall satisfaction, and strongly endorsed the value of peer group support, peer facilitation and material on understanding teenage behaviour.

Conclusions: Living With Teenagers may be an effective and acceptable intervention for parents in the community seeking support in their relationships with adolescent children.

The development of verbal short-term memory: Insights from, and implications for, adult models

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Studies of verbal short-term memory development in children have long been informed by adult theory, and, in particular, Baddeley’s working memory model. This model assumes that forgetting from verbal short-term memory is caused by trace decay, but that the effects of forgetting can be offset by rehearsal. Consequently, one potential cause of the age-related change in verbal short-term memory in children is the development of rehearsal strategies or rehearsal efficiency. Indeed, a number of authors have suggested that the development of rehearsal undergoes a qualitative change, with children younger than 7 years not engaging in rehearsal.

In this talk I draw on developments in the adult working memory literature to evaluate this claim. In particular, a number of recent adult models of verbal short-term memory (such as the Feature model and the SOB model) argue that forgetting from short-term memory is caused by interference rather than trace decay, and that rehearsal is not necessarily needed to support recall. I apply these lines of reasoning to the key evidence currently used to argue for a qualitative change in children’s use of rehearsal, specifically word length and phonological similarity effect data, and argue that the development of rehearsal plays little, if any, role in driving age-related change in children’s immediate serial recall of verbal information.

This position clearly has implications for our understanding of how verbal short-term memory develops, but it also can inform neuropsychological studies of adult patients with impaired short-term memory performance, which I also discuss.

Hebbian learning for tactile sequence

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The present study explored the Hebb repetition effect in the learning of tactile motor sequences. This effect refers to the incidental acquisition of

serial order memory following the surreptitious repetition of a specific sequence order (Hebb, 1961). Previous studies have reported improved memory for the repeated (Hebb) list with verbal (Hebb, 1961), non-verbal visual (Horton et al., 2008), visual-spatial (Couture & Tremblay, 2008), auditory-spatial (Parmentier et al., 2008) and olfactory stimuli (Johnson et al., 2013). Participants completed a serial-order reconstruction task comprising of six tactile stimuli. This was administered via a plastic probe, with the experimenter touching the intermediary phalange of the *digitus secundus*, *digitus tertius* and *digitus quartus* on the dorsal aspect of the right and left hands. Blind-folded participants were required to recall the sequence by moving their fingers in the order in which they were touched. Across the 30-trials, re-representations of the Hebb list occurred on every third trial. The order reconstruction task produced a serial position function comprising both primacy and recency for the repeated and non-repeated sequences. Serial-order reconstruction for the repeated tactile motor sequences improved compared to the non-repeated sequences across the 30-experimental trials. The current observation of a Hebb repetition effect for motor sequences further supports data indicating cross-modal similarities in order memory.

Sexual promiscuity and attentional bias for sexualised stimuli

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Bournemouth University

The present study examined the attentional bias for sexualised stimuli amongst individuals who scored high and low on sexual promiscuity (SP). Eighty participants completed a visual probe task in which pairs of images (one sexual and one-matched non-sexual image) were presented adjacently for 500ms. The images were immediately replaced by a target probe positioned identically to one of the preceding images. Participants were required to respond to the direction of that target probe. Group assignment to a high or low SP condition was implemented via median-split of questionnaire responses (the Relationship Exclusivity Measure: Schmitt and Buss, 2000). Attentional bias (i.e. the difference in reaction times when the probe followed sexual as opposed to non-sexual images) was significantly greater for the high SP group, indicating greater attentional proclivity for the sexual images. This data is consistent with the drug literature, wherein, for example, heavy social drinkers have a greater bias for alcohol-related stimuli (Field et al., 2004).

Subclinical delusional ideation, reasoning and creativity

Claire Jones

University of Wolverhampton

Previous studies (Colbert & Peters, 2002; Galbraith, Manktelow & Morris, 2008; LaRocco & Warman, 2009; Linney, Peters & Ayton, 1998) have demonstrated that people in the general population who hold unusual beliefs display reasoning biases similar to those displayed by people with delusions.

Furthermore, research has demonstrated that performance on tests of creativity among the general population is associated with scores on scales to measure liability to psychopathology (Nettle, 2006). The current research aimed to investigate how people in the general population who are classified into high and low delusion-prone groups reason about narratives with delusional and neutral content and to investigate the relationship between delusional thinking and creativity.

Participants (N = 93) completed the Peters et al. Delusions Inventory (PDI; Peters, Day & Garety, 1996) and assessed a series of delusional and neutral narratives. Participants also completed the Novelty subscale of the Emotional Creativity Inventory (Averill, 1999), the Remote Associates Test (Mednick, 1962) and the Snowy Pictures Task (Ekstrom, French, Harman, & Dermen, 1976).

Results revealed that those in the high delusion-prone group rated delusional narratives more highly than those in the low delusion-prone group; while those in the low delusion-prone group rated neutral narratives more highly than the high delusion prone group. The high delusion-prone group had significantly higher scores of emotional creativity and reported significantly more pictures on the Snowy Pictures Task compared to the low delusion-prone group.

In conjunction with other reasoning biases that have previously been identified in delusion-prone individuals, these findings may have implications for the formation and maintenance of delusions.

Demystifying the nine-dot problem: The dynamics of problem space search and insight

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The nine-dot problem has baffled psychologists for almost a century by being very difficult to solve and by being very resistant to helpful hints. Participants can be given one hundred attempts to solve the problem and still fail and even when participants are informed that the solution involves drawing lines that go beyond the perceived 3 x 3 square, the hint mostly leads to failure. By combining research from Ohlsson (1984, 1992) and Newell and Simon (1972), we provide a very straightforward explanation of problem difficulty in the nine-dot

problem: before insight is achieved, the problem space representation is *too small* and does not include the problem solution, resulting in impasse; if an insight is subsequently achieved to realise that lines need to go beyond the perceived 3 x 3 square, the problem space becomes *too large* meaning problem solution is difficult to find. We demonstrate this interplay between problem space search and insight using a study where participants are given differing levels of information – some of which further constrains the pre-insight problem space in order to facilitate impasse, and some of which constrains the post-insight problem space in order to facilitate problem solution. The results show that insight is encountered more quickly when the search space is constrained and that problem solution is easily found when the post-insight search space is constrained. In fact, of those problem solvers who drew lines beyond the perceived 3 x 3 square in the experimental conditions, an unprecedented 90%+ were able to solve the problem. We propose a cognitive model that focuses on general problem solving heuristics and representational change to explain problem difficulty.

Chunking trumps temporal duration in short-term memory: The case of the length effect that disappeared

Gary Jones

Nottingham Trent University

Studies that explore the memory of lists of items that differ in spoken length show – almost without fail – that long items are recalled with less accuracy than short items. These so-called length effects are explained by appealing to a short-term memory store whereby the amount of time that information remains in temporary storage is related to the spoken duration of the information. However, since length effects are derived from the spoken length of stimuli, they should not be susceptible to aspects of familiarity. I present two studies of length effects that illustrate how long stimuli are recalled more accurately than short stimuli by simply manipulating the familiarity of the items themselves. Study 1 shows how lists of five syllable high frequency words are recalled more accurately than four syllable low frequency words. Since the study shows that temporal duration is not a primary factor for these stimuli, I suggest that the data are more readily explained by chunking: low frequency four syllable words do not exist as single chunks and therefore occupy more space in short-term memory than five syllable high frequency words that do exist as single chunks. To support this view, study 2 compares lists of four syllable nonwords that contain familiar lexical or morphological units that should exist as chunks (e.g. *revamponist*) and lists of three syllable nonwords that do not contain familiar chunks (e.g. *senkergeef*). Recall accuracy is greater for four syllable items over three syllable items, illustrating that recall is governed by the chunking

of the stimuli. Taken together, the two studies show that short-term memory is primarily a chunk-based store, with temporal duration playing a secondary role.

Bullying and belonging: A longitudinal study of the protective role of defenders in peer groups

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Background: Research on school bullying focuses increasingly on the group processes that might underpin this behaviour. Salmivalli and her colleagues (e.g., Salmivalli, Lagerspetz, & Björkqvist, 1998) identify children who act as defenders in bullying situations. These children are supportive of the victim and actively try to make others stop bullying. Research has begun to look at the characteristics of defenders, however, as yet, relatively little research has looked at the specific effect of defenders in the peer group on later peer victimisation.

Method: In this study, 1,241 young people aged 11-13 years from six secondary schools in England provided self-reports of peer victimization experiences (using the Direct and Indirect Aggression Scale; Bjorkqvist, Lagerspetz, & Osterman, 1992), and psychosocial adjustment, as well as peer reports on those who acted as defenders, and who were their friends. These reports were completed at the beginning and end of the school year, as part of a short-term longitudinal research design.

Results: Using sociometric data analysis techniques to determine children's peer networks, the extent to which having a defender in one's peer group impacted upon peer victimization across the study was tested. It was found that the presence of defenders moderated the relationship between self-reported peer victimization at the beginning and end of the school year, and had a positive impact upon psychosocial well-being. Having more defenders in one's peer group at the beginning of the school year served a protective function against peer victimisation at the end of the school year, and increased well-being scores.

Conclusion: Children who are nominated as defenders in their class serve a protective function for well-being, and against future victimisation, for their peer groups. The implications of these results for theory relating to defenders' role in preventing peer victimization are discussed.

Online inference-making in children with and without comprehension difficulties

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Purpose. It is well-documented that so-called 'poor comprehenders' have difficulty making inferences during reading. However, we do not know whether

their difficulties occur during initial reading or whether they are due to integration processes, strategy use or in their output (i.e. answering questions). We examined inference-making in children with good or poor comprehension in an eye movement experiment in order to scrutinize whether children spontaneously make inferences during reading, and when and how poor comprehenders differ from controls in their reading of texts requiring inferences, as well as their responses to questions tapping those same inferences. We also examined whether presenting the question before the text affected inference-making.

Method. Children's eye movements were monitored as they read short texts, and then answered a question for which an inference was, or wasn't, needed in order to answer correctly. Questions appeared either before or after the text.

Results. All children exhibited longer first pass reading times on a target word in the inference than control condition. Poor comprehenders performed worse on the questions overall and presenting the question before the text resulted in poorer performance on question response accuracy for the control group. Differences in the time course of the effects observed between good and poor comprehenders will also be discussed.

Conclusions. Poor comprehenders do show evidence of spontaneous inference-making during reading but perform poorly on questions tapping those same inferences. This suggests that their difficulties may be in later stages of processing, or in how they organise their output in responding to questions.

Czech gifted preschoolers: Is early giftedness well identified by nonverbal intelligence tests?

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Masaryk University

The goal of this paper is to present ongoing research in the Czech Republic focused on nonverbal intelligence of 5-7 year old Czech children. Data are being collected from two populations: gifted children, identified by multi-dimensional intelligence tests standardized on Czech population, with an IQ score 130 or above (target sample $n = 30$), and a general population of children (target sample $n = 90$). The project aims to examine differences between the two populations in nonverbal intelligence. To capture these differences, we use the Universal Nonverbal Intelligence Test (standard battery which includes Symbolic Memory, Visual-spatial Reasoning, Spatial Memory and Analogic Reasoning). To gain more information about performance in this nonverbal test we extended the battery by two subtests of the Intelligence and Development Scales (Phonological and Expressive Speech), one subtest of the Woodcock-Johnson (Picture Vocabulary) and the Preschool Children Questionnaire for parents. The

Preschool Children Questionnaire is believed to assess which characteristics in children development indicate early giftedness. Concerning the use of Universal Nonverbal Intelligence Test with gifted children we pose three following questions: First, we ask whether this test is reliable and valid for use with Czech children. Second, we intend to find whether this test is appropriate for the identification of early giftedness. Third, we aim to examine whether the test provides some additional information compared to verbal subtests. The paper will present preliminary findings from this project.

The relationship between auditory processing, auditory sensory behaviours and communication skills in autism spectrum disorders

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University of Portsmouth

The aims of this study were twofold. First, the study aimed to evaluate the extent to which adults with autistic spectrum disorders (ASD) present atypical auditory processing. Second, the study investigated the relationship between auditory discrimination ability, sensory behaviours and communication skills. Auditory discrimination ability of intensity, frequency and duration, auditory sensory behaviours and communication skills were measured in 21 adults with ASD and 21 IQ and age-matched non-autistic sample. Results showed significantly inferior performance in the ASD group in the discrimination of both frequency and duration, with no group differences in intensity discrimination. The results also revealed group differences in the pattern of relationships between auditory discrimination, sensory behaviours and communication. While in the ASD, the three auditory parameters were related and in turn were related to communication and sensory behaviours, this was not the case in the comparison group. It is suggested that early auditory remediation may constitute an effective interventional strategy to help with sensory behaviours and the development of communication skills in people with ASD.

Executive functions and adolescents on the Register of Special Educational Needs

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The ability to function adaptively and to learn effectively is fundamental to a young person achieving their potential and is underpinned by executive functions (EF). The aim of this study was to examine EF in relation to the behaviour and abilities young adolescents receiving support within the Special Educational Needs (SEN) graded categories of School Action, School Action Plus and Statement. Domains of interest were inhibition, executive loaded working memory (ELWM)/fluency

and shifting. Information was collected about these domains by the use of relevant EF tasks and through the completion of the BRIEF (Behavioural Rating Inventory of Executive Function) sub-scales relating to working memory, inhibit and shift by students, participating teachers and parents. A clinical perspective was obtained through completion of the SDQ (Strengths and Difficulties Questionnaire) by teachers about the SEN students. Together, all measures enabled an extensive investigation of the cognitive and behavioral barriers to learning impacting young adolescents aged 11 to 14 years. The sample consisted of 134 adolescents on the SEN register and 141 typically developing adolescents from the same classes.

Preliminary analyses indicate SEN and Non-SEN group differences in all executive function verbal and non-verbal performance measures apart from verbal switching. Differences in BRIEF self-ratings, teacher and parent reports were significant between groups for all subscales with greater levels of difficulty reported for SEN students. Teachers and parents rated students in both groups as having greater levels of difficulty than students themselves. Teachers rated working memory as most problematic for both groups but parents rated inhibit worst. There was little agreement between teachers and SEN students on the degree of difficulty across sub-scales. Hyperactivity and conduct problems were areas of concern for teachers with high correlations between SDQ and BRIEF ratings. The implications of these findings for assessing and understanding EF will be discussed.

The role of conceptual understanding in children's mathematical skills

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Given the well-documented difficulties that many children have with learning mathematics, recent research attention has focused on identifying the domain-specific cognitive skills that are important for successful mathematics performance. In particular, the role and importance of conceptual understanding of mathematics has been questioned. We explored whether domain-specific conceptual understanding could be identified as a specific predictor of mathematics outcomes, separate to procedural and factual knowledge. Eighty-three eight and nine year olds completed tasks which measured domain-specific numerical skills, including factual, procedural and conceptual knowledge. WIAT Numerical Operations (written arithmetic) and Mathematical Reasoning (mathematical word problems) tests were used to assess mathematical achievement. Linear regression analyses showed that all three domain-specific skills were independent predictors of performance on the Maths Reasoning task, but only factual and

procedural knowledge predicted performance on the Numerical Operations task. This suggests that conceptual understanding can be overlooked in mathematical achievement tasks which assess written arithmetic only, despite playing a vital role in mathematical competence. A principal component analysis revealed how these separate components of mathematical skills relate to each other. Procedural and factual knowledge combine as a single factor, while conceptual knowledge alone loads highly as a second component. This suggests that factual and procedural mathematical knowledge are very similar, while conceptual knowledge is a somewhat separable skill. These findings contribute to the ongoing debate concerning the domain-specific cognitive skills important for mathematics achievement.

Cognitive systems underlying the comorbidity of motor and social difficulties in primary school children

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Research examining cognitive processing in developmental disorders has typically studied one disorder at a time without regard to comorbidity. Thus, the cognitive difficulties causing particular patterns of comorbidity remain largely unknown. This project aims to define the relationship between motor and social difficulties in children and the cognitive processes underlying these behaviours. We have selected three cognitive systems to investigate: 1) theory of mind systems, 2) mirroring systems and 3) systems of motor control.

Social and motor behaviour in 103 children (5-11 years) was assessed by parent questionnaires tapping social (SRS), executive (Conners) and motor (DCD-Q) skills. The children also completed cognitive tasks measuring of nonverbal IQ, theory of mind, action comprehension, imitation and motor control.

Initial correlations revealed high overlaps between motor, social and executive difficulties reported by parents, but lower overlaps in the cognitive assessments. Exploratory factor analysis of the cognitive performance data yielded three factors, corresponding to theory of mind, action comprehension and motor control. Linear regression analyses were then used to test how these cognitive factors predict the child's behaviour as reported by parents. Both social (SRS) and motor (DCD-Q) behaviour scores were related to the motor factor rather than theory of mind or action comprehension factors. Executive behaviour (Conners scale) was related to socioeconomic status rather than the cognitive factors tested.

Overall, these results indicate that the assessment of motor skill has an important part to play in understanding developmental differences in social cognition and motor functioning. Further analysis of this rich dataset is underway. We aim to explore

how different cognitive skills relate to each other, and how children's everyday behaviour is influenced by their underlying cognitive strengths and weaknesses.

Differently developed adults: Cultural similarities and differences in perspective taking mechanisms

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Aston University

Being able to judge another person's visuospatial perspective is an essential social skill and I will present recent studies, where we investigated the generalizability of the required mechanisms across groups with a different cultural background. Developmental, cross-species, and our own previous research suggests that two different levels of perspective taking can be distinguished, which are subserved by two distinct mechanisms. The lower level seems to rely on inferring the other's line-of-sight while the higher level depends on embodied simulation (e.g. Kessler & Rutherford, 2010). In the context of distinct educational backgrounds and their impact on perspective taking, cultural effects are of particular interest. Our most recent results suggest that, in principle, the same basic mechanisms are employed by males and females (Kessler & Wang, 2012) and in both, East-Asian and Western culture (Kessler et al., subm.). However, we also found systematic variations of these basic patterns. In agreement with previous research we observed that Westerners were indeed more egocentric, while East-Asians were more other-oriented. Furthermore, Westerners were slower overall than East-Asians and, importantly, showed stronger gender differences in speed and depth of embodied processing than East-Asians. That is, East-Asian males and females were more similar in their use of the basic mechanisms than Western males and females. Our findings substantiate differences and commonalities in social cognition mechanisms across cultures and genders and I will discuss these conclusions in relation to developmental implications.

Is the scholastic academic ability of mathematics related with the ability of theory of mind?

Haruo Kikuno

Osaka Shoin Women's University

The aim of this study was to examine whether the scholastic academic ability of mathematics would be related with the ability of theory of mind. It was expected that scholastic academic ability of mathematics would depend on the ability of theory of mind because the understanding of academic ability of mathematics would depend on student's ability to understand teacher's theory of mind in class. Students were received a questionnaire of theory of mind and problems in mathematics including calculation problems and issues of sentence. The results showed that the scholastic ability of mathematics depended on the score of

theory of mind. The result also showed that the scholastic ability of calculation problem depended on score of theory of mind more than that of issues of sentence did.

The relationship between symbolic gesture, maternal mind-mindedness and theory of mind

Elizabeth Kirk, Lisa Wheatley

University of Hertfordshire

Previous longitudinal research from our lab found mothers trained to gesture with their babies demonstrated higher levels of maternal mind-mindedness than those in control groups (Kirk, et al. 2013). We followed-up these children (now aged five/six) and tested whether those who had used gesture with their mothers as babies were better able to attribute mental states to others (Theory of Mind or ToM). We compared the scores of gesture trained (n = 17) and control (n = 16) children on the Strange Stories task (Happé, 1997) and found no significant difference; encouraging gesture in infancy did not result in observable differences in mentalizing abilities in childhood. Children's ToM was, however, significantly predicted by the extent to which mothers had commented appropriately on their child's mental states when they were 10, 12 and 20 months of age. Our findings make a valuable contribution to understanding the complex relationship between mind-mindedness and children's ToM.

Using eye movements to understand cognitive processing during copying from the board

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Although copying text from a board seems trivial, the task itself is psychologically complex. It involves a series of sequential visual and cognitive processes, including visual encoding, construction and maintenance of a mental representation in working memory, followed by production of the representation in written form. We measured eye movements while child and adult participants produced written copies of isolated words that were presented on a wall mounted screen. We manipulated word-length and whole-word frequency of the to-be-copied text to investigate whether these properties influenced encoding, representation and written production. Data for adult skilled readers showed a word-length effect during both encoding and production stages; increased total encoding duration was demonstrated for low compared to high frequency words. Lack of frequency effects in production was likely due to written word production being based on a complete lexical representation. Children, in contrast, show partial word encoding effects, where partial word representations are encoded across successive encoding episodes. Comprehensive

analyses will be reported for both adult and child participants. Encoding measures, combined with gaze transfer patterns (head movements between the original text and the participants' written copy) during encoding, production and checking, seem potentially sensitive measures in a board-copying task. We believe that this investigation demonstrates that this approach offers a potentially useful paradigm to investigate children's reading development. The copying task provides an opportunity to examine the process of reading as it develops, specifically, the units over which children's encoding operates at different stages of development.

EF, inner speech and maltreatment

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Research indicates that adolescents who have experienced childhood maltreatment (physical, emotional, or sexual abuse; neglect, or witnessing domestic violence) have more emotional and behavioural disturbances and lower cognitive abilities than typically developing (TD) adolescents. These difficulties are consistent with weaknesses in executive functioning (EF) skills.

This study investigated whether maltreated adolescents have impairments in EF abilities and inner speech compared to non-maltreated TD adolescents. Inner speech is thought to aid self-regulation and problem-solving, and may contribute to the development of EF. Furthermore, impairment in the internalisation of language is likely to lead to cognitive and behavioural difficulties.

Forty adolescents subjected to child maltreatment, together with 40 non-maltreated TD adolescents, completed a battery of EF tasks and a 'tower' task to assess planning efficiency with two conditions: Articulatory Suppression (AS) to prevent the use of inner speech; and foot-tapping to act as a 'control' non-speech interference condition. To examine group differences, hierarchical multiple regression analyses were conducted with the dependent variables being each of the EF measures, and planning efficiency under the two interference conditions.

The maltreated adolescents had significantly lower performance than the TD adolescents on tasks assessing ELWM, fluency, and inhibition. However, switching cost did not appear to be impaired. In the inner speech problem-solving task, there were no group differences in planning efficiency in the foot-tapping condition, suggesting that both groups were equally affected by non-speech interference. However, in the AS condition, the planning efficiency of the maltreated adolescents was significantly poorer than that of the TD adolescents.

These findings support the theory that impairments in EF may be the underlying reason that maltreated adolescents struggle to cope both inside and outside the classroom. Furthermore, it is possible

that maltreated adolescents may make more use of inner speech during challenging problem-solving tasks than TD adolescents, or at least are more vulnerable to disruption of inner speech.

The importance of ‘what’: The usefulness of multisensory information in statistical learning

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The perceptual system performs a staggering feat for the developing child: It presents cohesive and informative scenes, orients the child towards areas of high contrast and great activity, and localizes visual and auditory input. From these noisy scenes of visual, auditory, and tactile information, infants have to pick out events relevant to the task at hand, combine correct clusters of sensations to produce a veridical representation, and encode locations for later retrieval. Luckily, our world is layered with perceptual redundancies that help guide attention (e.g., Bahrick & Lickliter, 2000; Lewkowicz, 2000; Richardson & Kirkham, 2004; Kirkham et al., 2011), and support the development of predictive behaviours (e.g., Kirkham et al., 2007; Wu & Kirkham, 2010). The same information, such as the location of an event or the frequency of its occurrences, can be conveyed simultaneously in visual, auditory and/or tactile cues. In this paper, I will discuss findings from a body of research investigating how audiovisual regularities support perceptual representation. I will address several factors that will affect an infant’s ability to learn a particular sequence or set of events: The availability and coherence of multiple cues, and the age of the infant. I will present evidence that, at younger ages, infants will require a higher number of cues, and a higher degree of coherence between them. At later ages, infants will be able to learn probabilistic structure from a smaller set of cues, and be able to tolerate a degree of incoherence between multiple cues.

Audio-visual speech perception in children with Specific Language Impairment

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Children with Specific Language Impairment frequently show deficits in speech perception abilities at a group level. These auditory processing difficulties have been speculated to be significant to the aetiology of the disorder and in on-going issues with language development through childhood. Currently, all the work pertaining to speech perception has been carried out in the auditory domain, thereby contrasting with naturalistic speech environments which are typically audio-visual. Visual speech cues provide a powerful source of information for both adults and typically developing children; they confer significant advantages for speech perception in auditory noise,

and result in some persuasive illusions. In the current study 5-11 year old children with and without a diagnosis of language impairment were assessed on a range of language and speech perception tasks. The speech tasks were designed to study both lipreading ability and the benefit of being able to see the talking face in challenging listening conditions, given two competing speakers. We ask whether the development of audio-visual speech perception ability follows the same trajectory in those with language impairment as in their typically developing peers. Results will be discussed in the context of both aetiological and clinical implications; in particular what the practical significance of visual speech is for children with developmental language difficulties.

Recollection and familiarity in children

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Plymouth University

Recognition can be divided into two processes: Recollection and familiarity. Recollection is defined as an effortful, slow acting process, where qualitative details about an event have to be recalled. Familiarity is a less effortful, fast acting and relatively automatic process, which is not associated with contextual details (Yonelinas, 2002). Because of methodological difficulties only a few studies investigated the underlying processes of recognition in children. Here a novel paradigm, based on the process dissociation paradigm is used to gain insight into the qualitative aspects of recognition memory in 5-, 7-, 11-year-olds and adults. In encoding participants were presented with a series of pictures which displayed either one or two objects (this was used as source information to define target and non-target items). Recognition consisted of two phases: inclusion and exclusion. During inclusion participants were instructed to respond “yes” to words that have been presented before and to reject new words (“no”). In the exclusion condition participants were told to respond “yes” to previously studied items of the target group (e.g., 1 object items) and to reject both previously studied non-target items (i.e., 2 object items) and new items. By contrasting exclusion and inclusion familiarity and recollection values were estimated. It was found that recollection improves until the age of 11 whereas familiarity seems to be stable from the age of 5. Altogether these findings provide novel insight into familiarity and recollection processes in children.

When do children recognize that they don’t know emotions of others?

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Many researchers have investigated and theorized preschool children’s emotion understanding based on “I know” response. Most of them haven’t focused

on “I don’t know” response. However, when we distinguish self from others, emotions of others are also essentially uncertain. If we don’t consider “don’t know” response of preschool children, it could be possible that we incorrectly theorize their emotion understanding. This study investigated when “don’t know (about emotions of others)” response would occur. Children of 4-year-old (n=26), 5-year-old (n=30), and 6-year-old (n=34) participated in this study. They inferred the emotion of “self”, “friend”, and “fictitious other” in equivocal situation (e.g., a beetle stops on one’s arm). The result indicated that there were more “don’t know” responses in the condition of “friend” and “fictitious other” than in the condition of “self”. Also there were more “don’t know” responses among the 5- and 6-year-old children than the 4-year-old children. This result suggests that children would begin to recognize that they don’t know emotions of others from 5 (or 6) years old.

Neurochemical inhibition/excitation balance is linked to cognitive achievements in the developing and mature brain

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Academic achievements impact an individual’s future prospects greatly. A thorough understanding of the underlying biological basis of learning is crucial in order to design early identification and intervention methods for learning disabilities. Here, we examined the association between neurochemicals and one of the most important academic abilities: mathematics. At younger ages, children primarily recruit the prefrontal cortex for mathematical processing, whereas they recruit posterior brain regions, such as the parietal lobe later on. The neurotransmitters gamma-aminobutyric acid (GABA) and glutamate (glu) modulate learning via the formation of long-term potentiation and depression. We hypothesized the ratio between cortical inhibition and excitation (I/E), as measured by the GABA/glu ratio, would relate to mathematical achievement in the prefrontal but not the parietal cortex during the early years of mathematical education. Girls aged 7-10 years and female adults aged 20-23 years underwent magnetic resonance spectroscopy (MRS). Concentrations were quantified in the left inferior frontal gyrus (IFG) and right intraparietal sulcus (IPS). Right inferior occipital gyrus (IOG) measures served as a baseline control. Mathematical achievement was assessed using a standardized test (WIAT-II UK). Girls with lower mathematical abilities showed higher I/E ratios in the IFG, but not the IPS than girls with higher scores. Adults showed strong correlations between mathematical achievement and I/E ratios in the IPS but not the IFG. The groups differed significantly in the strength of the correlations, thus indicating a double dissociation between I/E ratios in IPS/IFG and mathematical

achievement in the two age groups. These results provide novel opportunities to examine developmental cognitive changes with potential biomarkers and to design interventions for learning disabilities and cognitive difficulties.

Recognizing sounds in complex sound scenes: Change over the school years

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Children grow up in a remarkable variety of complex and dynamic listening environments. In the school years, they must learn to adapt to and use information from these environments to succeed in navigating their real-world, social, and scholastic situations. Changes in attentional skills and environmental demands (such as noise levels in classrooms) may lead to developmental changes in the ability to deal with noise. Somewhat surprisingly, there has been little study of the development of children’s skills in detecting and recognizing ecologically important sound objects in such naturalistic listening contexts. Further, in these complex conditions, the semantics of a sound scene can act as an aid for identification. The extent to which children can benefit from these cues has not been explored previously. We use a non-linguistic analogue of the classic “cocktail-party” situation, where school-age children listen to different dynamic auditory scenes. While listening to the scenes, children are asked to detect and identify short, commonly-encountered sound objects. We explore the influence of masking and contextual congruence on children’s target recognition. As suggested by previous developmental studies of auditory perception, the current results imply that children’s abilities to use and integrate information about the auditory world continue to develop through the school years. These results are particularly relevant to discussions of children’s performance in noisy, real-world conditions.

Oromotor control and imitation predict novel word production in the school years

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Language impairment and dyslexia are specific developmental disorders, identified when the child has problems with oral or written language in the absence of a known cause such as low IQ or neurological damage. However, the nonspecific nature of these deficits is increasingly recognised. Deficits in motor skills often co-occur with language or reading problems, but it is unclear whether the nature of the motor difficulties is the same in these two conditions. We used a large (n = 322) sample of children who had explicitly been assessed for both oral and written language skills. The nine- and ten-

year-olds were given fine motor tasks to assess their speed, sequence, and imitation abilities. When categorised according to oral language ability, those with language impairment (LI, $n = 82$) were slower than language typical children (LT, $n = 240$) at peg-moving, and less able to imitate hand positions. When categorised according to reading ability, those with reading delay (RD, $n = 118$) were slower than reading typical children (RT, $n = 204$) at peg-moving and finger-tapping in sequence. Overall, comorbid motor deficits were found for both language and reading impairments, with slower performance for moving small objects associated with both conditions. However, deficits in motor imitation were not found for children with pure reading impairments but were specifically linked with impairments of oral language.

Visual processing of bodies when they are targets and distractors

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Several studies have indicated that human faces and body-like stimuli may attract attention (e.g. Bindemann et al., 2010; Ro et al., 2007; Downing et al., 2004). We have previously demonstrated (Kroll & Dunn, 2012) that there are processing speed advantages for detecting human targets in comparison to similar objects in natural scenes. This was using a visual search task in which participants had to indicate the presence or absence of a target (body/body part/clock/clock part). Here we used an irrelevant distractor paradigm in which we manipulate the presence or absence of a target and distractor independently of one another. The task was a speeded detection of the target (non-body object) in the presence or absence of the task irrelevant distractor (body/other object). In some conditions the task irrelevant presence of a human body slowed reaction times to a target. However, in other conditions this slowing did not seem to be exclusive to bodies. The extent to which bodies slow reaction time more than other distractors appears to depend on target distractor similarity.

Children's emotion perception in human voice and face

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Brunel University

Background: Children's emotion understanding abilities develop with age (for example O'Brien, Weaver, Nelson, Calkins, Leerkes & Marcovitch, 2011). This has either been found for visual stimuli (Grossmann, Striano & Friederici, 2006) or for auditory stimuli (Rothman and Nowicki, 2004) – but not for both independent modalities in parallel. This is especially true for narrow emotions such as fear, surprise and disgust since broad emotions such as happy, sad and anger are being practised and recognised earlier in life (Widen & Russell, 2008).

However, not many studies have included reaction times as well as accuracy and intensity measures of basic emotion perception. This research investigates developmental differences in emotion processing in children as compared to adults. Methods: 54 English children aged five to 10 as well as 52 English adults aged 18-64 rated Ekman visual faces stimuli (Ekman, 1976) as well as Montreal non-verbal affect stimuli (Belin, Fillion-Bilodeau & Gosselin, 2008) on a 7 point Likert scale for perceived emotion intensity. Results: Study I, Child Sample: Children's reaction times for rating emotions decreased with age. This was true for voices as well as for faces although faces were processed faster than voices in two out of three child groups. In none of the three child groups were broad emotions processed faster than narrow emotions. Study II, Adult Sample: Children rated emotions in general significantly slower than adults. This was true for visual as well as for auditory emotion stimuli across all trials. The margin in speed for rating broad and narrow emotions seemed to increase with adulthood. Discussion: Findings suggest that normally developed children have a similar understanding of all six basic emotions to adults. However, children take longer to rate emotions, especially in the voice trials indicating visual domain dominance. This could have practical implications for emotional interventions in clinical settings.

Measuring the development of visual attention in infancy: More exact timing due to eye-tracking

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The ability of infants to switch attention from a central fixation stimulus to a peripheral visual target, measured in the Fixation Shift Paradigm (FSP), is a reliable measure of normal and abnormal attention development in infancy (cf. Hood, B.M. & Atkinson, J., 1993. *Infant Behav Dev* 16, 405-422.). The switching of attention occurs later if the central fixation stimulus stays visible when the target appears (competition condition), than if the central stimulus disappears (non-competition condition). This difference decreases with age, most likely as a result of emerging cortical control of attention.

The standard FSP is based on an adult observer judging the infant's eye movements and making a manual response. We are developing an automated approach using remote eye-tracking (Tobii X120) which offers improved accuracy and shorter testing times.

We will present data from infants tested with the new method under competition and non-competition conditions, illustrating attention development in the first year of life. Our results are consistent with previous studies, but provide more precise measures of the timing and accuracy of fixation shifts. The new method should be suitable for fine-grained assessment of typical and atypical

development of attention. Furthermore, it can be combined with techniques such as event-related potentials to provide insight into the development of underlying brain mechanisms.

Tune Time: Investigating the impact of a program of spoken versus sung rhymes on Year 1's phonological awareness

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Tune Time (funded by the Harpur Trust) is an early literacy program developed with the express purpose of adding value to synthetic phonics programs and thus supporting early phonological learning in the classroom. Through the administration of phonological before and after tests, Tune Time assesses whether music has a particular benefit in early literacy learning by comparing our rhymes delivered as songs versus our rhymes delivered as poems.

The Tune Time rhymes have been written by a group of specialists in early literacy development and children's musical composition and feature rhyming couplets and use high frequency and regular words as appropriate for the Year 1 classroom. When delivered as songs, Tune Time uses strong tunes with prominent beat and actions are used to underline key words and aid comprehension in both conditions. All rhymes are based on common Year 1 cross-curricular topics and thus promote integrated learning.

Three classrooms in two schools in areas of social disadvantage in Bedford incorporated Tune Time into their classroom teaching in the autumn term of 2012/13. In both of these schools children enter with literacy skills which are below the national average. Before and after standardised and bespoke measures of phonological awareness (controlling for baseline verbal reasoning ability) demonstrated a specific benefit in the ability to produce rhyming words for children involved in the Tune Time program. This benefit was statistically significant when compared to seen control children from a similar school who were not receiving any additional literacy program.

Here we discuss the details of the Tune Time project and the ability for rhythm, rhyme, action and melody to support the literacy needs of all children. We ask whether music/poetry reading should be introduced as a mandatory addition to all Year 1 classroom phonics programs.

Visual word learning in adult British readers

Rosa Kwok, Andy Ellis

University of York

We report two experiments investigating the process of how an initially unfamiliar novel word becomes familiar as a result of training and

experience. In Experiment 1, participants named 4- and 7-letter nonwords 10 times in each of two separate sessions on week apart. Reaction times in session 1 decreased over the 10 blocks and the effect of length became nonsignificant in the later blocks. There was good retention over 7 days. Experiment 2 was similar to Experiment 1 but included high and low frequency words as well as nonwords. This time the two sessions were separated by 28 days. Participants were also asked to return after 3 months of session 1 to complete the lexical decision task. In session 1, the number of letters had a large effect on the naming latency of novel words, a smaller effect on low-frequency words, and no effect on high-frequency words in the initial blocks. Participants showed rapid learning of new novel items. Again there was good retention over 28 days. A competition effect was shown in the 4-letter learned novel words in session 3. The results are discussed in terms of the processes involved in learning new written words and the number of exposures required to create lasting representations in the mental lexicon.

Getting a grip: Developmental changes in motor overflow over the first year of life

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How do infants master their bodies? Born with poor control over their motor actions, infants quickly learn how to perform basic actions such as reaching. By 12 months, they can control both arms (relatively) independently and carry out sophisticated bimanual coordinated actions, during which each hand performs a different action.

The present study investigates whether these improvements in motor control are related to changes in motor overflow – involuntary limb movements that accompany the movement of a limb that is engaged in a goal-directed motor action. We present data from 60 infants across three age groups (6-, 9-, and 12-month-olds). These infants were handed various objects (small and large balls, rattles, small toys) and encouraged to engage in activities such as rattling, reaching and manual exploration. Arm movements were tracked using an Optitrack motion capture system. We analysed movement during unimanual actions, focusing on the movement of the arm that was not manipulating the object. In order to understand the mechanisms modulating motor overflow, we also investigated whether attention is involved in regulating motor overflow and examined the relationship between overflow and expertise with various motor skills (e.g., sitting, crawling, standing, walking).

Our pilot study (N = 30) demonstrated that motor overflow decreases between 6 and 12 months of age. This suggests that motor activation is

widespread early in development, leading to spontaneous activation of body parts that may be redundant for performing intended activity (e.g., spontaneous activation of the left hand when using the right hand to reach for an object). But during the course of development, the infant brain becomes progressively more specialized; possibly inhibiting widespread spontaneous motor activation as a function of efficacy of goal-directed action.

Development of spelling strategies in deaf children

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Research into deaf children's literacy achievements has tended to focus on reading development and as a result deaf children's spelling skills have received comparatively little attention. Here we present the results of a longitudinal investigation into deaf children's spelling abilities and the type of strategies employed. Two cohorts of deaf children were given a picture based spelling task every twelve months over a period of three years. At the beginning of the study, all members of the younger cohort were beginning readers (mean age 5:08) and members of the older cohort were between 7 and 8 years old (mean age 7:10). All deaf children had a severe or profound hearing impairment. Both deaf cohorts were matched to hearing children on reading age and there were no overall differences between deaf and hearing children's spelling scores. Spelling errors were analysed quantitatively to determine how similar the errors were to the target in terms of visual and phonological features and whether they were phonologically acceptable errors. In addition, the errors were also analysed qualitatively in order to look for similarities such as the initial letter, letter transpositions and substitutions, lipread confusions and syllabic representation. This talk will focus on (1) comparing the types of spelling strategies employed by deaf and hearing children and (2) examining the developmental change in deaf children's use of spelling strategies over time.

Children's attitudes towards ingroup and outgroup members and group evaluations: A minimal group study with competitive teams

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Ingroup favouritism is a strategy for anchoring positive identity based on one's group membership (Hogg & Vaughn, 2008), but much of the research on children's intergroup attitudes has focused on memberships in naturally occurring (e.g., sex, race) groups with unequal statuses. The present study adapted the minimal group paradigm (Patterson & Bigler, 2006) to assess children's use of arbitrarily assigned group memberships in their intergroup judgments. One hundred and twelve children aged

6 and 9 years wore green or yellow ties to mark their 'team' for two weeks. Staff in the experimental classrooms made persistent use of the colour teams before children took part in a competition when one team won and the other lost. Team memberships were not emphasised in the control condition. It was found that both age groups in the experimental condition displayed ingroup favouritism, but only 6-year-olds in the experimental condition showed outgroup derogation. Pretest self-esteem was positively associated with ingroup, but not outgroup, attitudes. Only children in losing teams wished to change teams, and 6-year-old winners were 'happier' with their team, which they evaluated had had 'more fun' and got in less 'trouble'. The results are discussed in the light of developmental and social-psychological theories.

From idea generation to idea donation: How memory strength leads us to attribute our own ideas to someone else

Nicholas Lange, Timothy J. Perfect, Ian Dennis
Plymouth University

Accidentally claiming someone else's original contributions as one's own constitutes unconscious plagiarism. The majority of studies exploring the phenomenon use Brown and Murphy's (1989) paradigm where participants first generate ideas with others and subsequently retrieve only their own ideas. Plagiarised ideas are partner-generated ideas that are output as the participants' own. This error has been attributed to a self-serving memory bias, yet in a series of studies we have shown that people are more likely to give away their own ideas when recalling what their partner generated than to steal when recalling their own ideas. Here we explore whether this pattern is due to faulty retrieval, or faulty output monitoring.

To answer these questions, 66 participants alternately generated category exemplars in pairs and after a delay recalled either their own or their partner's ideas in an extended recall task. Participants were encouraged to write down all ideas that came to mind during retrieval: target memories (own or partner's) were written in one response column and non-target memories were written in the other. We then looked at the propensity to generate non-target memories, and the ability to distinguish them from target memories.

Taking only the target column into account, participants were more likely to give away ideas (22%) than steal them (15%), replicating our previous findings. This was entirely due to generation though. People were more likely overall to generate their own ideas during the recall partner task than their partner's ideas during the recall own task. Monitoring was equally accurate in both cases, with 72% of wrong-source intrusions being written in the non-target column.

Thus, an ironic effect of our own ideas being more available to us during retrieval is that this increases the likelihood that we will give them away when trying to recall what our partner said.

Developmentally distinct gaze processing systems: Luminance versus geometric cues

Stephen Langton, Martin Doherty, Alex McIntyre
University of Stirling

We present data from two studies that investigate the development of the mechanisms underpinning gaze-cued attention (Experiment 1) and explicit judgements about gaze direction (Experiment 2). Children's performance was assessed using blurred images of faces, which contained only luminance cues to gaze direction, line-drawn images, which contained only the fine-grained detail supporting a geometric analysis of gaze direction, and unmanipulated greyscale images. In Experiment 1, 2- and 3-year-olds' accuracy at identifying briefly presented targets was higher when those targets appeared in gazed-at (cued) locations than when targets appeared in uncued locations for both unmanipulated greyscale images, and blurred images of faces. Critically, these same children showed no such gaze-cueing from line-drawn versions of these faces, which contained no luminance cues to gaze direction. In Experiment 2, children were asked to decide at which one of four objects a face was gazing. Two-year-olds performed very poorly at this task with line drawn and blurred images, which had, respectively, luminance and geometric cues to gaze direction removed from the faces. Three- and 4-year-olds, while far from perfect with the line-drawn and blurred faces, were nevertheless able to do this task, and children of all ages were much better with the unmanipulated face images. Together, these findings are consistent with developmentally distinct gaze processing systems: an early-developing luminance-based mechanism, which supports gaze-cued orienting of attention, but cannot initially support explicit judgements about where someone is gazing, and a later-developing mechanism, based on geometric cues in the eye, which supports explicit judgements about gaze.

The role of experience in face adaptation: Dog-specific adaptation for dog-owners but not non-owners

Sarah Laurence, Victoria Ratcliffe, Abigail McCay,
Graham Hole, David Reby
University of Sussex

Prolonged exposure to a distorted face results in subsequently viewed distorted faces appearing more normal. This type of face adaptation has been used extensively to probe our representations of human faces. In the present study we used face adaptation to explore the role of experience in the processing of unfamiliar individuals from a different species. We compared dog owners and non-dog

owners on a face adaptation paradigm that looked at the transfer of adaptation across different dogs. To do this we adapted our participants to a distorted golden retriever and tested their subsequent normality judgments of various dogs. After adaptation there was a different pattern of normality judgements for dog owners compared to non-owners. Dog-specific adaptation was only observed for dog-owners, whereas in non-owners there was equivalent adaptation for similar looking dogs. The findings highlight the mediating role of experience on face adaptation.

The role of affect in fantasy-reality judgments: looking at real, near-real and make-believe entities

Allán Laville, Rachel McCloy, Fiona Knott
University of Reading

Distinguishing between what is real and fantasy, namely the fantasy-reality distinction, is an important skill that develops throughout early childhood. The standard task involves the child sorting real, make-believe and near-real (e.g., a character played by a real human actor, as opposed to a cartoon) entities into categories of 'real' and 'make-believe'. Research so far has shown that as children get older they improve in their ability to correctly categorise entities with 7-8-year-old children categorising similar to adult participants. The current study examines the role of affect in entity categorisation, as previous research has shown that children are more likely to categorise make-believe events as real when they are positive than when they are negative (Carrick and Quas 2006). In the current study, 30 3-4-year-old children, 22 5-6-year-old children, 15 7-8-year-old children and 25 adults sorted three groups of eight entities (real/make-believe/near-real) into categories of real, make-believe or not sure. Within the make-believe and near-real categories, four entities were positive (e.g., Peter Pan) and four were negative (e.g., Cruella De Vil). Participants were asked why they placed the entity into the category and how that entity made them feel. We found that across groups, participants were significantly better at categorising real and make-believe entities (compared to near-real entities, and that performance improved with age). In addition, participants (particularly 3-6-year-old children), made significantly more errors by categorising positive make-believe/near-real entities as real compared to negative make-believe/near-real entities. These findings suggest that affect can influence fantasy-reality judgments and highlight the potential role of affect in children's critical thinking and decision making.

Infants and Robots: How robotic implementations can stimulate psychological models of development

James Law, Mark Lee

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Both Artificial Intelligence and Brain Science have made impressive advances in the last few decades, but current neural and computational models are nearly always based on data from mature brains at specific temporal points. Until quite recently, very little work has considered implementing developmental processes in computer models or artificial systems. Development is important because it shifts the emphasis away from the mature “intelligent” system, and focuses on how cognition might emerge from systems that begin with limited competencies, but which can learn through experience to construct new skills.

The relatively new field of Developmental Robotics attempts to find principles for building autonomous robot systems that incrementally and cumulatively increase their motor and cognitive skills through processes of growth and development. In this constructive approach models are developed, tested and refined to find those that produce desired behavior. This draws on infant development and the ideas being exploited here will be familiar to developmental psychologists; e.g. motor activity in proximo-distal and cephalocaudal directions, gradual increase in articulation, and coarse to fine resolution of sensory and motor systems.

This approach is less concerned with performance but is more about the challenge to understand how systems might develop autonomously to reach higher levels of competence. In that sense, the goal is the scientific understanding of what makes a truly sentient system.

In our work, investigating algorithms that can support the cumulative growth of cognitive skills through experience, we realize that the models produced by the developmental robotics community have potential value as psychological models and may generate insights and hypotheses complementary to existing theories. We wish to encourage engagement between the developmental, cognitive, and robotic disciplines with these studies, verify them against known data, and thus expand scientific understanding.

Topological body representations in early life

Frances Le Cornu Knight, Dorothy Cowie, Silvia

Rigato, Andrew J. Bremner

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Through development properties of the body change both in terms of physical extent and movement capabilities. Therefore the body may be better represented in terms of its topology of invariant parts rather than metric coordinates. In our work we use tactile perception to investigate

both the basic ability to distinguish tactile topographic locations on the body, and whether such spatial representations of the body rely on topological (part-based) relations across early development. We have found that children of 5-7 years of age represent their bodies topologically in terms of parts. Children were asked to estimate the distance between two punctate stimuli presented on the arm, hand or over the wrist. We found that perceived distance is significantly elongated when stimuli were presented over the wrist boundary. We therefore propose that from early childhood or before, a topological representation of the body modulates the perception of tactile space according to its boundaries: Stimuli that cross over the body part boundary are perceptually more distinct as they belong to distinct category sets. More recently, we have begun to investigate physiological measures of body topographical representations in young infants. In an ERP study we have found that 8-month-old infants are sensitive to changes in the site of tactile stimulation from one hand to another. We presented 20 infants with ‘oddball’ vibrotactile stimulation whilst recording event-related potentials. Frequent stimuli (80% of trials) were presented to one hand, and deviant stimuli (20%) to the other. For the first time in infants we find evidence of the somatosensory mismatch negativity (MMN) component in centroparietal regions, which demonstrates sensitivity to changes in the site of tactile stimulation on the body. Future directions will examine whether such sensitivity to location on the body depends on metric or part-based spatial representations.

The distracted mind: The developmental relationship between attention and intelligence

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Sung, Yi-Chin Lin, Hwa-Wei Ko et al.

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Attention, according to Posner’s framework, has three major facets: the ability to stay alert (alertness), the ability to turn one’s attention to the source of a target (orienting), and the ability to process competing stimuli (executive control). One of his studies suggests that the effect of training the executive control of attention in preschool children could bring about improvement in intelligence. To further explore this link between attention and intelligence, the present study investigated their developmental relationship in a sample of 146 children between the ages of 3.6 and 6.6 years using a child version of the Attention Network Test and two measures of intelligence: a short form of the Wechsler Preschool and Primary Scale of Intelligence – Revised, and the Raven’s Colored Progressive Matrices. Our results showed a significant main effect of flanker type and cue type on participants’ reaction time and accuracy; however, a careful reanalysis of the data revealed that the advantages of the different cues (central, double, and spatial) as expected of the task design

were observed mainly in children who were 4.5 years or older, indicating a developmental change in readiness towards different types of warning signals at around this age. Among the three network scores (alerting, orienting, and conflict) computed for each participant, only the conflict score remained significantly correlated with their verbal IQ score as measured on the WPPSI-R after controlling for age. A multiple regression analysis confirmed that the conflict score could uniquely explain variance of verbal intelligence that was not explained for by age. In other words, whereas verbal intelligence predictably increases with age, individual differences in the conflict network that exist within the normal development of children also play a role in determining their verbal intellectual functioning during the preschool period.

The influences of working memory, mastery and performance goals on mathematical performance

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A large literature on the relation between working memory and academic performance showed that children with larger working memory capacity perform better in mathematics. In the literature on academic goal orientation, high mastery goals are associated with better performance. Conversely, high performance goals are generally, though not uniformly, associated with poorer outcomes. Recent works have argued that performance is affected jointly by working memory and goal orientation (Avery & Smillie, 2013; Linnenbrink, Ryan, & Pintrich, 1999). However, the nature of this relation, particularly in children, remains unclear. We focused on the executive component of working memory, achievement goals, and their relations to mathematical performance.

10 and 12-year-olds (N = 608) were administered (a) tasks from the Automated Working Memory Battery (Alloway, 2007) and a running span task, (b) performance and mastery goal measures from the Inventory of School Motivation (McInerney & Sinclair, 1991, 1992), and (c) a battery of standardised (Wechsler Individual Achievement Test, 2001) and curriculum based mathematical tests.

Structural equation modelling showed that performance goal was negatively associated with mathematical performance. Both mastery and performance goals had direct (positive and negative, respectively) effects on working memory capacity. Moderated mediation analysis showed that the negative impact of performance goal on mathematics was the strongest for children with lower levels of mastery goal or working memory. Of interest was that the influences of orientation goals were minimal for children with high working memory capacity, who performed well regardless of their orientation goals. These findings suggest that a reduction in the availability of working memory

resources may be one reason for high performance orientation to be associated with poorer academic performance. We will also discuss on-going work that focuses on whether these findings are affected by age related differences.

The use of computerised intervention to support reading fluency development in Irish primary school children

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The potential of computer games for improving reading skills has been a subject of much discussion and research in recent years. To date, however, researchers have failed to establish consensus on this topic. Considering the drastic cuts in special needs provision which many schools have experienced in recent years, it is now vital to explore flexible, cost effective educational tools which can be used to support the needs of vulnerable students. The present study evaluates the effectiveness of one such tool, Graphogame-Fluent; a set of online educational games designed to improve the English reading fluency ability of struggling readers.

Participants in the intervention (n = 87) were 8-12 year old monolingual and bilingual children in the 3rd-6th classes in Irish primary schools. 44 children nominated by their teachers as being poor readers were divided into two groups in a two-way crossover design (receiving intervention from February-March 2013 or April-May 2013). A group of 43 randomly selected readers from the same classes served as a control group. Students played Graphogame either at home, in school or both. Playing was encouraged for 25 minutes a day for 7 weeks. An online assessment built into the game provided an evaluation of children's reading skills at three points throughout the intervention period (January, April and June).

Results concerning the effectiveness of the Graphogame-Fluent intervention will be presented. Qualitative analysis of interview data concerning the usability of the games and the student's engagement with and experience of them will also be presented. Finally, recommendations concerning the practical implications of implementing intervention in a school environment will be offered.

Mother-child affection, but not conflict, predicts the dyad's self- and other-regulation

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University of Sussex

Assistance from a knowledgeable other increases a child's learning potential. For an optimal tutor-learner interaction, both parties need to regulate their own contribution to the task appropriately, with the tutor providing other-regulatory support contingent on the child's self-regulatory behaviour.

However, little attention has been paid to the social and emotional factors which may help or hinder reaching this optimal interactive style. The aim of this study was to determine the impact of mother-child relationship quality on the dyad's ability to align their regulatory behaviours during a tutored problem-solving task.

Seventy-eight mother-child dyads took part in a two-wave study over 5 years (42 boys; mean age at T2 = 9.66 years). At Time 1, the mother completed a questionnaire on the mother-child relationship (affection and conflict), and at Time 2, the dyad was videotaped completing a block design task. The video was coded for parent's other-regulation (POR) and child's self-regulation (CSR). 'Alignment' was operationalised as the numeric difference between POR and CSR scores for each design.

Mother reports of affection within the dyad correlated negatively with POR, and positively with CSR and alignment. Sobel tests revealed that POR mediated the relationship between affection and CSR, and that POR and CSR mediated the correlation between affection and alignment of regulation. No significant correlations were found with reported parent-child conflict.

Our results suggest that in more affectionate relationships, the mother and child adjust their levels of regulation in line with each other more effectively; specifically, these mothers offer less other-regulation overall, and their other-regulation is more contingent on their child's level of self-regulation. These findings offer further understanding about the factors influencing the effectiveness of social learning experiences such as homework sessions.

Ethnic group attitudes and children's relationships in an multiethnic context

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A growing amount of recent research outlines how ethnic group attitudes develop across childhood. This research is important and useful, and has helped to shape new theoretical perspectives in social and developmental psychology. However, although there is some work exploring ethnic group attitudes in "atypical" ethnic contexts (that is, where there is not one majority ethnic group) most studies have focused on understanding intergroup (ethnic) attitudes in a classic majority-minority frame. Here we present findings from a large-scale study of N=499 children from an ethnically diverse area in South East England. We assessed the implicit and explicit ethnic group attitudes of 9 year olds at two time points, and additionally collected sociometric data which allowed us to compare these attitudinal measures with children's real, changing, friendship choices. Findings reveal that children's ethnic group attitudes follow predicted ingroup bias; that is, both

South Asian and white European children showed implicit preference for their own ethnic group. However, explicit ethnic group attitudes revealed an unexpected outgroup bias, which suggests that these 9 year olds had a good grasp of the socially desirable (or desired) ways of discussing ethnicity. Social relationships (sociometric ratings and friendship choices) also seem to reflect ingroup preference and this become more pronounced – i.e., there were more ethnic ingroup friendship nominations after the 4-6 week testing period –over time. This supports and may explain previous findings of growing ethnic homophily and cleavage in relationships across middle to late childhood. Findings are discussed in terms of recent theoretical work in the field.

Oral language skills in grade 3 among a group of Swedish students with weak word-decoding and reading comprehension in grade 2

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Background: Several studies indicate a link between oral language skills (e.g. vocabulary, grammar and discourse processing skills) and reading comprehension, and between phonological processing and word-decoding skills. This study compares the oral language skills of Grade 3 students who were assessed and identified in Grade 2 as having the literacy profiles: weak word-decoding skills (specific reading disability), specific reading comprehension difficulties, or mixed reading disability as defined by the "Simple View of Reading." Method: 35 students with word-decoding and/or reading comprehension skills below expected age level (< -1 SD) in Grade 2 participated in the study. Oral language skills, word-decoding and reading comprehension were assessed in Grade 3. One-way anova analysis was conducted to investigate possible significant differences in oral language skills between the different literacy profiles in grade 2. Results: Students with weak reading comprehension skills in Grade 2 performed with mean values below expected age level in oral language tasks measuring discourse-level processing skills (Renfrew Bus-story). The whole study-cohort performed with mean values below age-level in rapid naming, mean length of utterance (MLU) and repetition of non-words including the students with only specific reading comprehension difficulties. Students with specific word-decoding difficulties in Grade 2 performed with mean values within age-norms in all tasks related to oral language comprehension and performed significantly better in rapid naming and MLU compared to students with mixed reading disabilities in grade 2. Implications for literacy intervention are discussed.

Rehearsal in working memory: Friend or enemy of retention?

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We examine the many explanatory roles that have been ascribed to various forms of rehearsal or refreshing in short-term and working memory paradigms. We instantiate the most common assumptions about rehearsal in generic simulations of decay and interference models, and we apply those models to benchmark paradigms ranging from immediate serial recall to complex span and delayed recall. The results show that articulatory forms of rehearsal can be harmful to memory performance in some circumstances, especially when combined with temporal decay. Rapid attentional refreshing performs considerably better, but so far there is scant empirical evidence that people engage in refreshing during short-term memory tasks. We conclude that a strong reliance on articulatory rehearsal as a causative agent in memory is unwise and that explanatory appeals to rehearsal are insufficient unless buttressed by precise modeling.

The impact of Navon-letter processing on expert behaviour

Michael B. Lewis, Gemma Dawkins

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The processing of Navon letters (large letters formed from repeated small letters) has been found to affect face recognition: If the small letters are read immediately prior to a face-recognition task then performance is reduced in that task. A similar effect has been found for the recognition of wines suggesting that the impairment crosses modalities. It is proposed that the Navon effect (on faces and wines) is a result of interference with typical automatic (or expert) behaviours. The current research explored this effect in a new domain – namely sports performance. Participants performed a Navon-letter task immediately prior to a golf-putting task. Regular golf players performed significantly worse at the putting task following the local-Navon task than following the global-Navon task. The results support the idea that the local-letter-Navon task interferes with over-learned or automatic performance that is typically employed by experience golf players.

Salience in schizophrenia and ADHD

Elizabeth Liddle, Peter Liddle

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Schizophrenia and attention-deficit/hyperactivity disorder (ADHD) are characterised by a number of superficially similar deficits on tasks that tap attention, working memory, and impulsivity. They are also both characterised by what can be

described as “disorganization”. On the other hand, they are very different disorders, with possibly antithetical neural substrates: schizophrenia is a serious psychotic mental illness that typically develops in late adolescence, may become chronically disabling, and is treated by dopamine antagonists; ADHD, although disabling, is not a mental illness, is typically diagnosed in childhood, is often attenuated by adulthood, and is treated with dopamine agonists. This suggests that the neural substrates of the two conditions are very different, and while they are usually easy to distinguish clinically, the consequences of one being mistaken for the other, for example during a disturbed period in adolescence, are potentially serious as the pharmaceutical treatment for one is likely to exacerbate the other.

One possibility is that both disorders are disorders of salience – of the capacity to distinguish what is task-relevant from what is task-irrelevant, a process in which dopamine is strongly implicated. An excess of dopamine may render task irrelevant stimuli erroneously salient, while a dopaminergic deficit may render task-relevant stimuli insufficiently salient. In both cases, the result would be increased competition between task-relevant and task-irrelevant stimuli, resulting in impaired attention and working memory. Enhanced salience may also contribute to the “jump to conclusions” cognitive style that has been observed in schizophrenia and schizotypy; in contrast children with ADHD appear to sample information normally, but make poor decisions based on that information.

I will review and present evidence that may help to distinguish the underlying phenotypes from the phenocopy, including studies using eye-tracking, MEG and fMRI, and may suggest alternative therapeutic approaches to these conditions.

Does sensory over-responsivity account for the anxiety experienced in autism?

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Anxiety and sensory oversponsivity (SOR) often co-occur in children with autism spectrum conditions (ASC), but the relation between the conditions is not understood. This study investigated the links between autism, SOR and anxiety by analysing the interrelations between three standardised measures: Autism (Autism Quotient-Child), Sensory Processing (Sensory Experiences Questionnaire) and Anxiety (Spence Childhood Anxiety Scale). The participants, all diagnosed with ASC (n =50, m:f 39:11), age M=9.02 range 4.6-12.5 yrs, presented with high levels of SOR and anxiety. The results show significant positive correlations between autism and SOR and between SOR and anxiety. There was not a significant correlation between autism and anxiety, but autism was found to moderate the relation between SOR and anxiety. The results are discussed in relation to the possible

explanations as to why the degree of autism should moderate the effect of SOR on anxiety, and possible future directions of research.

Action perception in the pSTS-IPS region is associated with action production in young infants

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The extent to which perception and action share common neural processes is much debated in cognitive neuroscience. Taking a developmental approach to this issue allows us to assess whether perceptual processing develops in close association with the emergence of related action skills within the same individual. The current study used functional near infrared spectroscopy (fNIRS) to investigate the perception of human action in four to six month old human infants. In addition, the infants' manual dexterity was assessed using the fine motor component of The Mullen Scales of Early Learning and an in-house developed Manual Dexterity task. Results show that the degree of cortical activation, within the posterior superior temporal – inferior parietal (pST-IP) region, to the perception of manual actions in individual infants correlates with their own level of fine motor skills. This association was not fully explained by either measures of global attention (i.e., looking time) or general developmental stage (Mullen, 1995). This striking concordance between the emergence of motor skills and related perceptual processing within individuals is consistent with experience-related cortical specialisation in the developing brain. The implications of this research and future longitudinal research are discussed.

Biomechanically possible and impossible hand movements: Do neonates discriminate?

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University of Milan Bicocca

Several studies have explored human body perception in infancy, but little is known about how human form and movements are perceived at birth. This study aimed to understand neonates' sensitivity to hand gestures. Using a preferential looking paradigm, 2-day-old's ability to discriminate biomechanically possible and impossible hand gestures was tested. In particular, we explored whether newborns' preference for one hand gesture over the other is modulated by motion information, and by their own sensory-motor experience. In Experiments 1a and 1b, neonates watched dynamic and static whole hand closure respectively, i.e., gestures which are part of their motor repertoire. In Experiments 2a and 2b, dynamic and static pincer

grip, i.e., fine hand movements not yet experienced, were shown.

In Experiment 1a neonates looked longer at the biomechanically impossible whole hand movement, (i.e., with the fingers moving backward towards the back of the hand) than at the possible one. In Experiment 2a infants looked longer at the possible than at the impossible pincer grip (i.e., thumb and index finger moving unnaturally backwards). No visual preference was found when static hand postures were presented (Experiments 1b and 2b).

In sum, the ability to discriminate possible and impossible hand movements is present at birth and modulated by: a) the presence of motion information, and b) infant's own ability to perform the movement. In fact, when the observed hand movement has been experienced before, neonates recognise the possible movement as familiar, thus looking longer at the novel, impossible movement. By contrast, when the observed hand movement is not yet part of their motor repertoire, newborns look longer at the movement which matches the biomechanical properties of biological movement, i.e., the possible one. These findings suggest a link between newborns' own motor experience and the perception of biomechanically possible hand movements.

Stimulating the brain during video games to decrease cognitive disparity and induce transfer and long-term cognitive effects

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Effective processing of spatial representation of number magnitude is crucial for the development of mathematical skills. Recent research has shown that: 1) bodily spatial experiences of number magnitude resulted in pronounced improvement in numerical development (Moeller et al, 2012), and 2) competence with fractions predicts gains in mathematical achievement (Bailey et al, 2012). We combined an adaptive computer-based mathematics game using a motion-sensing input device (KINECT™) with wireless transcranial direct current stimulation (tDCS, NeuroElectrics), delivered anodal-tDCS to the right dorsolateral prefrontal cortex to modulate neuronal excitability and neuroplasticity during the mathematical game. Twenty participants completed two 30-minute training sessions on two separate days. They indicated the location of fractions on a visually presented number line by physically moving side-to-side. Trial difficulty increased as a function of performance. Compared to sham stimulation, tDCS led to more accurate performance and faster reaction times at higher levels of difficulty. At the end of the training, tDCS led to a transfer effect in which participants who received tDCS showed a significant increase in verbal digit-span working

memory performance, but not visuospatial working memory performance, compared to the sham group. Both improvement in game performance and transfer effects remained in a 2-month post-training follow-up study. These results suggest that the combination of tDCS with video game training can lead to an enhancement effect, including positive effects to non-trained mental faculties, which are long lasting.

The developmental trajectory of morphological knowledge in Brazilian Portuguese

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The present work takes into account the developmental trajectory of the Brazilian Portuguese morphological knowledge by children from two to eleven years old and its relation with the four levels of mental representations postulated by the Representational Redescription model (Karmiloff-Smith, 1986, 1992, 1998). The analysis is based on spontaneous and elicited data. The spontaneous data consist of regularized verbal forms, changing of inflectional suffixes and lexical novelty. The elicited data were provided by three morphological tests, which involve inflection and derivation of nonce words, extraction of nonce base from derived nonce words, and judgment of words as well as an explanation of why these verbal forms are incorrect. The survey of the responses shows morphological knowledge from sensitivity to linguistic awareness, through which we can notice the developmental trajectory of this kind of knowledge. This means that all RR model's levels of representations – Implicit, Explicit 1, Explicit 2 and Explicit 3 were at least suggested by the data. Furthermore the data analysis allows us to verify that the development of skills to deal with the morphological resources of Portuguese is not age-related, as Karmiloff-smith explains. In addition, children seem to deal with nonce words and with real words in a different way, as well as they show different ways to work on inflection, derivation and extraction of the base tasks. Those differences pointed by data seem to consist on an interesting issue about the understanding of the linguistic knowledge produced by children and its relationship with the language domain of the mind, as well as with its subsystems (phonological, morphological, and semantic). I believe that this work consists of the very first step towards an explanation of the mental representations that underlie morphological knowledge that children produce, in a developmental perspective.

Children's understanding of strategies of emotion regulation: What developmental changes occur?

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Emotion regulation is a process which develops from provision by caregivers to a skill we can

perform ourselves with varying degrees of success (Holodynski, 2004). Strategies that can be effective in helping alleviate negative emotions are wide ranging, but typically researchers have focused on the distinction between behavioural and cognitive strategies. Developmental research into the understanding of strategies in emotion regulation has shown evidence that different strategies are used depending on the context of the event as well as with the increase in children's age (Altshuler and Ruble, 1989; Davis, Levine, Lench and Quas, 2010).

Research has differed in the age at which children are credited with beginning to understand when behavioural and cognitive strategies can be utilised to alleviate such stressful events. Meerum Terwogt and Stegge (1995) argue that the developmental change from primary (problem focused) to secondary (emotion focused) strategies reflect a general conceptual shift from a behavioural to a cognitive understanding of emotions. The extent to which cognition and verbal expression limits the apparent understanding of younger children is also unclear.

The present study investigated developmental changes in children aged 4-11 regarding their understanding of strategies for emotion regulation for a number of negative emotions within different contexts. Children were asked to give verbal responses as to what they would do in a number of hypothetical situations. Expressive vocabulary was measured as a covariate. The types of strategies suggested by different age groups were of interest, as well as how children were able to express the usefulness of their suggestions. The study addresses whether the results support the idea of a conceptual shift and how best to categorise emotion regulation strategies. A range of strategies were identified and their developmental trends and implications for existing theory and future research are discussed.

The role of verbal labeling on reactive control: A lifespan study

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The development of two components of cognitive flexibility, goal setting and switching, has been extensively studied in a context enabling participants to actively prepare for the upcoming tasks (Kray, Eber & Karbach, 2008). However, little is known about their developmental trajectory when the opportunity to anticipate task goals is prevented. The main goal of this study was to explore how goal-setting and switching abilities develop when reactive control must be used, i.e., when participants do not know which task to perform in advance of the stimulus display. This study also investigated the effects of using different self-instructions. A cued task-switching experiment

was performed by 47 eight-year-olds, 48 younger adults and 15 older adults in a silent and a labeling condition. In the labeling condition participants were required to verbalize aloud either the task goal or the relevant dimension of the stimulus at the stimulus onset. Participants were required to categorize bivalent stimuli according to shape or colour in single task-blocks, then to unpredictably switch between these two tasks in mixed task-blocks. Each trial began with the presentation of the stimulus and its position indicated the task to perform. Switching and mixing costs were computed on response times and error rates. Mixing costs followed a U-shape age function ($p < .001$), while switching costs remained more stable across the three age ranges ($p < .05$). Labeling produced differential effects on mixing costs among age groups: whatever the content, older adults benefited from labeling ($p < .05$), whereas younger adults were impeded by verbalization ($p < .001$). Children were characterized by their heterogeneity, with some children showing a beneficial and others a detrimental effect of labeling. These findings extend the understanding of the components of cognitive flexibility to the context of reactive control across the lifespan.

“My child and my dog”. Thinking about others’ mental states: Anthropomorphism and mind-mindedness

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Oxford Brookes University

Mind-mindedness is the tendency to treat a child as an individual with their own mind rather than merely an entity that has needs that must be satisfied (Meins and Fernyhough, 2010) and can be assessed by measuring attributions to the child’s mental states. Anthropomorphism in relation to animals is similarly characterised by the attribution of mental states (Serpell, 2003) and there is evidence that people view their pets as family members (Cohen, 2002) and as minded, emotional and intelligent beings (Sanders 1993). The research reported here investigated the extent to which dog owners spontaneously attribute mental states to their pets compared this with their representations of their children.

Ninety-eight dog-owning parents of primary school-age children were surveyed to assess a) their level of mind-mindedness in relation to both their child and their dog and b) their level of general anthropomorphism.

A positive relationship was found between the level of mind-mindedness shown by people in relation to a child and the level of mind-mindedness shown in relation to a dog. This suggests there may be an underlying general tendency to make mental state attributions about beings, human or otherwise, with whom one has a close relationship (e.g. Arnott and Meins, 2008).

The second aim was to investigate the relationship between mind-mindedness and anthropomorphism however the correlation was non-significant, suggesting that despite their apparent similarities, these are distinctly different constructs.

The relationship between maternal mind-mindedness and levels of scaffolding in mother-child interaction

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Recent research has focused on the parent’s proclivity to treat the child as a psychological agent, referred to as mind-mindedness (Meins, 1997). The relationship between this indicator of maternal sensitivity and quality of scaffolding in parent-child interactions is reported here. The study explored (1) the relationship between maternal mind-mindedness and ability to scaffold their child’s problem solving and (2) the different styles of scaffolding provided by mothers low and high in mind-mindedness.

Eleven mothers and their four to five year old children participated. Maternal mind-mindedness was measured by interview using the Meins and Fernyhough, (2010) protocol and coding system and observations were made of the mothers and children engaged in a collaborative problem solving activity (a block design task). The interactions were coded for maternal verbal scaffolding level using an adaptation of the Wood, Wood and Middleton (1978) assisted problem solving coding scheme. Children’s success/failure at block placement and non-response to maternal interventions was also recorded.

The proportion of maternal verbal interventions coded as supportive was found to be positively correlated with mind-mindedness. To test the assumption that mothers whose representations of their child include high levels of awareness of the child’s mental states might make more finely-tuned responses to their child’s problem solving efforts, conditional probabilities of using high or low-level scaffolding support following child errors or non-responses were calculated and related to mind-mindedness. The findings support the idea that highly mind-minded mothers tend to provide higher quality scaffolding in response to their child’s errors or non-responses.

‘Best friends’ and best friends: Attachment and mind-mindedness in relation to human and animal companions

Morag MacLean, Suzanne Kane
Oxford Brookes University

Dogs have traditionally been described as the ‘best friend’ of humanity. We care for them as companion animals, acknowledging their dependency. There is also evidence that we see them both as family members (Cohen, 2002) and as minded, emotional

and intelligent beings (Sanders 1993). Given the role of companion dogs in families, it is possible that similar patterns of attachment exist between individuals and their animal 'best friends' as with their human best friends. One concept relevant to how animals are conceptualized and which is also linked to attachment is mind-mindedness. Mind-mindedness (Meins, 1997) is most frequently considered in relation to mother-child interactions but recently this aspect of close relationships has also been investigated in the context of friendships. The study reported here aimed to investigate the relationships between representations of attachment and mind-mindedness, but to do so in the context of companion dogs and best (human) friends.

A self-report questionnaire was completed by 72 dog owners. Measures of attachment included the Bartholomew & Horowitz (1991) Relationship Questionnaire and an adaptation of the Lexington Attachment to Pets Scale (Johnson, Garrity & Stallones, 1992). Mind-mindedness was assessed separately for dog and best friend using the questionnaire version of the Mind-mindedness Interview (Meins and Fernyhough, 2010) and anthropomorphism was measured using a 21 item attitude scale.

Individual differences were found in both measures of mind-mindedness but these were not significantly correlated. Secure attachment style was positively correlated with mind-mindedness in relation to a close friend but not in relation to a dog. Attachment to dog and anthropomorphism were also positively correlated.

The results are discussed in terms of the nature of human-animal relationships and the meaning of making mental state attributions to animals and humans.

Degree of between-sequence semantic similarity exacerbates semantic auditory distraction

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We investigate whether semantic auditory distraction is proportional to the degree of semantic similarity between distracters and targets in two experiments. Typically, a sequence of to-be-ignored spoken distracters drawn from the same semantic category as a list of visually-presented to-be-recalled targets impairs free recall performance. According to one approach dissimilarity within the bounds of similarity should increase this between-sequence semantic similarity effect, e.g., when distracters are semantically dissimilar to targets) whilst another approach supposes the opposite, e.g., similarity between targets and distracters should increase the effect. The latter of these accounts was supported.

Similarity (as indexed by WordNet) produced greater disruption when the targets and distracters were semantically related, but only when the distracters were high (Experiment 1), not low (Experiment 2), in output-dominance. On the assumption that the WordNet similarity metric correlates with featural similarity (Maki, McKinley, & Thompson, 2004), semantic feature overlap exacerbates the between-sequence semantic similarity effect.

Executive function and language in deaf and hearing children

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Executive Function (EF) covers many different thought processes including planning, memory and problem solving. The development of EF skills is critical for success in school and in life (Diamond, 2011). Language facilitates EF e.g. children talk to themselves during tasks to help them remember, plan and avoid distracting information and children with language impairments perform poorly on EF tasks (Henry et al., 2012, Lidstone et al., 2012). However there is contradictory evidence regarding deaf children's performance (Meristo & Hjelmquist, 2007, Figueras, Edwards & Langdon, 2008) perhaps due to many tasks being English based and inappropriate for deaf individuals. This study examines the relationship between language (signed and spoken) and EF in a large group of deaf oral/signing and hearing children aged 6-11 years old. All children were tested on three different language measures (vocabulary, narrative and parental report) and a series of EF (language free) visual tasks using assessments appropriate for signed or spoken languages at two time points. The aim was to compare the different groups on their EF performance and language skills and ask how deafness, delayed language development or sign language use may affect EF ability. In total 120 children have been tested to date, analysis suggests that the EF tasks and language measures work well across the deaf and hearing groups in this age range. Deaf signers with good language skills perform significantly better on tests of EF than deaf signers with low language. Preliminary findings will be presented and implications for classroom learning, education and interventions will be discussed.

How does temporal memory and temporal knowledge develop across the primary school years?

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Objectives: To understand how children's temporal memory (both short-term and long-term) and temporal knowledge (e.g. correctly ordering

months of the year) develop over the primary school years, and to investigate relationships between them. The current study examined two types of temporal memory – duration and sequencing - in children aged between 6 and 11 years, and how this related to temporal knowledge.

Design: Performance on three tasks was measured: a conventional time knowledge questionnaire, comprising of 23 general-knowledge type questions; short-term memory computer tasks for both duration and sequencing; and memory for information relating to the duration and sequencing of an episodic event. Children were tested from three age groups (6-7; 8-9; 10-11 years).

Methods: Seventy five children participated (24 in Year 2; 24 in Year 4; and 27 in Year 6). Children completed the time questionnaire verbally, and specialist software (Kinelab) was used to assess children's ability to remember and reproduce a sequence of shapes, as well as to reproduce short-term durations of varying lengths. Finally children watched a video relating to a craft activity and, after a delay of four hours, answered questions relating to the duration and sequencing of events within the video.

Results: Multivariate analysis of variance showed an increase in time knowledge with age. A significant effect of age was also shown for both short-term duration and short-term sequencing abilities. For episodic memory, a significant effect of age was found for the duration task, but not for the sequencing task. Examining correlations, a significant relationship was found between performance on the short-term duration task and time knowledge, as well as between the two short-term memory tasks.

Conclusions: The results of this research will contribute to our limited understanding of how children's memory for time develops. Implications for applied contexts (e.g. educational, legal) will be discussed.

Children's understanding of the earth's gravity: A Q-methodological study

Alan Martin, Sherin Salem
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The objective of this study was to explore children's understanding of the earth's gravity by examining whether it is understood as a force of attraction which is universal to different types of objects on earth. Sixty children aged between 5-10 years performed a Q-sort of 16 picture cards depicting a range of intuitive and scientific representations of the earth's gravity applied to different objects. The children were required to rank-order the picture cards according to the extent to which the pictures were thought to accurately represent the action of gravity upon the different objects. Intuitive representations of gravity generally depicted

objects as being located only at the 'top' of the earth or falling off the 'bottom' of the earth. In contrast, scientific representations of gravity depicted objects as being located at the 'top' of the earth as well as at the 'bottom' of the earth. Q-factor analysis identified five main factors which were indicative of five distinct patterns of sorting or depth of preferences among the children. A common feature amongst the five factors was the lack of a coherent scientific understanding regarding the earth's gravity. Therefore, the results support the view that children's understanding may be fragmented (Nobes, Martin and Panagiotaki, 2005).

Children's understanding of intentional behaviours: The difference between joking and pretending

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Joking and pretending are two different ways by which people intentionally do something 'wrong'. We use objects in non-functional ways, say things that are not true and act in a manner which is inconsistent with reality. They are, however, two very different means of behaving the wrong way on purpose. Joking involves an element of surprise or incongruity which comes about intentionally and is perceived to be humorous. In contrast, pretending is the act of behaving in a way that is accurate according to a set of fictional norms but incorrect in fact. This study was designed to identify whether 2- and 3-year-olds are aware of the difference between these two behaviours. In one scenario we created a joking game (N=?) to see if children would object when a new participant performed pretend versus joke actions. In another scenario we set up a pretending game (N=?) and tested whether children would object when a new participant performed joke versus pretend actions.

Children were significantly more likely to object when contexts and actions were mismatched (OR = 8.49, $t = 2.40$, $p = .0190$). When analysing the pretence context alone, children were significantly more likely to object when the experimenter performed joke versus pretence actions (OR = 7.43, $t = 2.65$, $p = .0384$). There was no effect of action type when analysing the joke context alone.

Thus children differentiate joking and pretend actions and contexts from as young as two years. While joking and pretence acts are both technically wrong, toddlers recognise that when the intention is to joke, any action is ok, however when the intention is to pretend, only certain types of wrong actions – pretend actions – are ok. Thus toddlers may see joking as more "wrong" than pretending.

Naming during a novel word-learning task: An exploration of toddlers at increased risk of autism

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Children with autism struggle with learning new words and also pay less attention to speech sounds. However, Norbury et al. (2010) found that children with autism were in fact better at immediate repetition of newly learned words than typically developed peers. In this study we aimed to explore the ability to repeat novel words during a word-learning task in a group of toddlers at increased risk of developing autism. Thirty-nine 2-year-olds with ($n = 22$) or without ($n = 17$) family history of the condition took part in the study. In the task, six novel objects were presented on a screen and toddlers could hear them labeled four times. Immediately after the last repetition, the novel object was presented again and participants were asked to name it. Responses were scored for mean number of words repeated correctly and the proportion of correct syllables and phonemes. Preliminary results show that 24-month-old toddlers at-risk for autism correctly repeated an average of 1.27/6 words, with their typically developing peers repeating more than double the number of words ($p = 0.032$). Furthermore, at-risk toddlers also showed less attempts at producing the novel words whilst children in the control group tried to produce the word even if it was incomplete or incorrect. We consider how early motivational, social-communicative and language processing abilities may contribute to this profile and propose that the better repetition found in Norbury et al.'s study might be a result of years of atypical language learning. Poor attention to the phonological detail of words may underlie poor language skills in children with autism.

Development trajectories comparison between WS, HFA and typical development

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Background: The cognitive profile of individuals with developmental disorders turns more pronounced along development (Hodapp, 2004). In Williams syndrome (WS), verbal skills are higher than visuo-constructive skills (Mervis et al., 2000). In addition, due to a faster verbal developmental rate, the higher the performance on verbal tests, the higher the difference between verbal and non-verbal skills (Jarrold, Baddeley, Hewes, & Phillips, 2001). A greater heterogeneity seems to characterize the cognitive profiles of individuals with high functioning autism (HFA) (Siegel,

Minschew & Goldstein, 1996). However, changes in the magnitude of the difference between verbal and non-verbal skills along development have been reported so that this difference would be larger with age (Joseph, Tager-Flusberg & Lord, 2002).

The aim of the study was to analyze whether, as observed in WS, development is the key variable to explain the variability reported for the cognitive profile of individuals with HFA. To fulfill this aim, we compared the developmental trajectories of verbal and visuo-constructive skills in individuals with WS, HFA, and typical development (TD).

Method: Vocabulary and block-design subtests of the Wechsler scale for children were administered to three groups of individuals: people with SW ($N=16$, CA range = 7;4-21), HFA ($CI > 75$): $N=15$, CA range = 6;5-14;6) and people with TD ($N=29$, EC=6,16-15,75)..

Results: We found that both in the WS and HFA groups, the higher the verbal development, the larger the difference between verbal and non-verbal skills in favour of the former. However, this developmental trajectory was not found for the group with TD. Group averaged analyses did not show any significant differences between verbal and non-verbal skills for any of the groups.

Conclusions: These results highlight the importance of tracing developmental trajectories when considering profiles of cognitive functioning in different developmental disorders and of searching for associations rather than dissociations among groups.

Effects of age and memory strategy use on performance in single and dual-tasks

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Previous research has shown the benefit of using a strategy such as imagery/association in a memory task (Bissig & Lustig 2007), and this benefit has been documented in older adults (Cavallini, Pagnin & Vecchi, 2003). Less established is whether these strategies can be utilised in more demanding dual-tasks, and research investigating this has yielded mixed results (Whiting, 2003; Naveh-Benjamin, Craik, Guez & Kreuger, 2005) with Naveh-Benjamin et al. (2005) finding that improvement to memory performance came at a 'cost' to the secondary task.

It was hypothesised that, although age-related differences were likely to prevail with better performance in younger adults, both groups would enhance their single and dual-task performance when using a strategy. A repeated measures design was used in which 18 young (18-25) and 18 older (65+) healthy adults completed a memory task and a secondary auditory discrimination task, individually and combined in a dual-task. Training in memory strategies (imagery/association) was given to the experimental group ($N=18$) and the control group ($N=18$) received no training. Performance

was measured by number of words recalled on a word list and reaction time on the auditory discrimination task, pre and post strategy training.

In line with the hypothesis, age differences were found between younger and older adults, with younger adults performing better in single and dual tasks (pre and post-strategy training). Strategy training was shown to improve younger adult's performance in both the single and dual task, however in the older adults performance was only improved in the dual-task following strategy training. In contrast to previous research, the results indicate that older adults are able to utilise an elaboration strategy to enhance their performance when attention is divided, and this does not come at a cost to the secondary task performance.

Aging and risky choice in decisions from experience

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Real life seldom entails the luxury of summarized information about risky options. Instead, people often need to search for information and learn about environmental contingencies in order to make decisions, that is, they need to make decisions from experience. Aging is associated with cognitive and learning deficits—but do these translate into poor choices in decisions from experience? We report two studies investigating age differences in decisions from experience with a sampling paradigm (Hertwig, Barron, Weber, & Erev, 2004). Study 1 asked younger and older adults to make 12 decisions concerning monetary risky prospects (N = 121). Study 2 used the same paradigm but gave younger and older adults portable devices for one week to collect about 84 decisions per individual (N = 70). Overall, behavioral and computational modeling of the data from the two studies suggests that younger and older adults are remarkably similar in their search and choice behavior because they rely extensively on a simple value-updating strategy. We interpret these findings in light of evidence suggesting that search and integration in the sampling paradigm are not impacted by cognitive limitations, such as working memory constraints.

Perspective taking and language development: What can a two-systems account explain?

Danielle Matthews

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Under certain circumstances, infants demonstrate the motivation and social-cognitive ability to take into account their interlocutor's point of view when communicating. For example, infants adapt their pointing gestures to others' epistemic states and can learn new words by taking into account a speaker's false belief. However, in referential communication tasks, pre-schoolers frequently fail

to engage in audience design and are often difficult to understand for this reason. Apperly's (2011) two-systems explanation for this discrepancy is that some types of perspective taking, such as visual perspective taking, are mastered earlier than others since they are handled by a rapid, automatic perspective taking system that provides even infants the necessary information to adapt their communication to the point of view of their interlocutor. Other types of perspective taking are handled by a system that allows more flexible thinking but which takes longer to develop and is slower to use. If this is so, we should be able to explain children's ability to meet different types of communicative challenge by considering the relative ease of the type of perspective taking required. In this talk, I will explore the extent to which this is the case by considering a number of studies of communicative development including two new studies, one with infants, and one with 3- and 5-year-olds.

Multi-modal distraction: Insights from children's limited attention

Pawel J. Matusz, Gaia Scerif

University of Oxford

How do multi-modal stimuli influence information processing? Cognitive systems with limited selective attention can elucidate these processes. Six-year-olds, 11-year-olds and 20-year-olds engaged in a visual search task that required them to detect a pre-defined colored shape under conditions of low or high visual perceptual load. On each trial, a peripheral distractor that could be either compatible or incompatible with the current target color was presented either visually, auditorily or audiovisually. Unlike unimodal distractors, audiovisual distractors elicited reliable compatibility effects across the two levels of load in adults, but high visual load significantly reduced distraction for children. For the first time, this study demonstrates that multimodal distraction has powerful effects on selective attention and that poorer attentional resources might, paradoxically, shield from its deleterious effects. In turn, we highlight how developmental research can enrich an understanding of adult selective attention in multisensory environments.

Investigating ADHD effects in visual search using sSoTS model

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ADHD is a disorder that is characterized by a group of behavioural symptoms that include inattentiveness, hyperactivity and impulsiveness. ADHD is managed with appropriate educational support and medication. There is a direct link between ADHD and arousal levels, which is related to norepinephrine function. This work investigates inattentiveness in ADHD and the underlying

neuronal mechanisms using computational modelling techniques, a novel approach.

The computational work extends a neural-level model, the spiking Search over Time and Space (sSoTS) model that is developed to simulate visual search [1]. The sSoTS model incorporates effects of top-down processes and neuronal details of the system. In this work we attempt, through sSoTs to identify the mechanism(s) responsible for the decline of attentional function in children with ADHD, giving us new insights into how neurotransmitter modulation may change 'whole system' behaviour. Furthermore, this modelling work provides a link between psychological analyses of cognitive sub-systems and neural function.

Reference: Mavritsaki, E., et al., Bridging the Gap Between Physiology and Behavior: Evidence From the sSoTS Model of Human Visual Attention. *Psychological Review*, 2011. 118(1): p. 3-41.

An eye movement investigation of syntactic ambiguity in main verb and reduced relative constructions

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The current study seeks to investigate the pattern of eye movement behaviour when readers encounter syntactically ambiguous and unambiguous sentences with main verb (MV) and reduced relative (RR) syntactic constructions. For example, in the ambiguous sentence The experienced soldiers warned about the dangers before the midnight raid, "warned" represents the MV and so this is the preferred syntactic construction, alternatively in The experienced soldiers warned about the dangers conducted the midnight raid, "warned" represents is a RR and so this structure is unpreferred. Early research (Frazier & Rayner, 1982) suggests that in MV constructions there will be no difference in processing times for ambiguous and unambiguous sentences, whereas for RR constructions there will be longer processing times for ambiguous than unambiguous sentences. More recently, in an fMRI study, Mason, Just, Keller & Carpenter (2003) found a higher level of brain activity for MV constructions when sentences were ambiguous rather than unambiguous. This experiment will use materials taken from Mason et al. (2003) to establish if the pattern of eye movements supports that of early or more recent research. Participants viewed 32 sentences, 8 sentences in each of four conditions: Ambiguous/MV, Ambiguous/RR, Unambiguous/MV, Unambiguous/RR, whilst their eye movements were monitored using an Eyelink-1000 eye-tracker. For analysis, regions were defined as the point of ambiguity e.g. "warned" and the spill-over region. Results from first pass and total reading times show a significant main effect of ambiguity, and a significant main effect of construction at the point of ambiguity. This pattern is maintained in first pass reading times for the spill-over region. However, in

total reading times there is a significant interaction suggesting that the effect of ambiguity is moderated by construction. Results will be related to the studies detailed above and discussed in terms of serial and parallel models of parsing.

Passive eating? Infant reactions to others eating

Noele McCarthy, Vasudevi Reddy

University of Portsmouth

This paper explores infants' awareness of the hand-to-mouth action of eating. Although action understanding in infancy has become a topic of intense interest in the last decade, there has been almost no research on infants' understanding of eating. The only two studies on the understanding of eating focus on children with autism (Cattaneo et al, 2007) or on older infants between 6 and 12 months of age (Gredeback & Melinder, 2010). However, infants are likely to be regularly exposed to other people eating solid foods even they themselves have been weaned or introduced to solids. Existing explanations of the emergence of action understanding range from action production, action observation, action reception to deductive inference. Examining infant reactions to others eating before and after they have themselves been weaned allows us to examine these different (and competing) explanations of the emerging process of action understanding.

In this field-experimental study we filmed twelve mother-infant dyads under six month of age in three conditions: Infant watching their mother Eat Food, Read a Book and Pretend to Eat a piece of Paper. We compared infant Gaze, Chewing Movements and Reaching in each condition. Frequency and duration of Chewing movements was greater in the Food than in the Book or Paper conditions. There were no condition differences in Gaze or Reaching for the Object, suggesting that the effects on chewing movements were not due to a greater interest in or attentiveness towards food. These effects were present in both weaned and unweaned infants, suggesting that while experience may matter in many ways, the experience of eating solids per se – in particular, the production of the hand-to-mouth eating action - did not determine the infants' awareness to grasp what their mothers were doing.

Risk perception and affective judgement: A linear relationship in experts and laypeople?

Tony McCarthy, Calvin Burns, Matthew Revie

University of Strathclyde

The psychometric paradigm (Slovic, 1987) has been very influential in the study of risk perception. More recently, the affect heuristic (a cognitive process in which people use their positive and negative feelings to evaluate risk) has become the focus of much research in risk perception. This study investigated the relationship between risk perception and affective judgement in experts and laypeople. It was hypothesized that perceptions of

'high risk' would be associated with 'negative affect', and 'low risk' with 'positive affect'. Additionally, it was predicted that experts would be more cautious in their judgements than laypeople. An online survey was used which required participants to rate target words for their connotation of risk (risky or safe) and affect (positive or negative). Participants in the expert group were 47 risk analysts employed in high hazard organizations (e.g. Ministry of Defence). Participants in the lay group were 70 undergraduate students at a UK university. A strong correlation was found between risk perception and affective judgement for both the expert group, and lay group in the expected direction. Laypeople tended to make more extreme judgements overall though. These findings are in line with previous research but demonstrate a linear relationship between risk and affect, in a manner not previously shown. The paper will consider these findings in relation to the literature on emotion in risk perception. It will also consider how implicit attitude measures can be used to investigate the role of affect in risk attitudes.

Children who experience regret make better decisions

Teresa McCormack, Eimear O'Connor, Aidan Feeney
Queen's University Belfast

If regret is functional emotion that facilitates good decision making, we would expect that when children begin to develop regret, it has an impact on their decision making. Four experiments examined for the first time the relationship between children's ability to experience regret and the quality of their subsequent decision making. Children chose between two options on Day 1, discovered that the non-chosen option was better, and then rated their feelings about their choice. On Day 2, to examine rates of choice switching, children were presented with the same decision. In Experiment 1 regret and adaptive choice switching showed the same developmental profile, with both first appearing at about 7 years. In Experiments 2 and 3, children aged 6-7 who experienced regret on Day 1 adaptively switched their choice more often than children who did not experience regret, and this was true even when controlling for age and verbal ability. Experiment 4 ruled out an interpretation of these findings in terms of the ability to remember Day 1 outcomes. We suggest that the experience of regret facilitates children's ability to learn rapidly from bad outcomes. Our findings suggest that experiencing regret about a choice increases the likelihood that one will spontaneously recall the outcomes associated with choices when faced with the same decision again.

Do children value the future more than the past? Examining a bias in children's episodic future thinking

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Queen's University, Belfast

Episodic future thinking is the term posited by Atance and O'Neil (2001) to encapsulate our ability to imagine and contemplate future events. Adults demonstrate systematic biases in future thinking, one instance of which is their tendency to value future events more than equivalent events in the equidistant past (Caruso, Gilbert, & Wilson, 2008). For example, when asked to judge the size of a gift they should receive for helping someone, adults expect a larger gift if they are due to help in the future than if they have helped in the past. This tendency is described as Temporal Value Asymmetry (TVA, Caruso et al.). To date, this bias in future thinking has not been considered from a developmental perspective. The present study aims to fill the lacuna in the literature. Ninety five 6- to 10-year-old children took part in this study: 48 six- to seven-year-olds and 47 nine- to ten-year-olds. Children listened to a set of past and future hypothetical vignettes and made valuations regarding events in the vignettes using a similar methodology to that utilised with adults. The results showed no difference in children's valuations for past versus future events, and no effects of age. Unlike adults, children aged between 6-10 years of age do not seem to value events in the future more than those in the equivalent past, potentially suggesting that they may be more oriented towards the present than the future. However, the vignettes used did not closely match those used in previous studies with adults. Therefore, an additional study was conducted with undergraduates to establish a vignette that would also be suitable for children. This study replicated previous findings of TVA in an adult sample. The findings from a further study in which this vignette was administered to children of different ages will be reported.

Vigorous cross-examination of facial-mapping expert reduces false identification

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Within the criminal justice system establishing identity via the face is commonplace and this is usually achieved by comparing the face or facial image of the accused with that of the culprit. It is common, when identification evidence is ambiguous, for the prosecution to call a facial mapping expert. These experts use a variety of techniques to compare images of the culprit and suspect and draw conclusions about the likelihood that the images are of the same person. However, Strathie and McNeill (2011) indicate that use of these techniques encourage false positive responding (saying two faces belong to the same

person when they do not). This suggests that use of such techniques is likely to lead to an increase in the conviction of innocent people. The study extends this work in a more realistic setting, by seeking to establish what effect cross-examination might have on a jury's interpretation of this type of evidence. Mock jurors viewed a series of 3 films recorded in a real courtroom setting. In film 1 jurors view only the evidence given by the mapping expert. In film 2 jurors view the evidence given by the expert followed by a gentle cross-examination (in which the expert's general expertise is questioned). In film 3 jurors view the evidence given by the expert followed by a vigorous cross-examination (in which the both expert's general expertise and the scientific veracity of the facial mapping technique is questioned). Results support earlier lab based studies in this area, indicating the use of mapping techniques combined with expert evidence from facial mapping experts increases rather than decreases false identification. It further suggests, that while this technique continues to be permitted in court, one way to mitigate its effects is via vigorous cross-examination of the both expert and the technique.

The contribution of perinatal adversity to early symptoms of ADHD

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Intrauterine and perinatal circumstances have repeatedly been associated with the development of ADHD, however the literature is characterised by inconsistent findings and is clouded by confounded variables. The aetiology of ADHD is likely to be complex and interactions between genetic and environmental risk factors need further exploration.

This study therefore examined the contribution of multiple psychosocial, pre- and perinatal risk factors within one study, in order to find out how these factors were inter-correlated and how they predicted possible early ADHD symptoms at 33 months of age, measured using the ADHD scale of the Child Behaviour Check List (CBCL).

CBCL scores were significantly related to the mothers' age, ADHD symptoms, education, symptoms of antisocial personality disorder, prenatal smoking, levels of stress during pregnancy and breastfeeding. However, multiple regression analysis indicated that only maternal age and stress in mid-pregnancy were independently associated with early ADHD symptoms. Several possible interactions between risk factors are pointed out and implications for early prevention and intervention strategies are discussed.

The Early Years Developmental Journal: A resource to record, monitor and support children's progress

Silvana Mengoni, John Oates

The Open University

Early Support is a way of working that aims to improve the delivery of services for disabled children, young people and their families. It enables services to better coordinate their activity and provide families with a single point of contact and continuity through key working.

A central component of Early Support is the Developmental Journal. The Early Years Developmental Journal (EYDJ) helps families and practitioners working with them to record, celebrate and support children's development and to identify areas where extra help may be needed.

The EYDJ presents behaviours and skills as items that parents can observe in their children and note as 'emerging', 'developing' or 'achieved'. These items are from four Areas of Development: Personal, Social and Emotional; Communication; Physical; Thinking. The items within the Developmental Journal are structured into sequential Developmental Steps covering birth to five years.

Established developmental schedules were used when designing the EYDJ. These included: Bayley Scales of Motor and Cognitive Development (2nd edition), From Birth to Five Years by Mary Sheridan, the Developmental Rainbow, the Ages and Stages Questionnaires (2-60 months), the Department of Health Birth to Five timeline, Personal Child Health Record (PCHR) and Early Years Foundation Stage (EYFS) Development Matters. These were used to help select items and place them in a developmental sequence.

Whilst the EYDJ is primarily aimed at parents, it is also of relevance to practitioners completing assessments and statutory reviews. To this aim, many of the items in the EYDJ correspond to items included in the EYFS Development Matters and/or the PCHR. These items are highlighted in the EYDJ to aid practitioners using these tools.

We will also present the preliminary results from evaluation studies, including data from questionnaires, case studies and focus groups.

Why do preschoolers' attention and numeracy relate? Implications from cognitive training

Rebecca Merkley, Gaia Scerif

University of Oxford

It has been well established that relationships exist between mathematics achievement and executive processes, including working memory (Bull & Scerif, 2001, Dev Neuropsychol; Bull, Espy, & Wiebe, 2008, Dev Neuropsychol; St Clair-Thompson & Gathercole, 2006, Q J Exp Psychol) and attention (Steele, Karmiloff-Smith, Cornish, & Scerif, 2012,

Child Dev). However, most of the evidence for these relationships is correlational, and it remains unclear exactly why or how these skills contribute to early math. The current study used cognitive training as a method to explore the mechanistic relationships between developing attention and developing numeracy skills in early childhood. We hypothesized that training a domain general process would lead to improvements on the trained skill and would also have transfer effects to domain specific numeracy skills. Thirty-nine children between the ages of 36 and 66 months ($M = 51$, $SD = 7$) were randomly assigned to either task switching training, in which children played a sorting game and switched between two rules, or a control number sense training (Wilson et al., 2006, *Behav Brain Funct*), which was based on a numerical comparison task. Eight 15-minute training sessions were completed over a period of five weeks. Participants also completed a battery of attention, memory, and numeracy assessments prior to and after completing the training. Participants in both groups improved on a non-trained task switching measure as well as the Test of Early Math Achievement (TEMA-III; Ginsberg & Baroody, 2003), suggesting that the trained processes are malleable and related. These results will be interpreted in light of data from an additional passive control group of 18 participants and implications for theories of the development of attention will be discussed.

The prediction of cognitive development from maternal scaffolding behaviours in the first year

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The purpose of the present study was to create a reliable observation tool to assess maternal instruction behaviours during play and book-sharing interactions with their 10 months old infants. This was done by focusing on two different theoretical frameworks when developing the observation scheme: Wood, Bruner and Ross (1976) scaffolding theory and Bus and Ijzendoorn (1997) study of the affective components of book-sharing interactions. The second aim of the study was to assess whether the observed maternal instruction behaviours were predictive of children's verbal abilities at school entry age over and above mother's characteristics such as depression, education and home stimulation. 111 mother-infant dyads were observed during videotaped interactions engaging in two 2.5-minute segments of book-sharing and shape-sorting play activities. Each interaction was assessed separately generating a different factor structure of maternal instruction behaviours. The book-sharing interaction presented four factors including: physical control, verbal input, physical instruction and affective input, whereas shape-sorting activity produced four factors which include: verbal input, demonstration, task features and physical instruction. Furthermore, maternal general style of verbal interaction was also observed as part

of the scheme. Findings suggest that maternal verbal style and some aspects of maternal instructions during book-sharing interaction were predictive of verbal abilities at 51 months in addition to maternal depression and education. Maternal scaffolding during shape-sorting interaction predicted a greater amount of variance in children's verbal cognitive ability. These findings add to the growing body of literature linking maternal scaffolding with children's developmental outcomes, indicating that the relevant maternal behaviour can be identified in the child's first year.

Understanding observed gaze towards objects by 4-month-old infants: An EEG oscillation study

Christine Michel, Stefanie Hoehl

Heidelberg University

In an ERP study with 4-month-old infants, pictures of a person looking at an object lead to greater positive slow wave (PSW) activity than pictures of a person looking away from an object. Together with previous results, this suggests that infants build stronger memory representations for gaze-cued objects compared to objects that are not looked at (Hoehl, Reid, Mooney, & Striano, 2008).

In adults, alpha oscillations were recently associated with access to a knowledge system in the human brain (Klimesch, 2012). Oscillations in the alpha range may thus be involved in infants' encoding of novel objects. Here, alpha oscillations in reaction to object-directed and object-averted eye gaze were investigated in 16 4-month-old infants.

Data from Hoehl et al. (2008) were reanalyzed with regard to oscillatory brain activity. Infants were presented photographs of a person either looking at or looking away from an object and EEG was recorded continuously. Pictures were presented for 1000 ms and alpha band oscillations time-locked to stimulus onset were analyzed. Mean amplitude of the frequency range 5 – 7 Hz, 400 – 800 ms after stimulus onset on fronto-central electrodes was used as the dependent variable.

Desynchronization of alpha band activity in comparison to the baseline was found for object-directed gaze ($t(15) = -3.7$, $p < 0.01$), and no changes in alpha band activity were found for object-averted gaze ($t(15) = -1.3$, $p = 0.20$) in 4-month-old infants. Additionally, data of 2- 6- and 9-month-olds that are currently being analyzed will be presented.

Alpha desynchronization in infants may reflect processing of the relation between eye gaze direction and related objects. Similar to the PSW, alpha desynchronization might be a neural correlate of forming memory representations in infants, possibly through access to a knowledge system as described in adults.

Visual and proprioceptive cue weighting in children with ASD, DCD and typical development

Louisa Miller

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Accurate movement of the body and the perception of the body's position in space usually rely on both visual and proprioceptive cues. These cues are weighted differently depending on task, visual conditions and neurological factors. Children with Developmental Coordination Disorder (DCD) and often also children with Autism Spectrum Disorder (ASD) have movement deficits, and there is evidence that cue weightings may differ between these groups. It is often reported that ASD is linked to an increased reliance on proprioceptive information at the expense of visual information (Haswell et al, 2009; Gepner et al, 1995). The inverse appears to be true for DCD (Wann et al, 1998; Biancotto et al, 2011). I will report experiments comparing, for the first time, relative weightings of visual and proprioceptive information in children aged 8-14 with ASD, DCD and typical development. Children completed the Movement Assessment Battery for Children (MABC-II) to assess motor ability and a visual-proprioceptive matching task to assess relative cue weighting. The matching task required children to estimate the location of a target under varying visual and proprioceptive conditions: vision only (V), proprioception only (P), vision and proprioception (VP), and finally vision and proprioception with prismatic displacement of the visual feedback. Contrary to the initial hypothesis, ASD and DCD were not differentiated by cue weightings. However, those children with ASD and DCD with impaired motor skills did show a greater relative reliance on vision than children with ASD with spared motor skills. These findings are discussed with reference to the new diagnostic criteria for these disorders in the DSM-5.

Can we guess how empathising a person is after watching them in a 30 second video clip?

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The current study builds upon previous work in which participants successfully guessed what had happened to a target after viewing their reaction in a 10-second video (Pillai et al (2012)). In the current study, targets filled in an empathizing quotient questionnaire (EQ) and subsequently participants watched a video clip lasting between 5 and 40 seconds of the target reacting to a situation or reading some text. Participants were asked to guess how empathizing they thought the target was on a four-point scale ranging from low to high. The findings from Study 1 (60 participants) and Study 2 (90 participants) converge in revealing that participants are surprisingly effective in correctly guessing which targets have high empathizing and which have low empathizing but not so effective

when targets were in the middle range of empathizing. In addition, we found a bias in participants' guesses in that they tended to guess that targets had a rather similar EQ to what they thought they had themselves. Despite this bias, participants were systematically able to detect when targets had low or high EQ. These findings reveal impressive abilities in making guesses about others' psychological characteristics in the context of minimal information. We argue that having a theory of mind equips people not only to make estimations of other people's states (e.g. belief state) but other people's traits as well. The current research adds to the literature in speaking about the breadth, versatility and sensitivity of our mentalizing abilities.

Sleep-dependent consolidation of semantic memory for problem solving

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Sleep has been shown to have an enhancing effect on problem discovery. However, specification of the mechanisms engaged by sleep to assist in problem solving are as yet underspecified. In this talk we present experimental data and a computational model of the effect of sleep on consolidation of semantic memory to detail how problem solving is enhanced by sleep. We focus on performance on "remote associates tests" (RATs), where participants are given three words and have to find a word that relates to each of them. Such problems require semantic associations between words to be activated in order to find the solution. Problems can be easy or hard, in terms of how distant or close the semantic associations are between the given words and the answer word. We tested whether sleep particularly affected problems that required more distant associates to be activated within the semantic memory network. Participants attempted to solve RATs that had close or distant associations to the answer, they then returned after a night of sleep or day or wake and reattempted the problems. We found that the sleep group showed an improvement for the harder problems compared to the wake group, but performance was similar for the easier problems. An implemented computational model of the semantic associative network for RATs confirmed that additional spreading activation in the model associated with sleep was sufficient to improve performance on easy versus harder problems. The "small world" structure of semantic memory meant that problem discovery requires activation to spread beyond a local set of associations, a process of consolidation of knowledge within the semantic network that was related to sleep.

Do children who write more write better? An analysis of writing done by children aged 9-10 years

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Handwriting remains an important medium for acquiring and demonstrating knowledge. After considerable instruction and practice, handwriting skill development culminates in automaticity; awareness of motor-control becomes minimal and demands upon working-memory resources reduce. This releases capacity for the higher-level processing of writing, upon which compositional-quality stems. Letter-writing speed, an indication of handwriting automaticity, is the best predictor of compositional-quality throughout education. Nonetheless, little is known about the amount and type of writing practice achieved in primary school and its relationship with children's writing-quality.

The first aim of this study was to estimate the extent of handwriting practice by UK primary school children and factors which may influence productivity, for example gender, teacher-practice and school handwriting-policies. The second was to investigate associations between the amount of practice and compositional-quality. All handwritten work carried out over a typical school week by 101 9-10 year old children at 6 schools was photographed, and the numbers of letters counted. Lexical richness (operationalized in terms of word-length and frequency) was recorded as a measure of writing quality. There was notable inter-school variation in mean numbers of letters written, and a 10-fold difference between minimum and maximum levels of child-output. Multilevel modelling showed that the lexical richness of children's handwritten output was significantly predicted by how much they wrote: children who wrote more letters wrote longer, less frequent words. In addition it predicted that children who attended at schools with higher Ofsted grades and previous National Curriculum Assessment writing scores used longer, less frequent words. Word length was also predicted by children whose writing opportunities were more varied. The findings suggest that if children's handwriting were to become automatized earlier in their school careers, there would be a greater fulfilment of academic potential. Implications for governmental and school writing policies are discussed.

The effect of mathematical anxiety on cognitive reflection

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When asked to solve mathematical problems, some people experience anxiety and threat, which can lead to impaired mathematical performance (e.g., Ashcraft, 2002). The present study investigated the

effect of mathematical anxiety on performance on the cognitive reflection test (CRT; Frederick, 2005), which is based on mathematical word problems, and it is a measure of a person's ability to resist intuitive response tendencies, and rely on precise computations instead. The CRT has been found to correlate strongly with important real-life outcomes, such as time preferences, risk-taking, and rational thinking. Given that mathematical anxiety is related to using simple strategies which are less demanding of working memory resources, we predicted that mathematical anxiety would impair performance on the CRT. Specifically, we expected that participants with high anxiety would be more susceptible to produce incorrect/heuristic responses than participants with low anxiety. In our study a large number of secondary school ($n=197$, mean age=15 years 10 months) and university students ($n=479$, mean age: 20 years 7 months) were administered the CRT, together with measures of mathematical anxiety, test anxiety, and general mathematical abilities (corresponding to the students' educational level). As predicted, maths anxiety was a significant predictor of cognitive reflection, even after controlling for the effects of general mathematical knowledge and test anxiety. Path analyses indicated that the effect of mathematical anxiety on the CRT was partially mediated by mathematical knowledge, but even when this effect was controlled for, there was a direct effect of maths anxiety on the CRT. That is, in line with our hypothesis, participants with high mathematical anxiety were less able to resist tempting heuristic responses. Given earlier findings regarding the role of cognitive reflection in risky decision-making and rational thinking, these results suggest that the negative effect of mathematical anxiety extends beyond the domain of mathematics and career choices.

Developmental changes in the conjunction fallacy: The role of contextual cues

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The conjunction fallacy is a violation of a very basic rule of probability - that the probability of two events happening together cannot be higher than the probability of either constituent event happening. People typically commit the fallacy when one conjunct corresponds to a description given in the task (which is usually based on a social stereotype), whereas the other conjunct (which is the same as the single comparison event) is unrelated to the description. Interestingly, although committing the fallacy seems irrational, adults are no less susceptible to the fallacy than young children. In Experiment 1 we provide evidence that adolescents and adults who show sensitivity to the conjunction rule in a novel version of the task (which includes a conjunction of two non-representative events), still tend to commit the fallacy in the traditional version of the problems.

The pattern is similar in adolescents and adults, although fallacy rates are lower in adulthood. Additionally, in Experiment 2 we show that children's relatively good performance on the task is not the consequence of their missing knowledge of social stereotypes. Finally, Experiment 2 also demonstrates that when solving the problems, children show higher sensitivity to literal meaning, whereas adults are more sensitive to contextual cues. Overall, the results suggest that whereas the potential for normative reasoning increases with development, this potential is often overshadowed by a pervasive tendency in adolescence and adulthood to rely on contextual information, whether it is relevant or not.

RCT of an intervention for children with pragmatic language disorder focusing on peer interaction

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Children with pragmatic language impairments (PLI, also known as social communication disorders) find the use of language for social purposes challenging, and struggle to communicate their meaning. We present the results of a pilot randomised controlled trial (RCT) to test an intervention designed to support children (5-6 years old) to participate in collaborative problem-solving. 31 children with PLI were selected using the Test of Pragmatic Skills (TPS). These children took part in a dyadic computer task (with typically-developing children) developed especially for this project. To complete the task, one child directs another child through a maze with features such as houses, trees and ponds. The task includes obstacles to be negotiated and the aim is to find 'hidden treasure' such as coins and magic wands which are then displayed in a hoard of rewards for both children. The task was designed predominantly to test the children's perspective-taking abilities, thus the children with PLI found it particularly demanding. Audio-recordings were taken of the children's interaction and coded according to type of questions used, quality of directions given, descriptions given and positive and negative statements made. 15 of the children then received an intervention administered by an adult specifically targeted at the differences found between typically-developing children and those with PLI. Training was provided on how to ask questions, give directions and request clarification, the other 16 children received no intervention. At post-test, when the children played the computer task again in dyads, the children who had received the intervention were more successful at the task, gaining more rewards, using questions and statements of higher quality and expressing more positive affect. Furthermore, the intervention appeared to generalize beyond the computer task and the children who received the intervention

showed significantly higher scores on the TPS post-test compared to those who did not.

Maternal mirroring of infant facial gestures from the first week of life and its role in the development of infant expressiveness

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The phenomenon of neonatal imitation of controlled displays of adult facial (and hand) gestures has received much attention. Nevertheless, the natural history of imitation, or mirroring, during spontaneous human adult-infant exchanges early in development has not been well-documented, although limited data suggest that maternal, rather than infant, imitation is the more dominant feature of such interactions.

We conducted weekly videotaped observations of naturally occurring mother-infant face-to-face interactions from 5 days to 9 weeks in the home setting. Participants were 10 infants had cleft lip, and 20 non-affected control infants and their mothers. We coded maternal and infant behaviour, using a scheme specifically designed to capture distinctive characteristics of maternal mirroring. Changes in maternal mirroring over time, and its relation to the development of infant social behaviour, will be described. The implications of this evidence for theories regarding the Mirror Neuron System are discussed.

The presence of perceived environmental disease shifts preferences for female body weight

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Objectives: Research has suggested that implicit cues regarding environmental factors such as resource availability (e.g. hunger) can influence preferences for body weight. It is therefore possible that the way we perceive bodies could also be affected by environmental factors such as disease and the potential existence of pathogens, however no research has examined this. For that reason we examined the effects of a perceived increase in environmental disease on preferences for body weight. Design: An independent measures design was used. Method: Participants (n= 90 female: 30 male) were primed verbally using a scripted conversation. Depending on which condition they were in participants were either engaged in a short conversation about illness or a conversation about the location of the experiment. A third group experienced no conversation. Participants were asked to indicate their preferences (attractiveness, health, normality and intelligence) for female and male bodies before and after priming. The bodies were presented on a scale and varied in size from thin to overweight. Results: An independent measures ANOVA indicated that there was a significant shift in preferences for female bodies in

participants who had experienced the illness prime with larger bodies now being found more attractive and healthy. This was not evident in the other conditions. Preferences for normality and intelligence did not alter. Conclusion: The presence of a perceived increase in environmental disease causes both males and females to shift their preferences towards a larger body. This suggests that male and female preferences for bodies are sensitive to local environment and vary with the detection of cues that signify environmental threat.

Imitation and communication in human neonates: Possible mechanisms

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Imitation in human neonates, unlike imitation in young infants, is still regarded as controversial. In a series of four studies with 203 newborns the imitation of index-finger, two- and three-finger movements in human neonates was explored. Results found differential imitations of all three modelled gestures, a left-handed pattern, and a rapid learning mechanism. The lateralized behavioural pattern suggests the involvement of a right lateralized neural network. In previous studies, elements of the mirror neuron system comprising the posterior inferior frontal gyrus and the posterior parietal cortex were found to be active when human adults imitated simple finger, mouth, hand, foot, or facial movements, but the majority of the studies on the mirror neuron system found no evidence for lateralization. It has been suggested that the common coding between perception and action must be innate (Lepage & Theoret, 2007; Nagy et al., 2005; Nagy, 2006), although there is no evidence for innate coding, and the activity of the mirror neuron system has been confirmed earliest at six months of age (Nyström, 2008). In our earlier study reciprocal imitation of finger movements activated the right IFG and left IPL (Nagy et al., 2010), a network that overlaps with neural structures for understanding others' intentions in relation to the self, and might support the view that the network for imitation evolved to support interpersonal communication.

Sensorimotor modulation during the observation of hand-to-mouth actions in 13-14 month old infants

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Observing an action performed by another person is known to modulate activity in sensorimotor regions of the brain, in both adults and infants. Our research is investigating the effects in infants of observing actions towards food, specifically hand-to-mouth actions, with the rationale that the neural effects of observing such actions might partly underlie children's imitation of food choices. Twenty 13-14

month old infants watched video clips of an adult grasping and bringing to the mouth, or grasping and placing, food (apple) and non-food (lego blocks) items. In addition, a parental-report measure was taken of each infant's experience of self-feeding and finger foods. EEG was used to record and assess changes in alpha and beta rhythms over sensorimotor areas (C3 and C4). Preliminary data analysis suggests suppression of activity in the alpha and low beta bands during action observation, which is in line with previous findings. The magnitude and timing of modulation will be compared between hand-to-mouth and placing actions, and between actions towards food and non-food. We will also assess whether there are any differences in neural modulation between infants with a greater amount of experience and familiarity with self-feeding (e.g., infants of parents who employed 'baby-led weaning'), versus those with less experience.

Effects of self-reported empathy on 5-to-7 year-olds' memory for a competitive activity

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Young children often misattribute the actions of another person to themselves when asked to make source monitoring judgments about who did what during a previous collaborative task, a phenomenon known as the appropriation bias (Foley & Ratner, 1998). Previous studies (Ford et al., 2011) revealed that the appropriation bias was positively correlated with empathy. The present study investigated the potential role of empathy in a competitive task, where shared intentionality was precluded. Children were assessed for general intellectual ability, inhibitory control, theory of mind and empathy. It was predicted that there should be no appropriation bias following an activity that encourages children to think about their partner's feelings but precludes shared intentionality. Children were aged 5- to 7 years (N = 38) and worked in pairs in a turn-taking activity with a strong competitive component that had two stages – a card selection stage and an ownership identification stage. As predicted, there was no significant appropriation bias: children were *not* more prone to claim that they selected pictures that really were selected by their opponent than they were to make the reverse misattributions. Nevertheless, children with greater empathy showed superior recognition - and source memory for pictures selected by their opponent. Additionally, results showed that measures of affective versus cognitive mindreading (i.e., theory of mind vs. empathy) made *independent* contributions to the variance in source memory. That is, further to empathy, theory of mind showed a unique, positive correlation with agency judgements regarding other-selected pictures. We consider the implications of these findings for understanding the processes driving the

development of memory source monitoring during early childhood.

Predicting literacy outcomes in at-risk children; the role of early language skills

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The present paper reports data from a longitudinal investigation of the overlap between SLI and dyslexia. A key research question is to what extent early language skills can be used to predict later literacy difficulties. Children were recruited when they were 3½ years old and assigned to one of three groups; preschool SLI, family risk (FR) for dyslexia and typically developing (TD). Language skills were reassessed at 4½, 5½ and 6½, at which point we also assessed reading accuracy and comprehension. A sample of 209 children (TD = 69, FR = 109, SLI = 31) completed all assessment points. At Time 1 there was overlap between the FR and SLI groups; 30 FR children met criteria for SLI. Overall at 6½ years, 94/209 children had below average reading accuracy (n=9), reading comprehension (n=14) or both impairments (n=71). The prevalence of reading difficulties was highest among children who were at family risk and had SLI (90%) compared with 61% for SLI and 47% for the remainder of the FR group. In the FR group, the majority of children who went on to develop reading difficulties had poor preschool phonological skills. Among children from the SLI and FR + SLI groups, those whose language impairment persisted into the school years were at highest risk of reading impairment. Together these data show that poor preschool language skills are a major risk factor for reading difficulties and further, that both phonological and broader oral language skills are important. However, early language difficulties can resolve and this complicates prediction. These findings demonstrate the importance of assessing and continuing to monitor oral language skills in the early years.

Why do children bully? A child's perspective

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This paper examines, from the child's perspective, why children bully. A Foucauldian perspective is used to conceptualise bullying and perceives it as involving power which is fluid and struggles between individuals. It also analyses how power is exercised through normalisation and panopticism which is beyond the control of individuals. This research investigates how bullying is experienced in the mundane and everyday lives of children. Different severities of bullying from clear to 'grey'; and different perspectives of children are also examined. Traditional definitions are challenged which distinguish bullying as a specific form of aggression, experienced by a minority of

pathologised individuals. This paper draws upon data from observations, focus groups and individual interviews conducted with children in five state schools, a private school and a pupil referral unit. Children often suggested that children bully to be popular. Children who were popular were usually admired, respected and exercised social power over their peers. Another reason cited for bullying was boredom and having experienced being bullied. Working-class boys with learning difficulties were particularly under 'the gaze' and increasingly targeted for punishment, which usually increased their boredom. Some of these children wanted revenge and engaged in bullying. Because they often felt increasingly targeted for punishment, they also experienced bullying by teachers. This research is an original contribution to knowledge because of its complex understanding of how children experience bullying in their everyday life and why they engage in such bullying. These findings have wider resonance and are likely to apply where these processes occur, for example, in other schools.

The contribution of inhibitory abilities to arithmetic word problem solving containing irrelevant information

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Empirical evidence on whether inhibitory abilities are important for word problem solving is mixed. For instance, Passolunghi and Siegel (2001) found that poor problem-solvers performed worst on working memory measures requiring the inhibition of irrelevant information compared to good problem-solvers. In contrast, Lee, Ng and Ng (2009) found that various inhibition measures were uncorrelated with word problem-solving accuracy. However, their word problems did not contain any irrelevant information. In this study, we focused on whether (i) the inclusion of irrelevant information of varying amounts and types interfere with word problem solving accuracy and, (ii) susceptibility to interference from such irrelevant information is related to individual differences in inhibitory abilities. Normally achieving Primary 5 students were administered tasks that gauged potentially different aspects of inhibitory abilities: the California Verbal Learning Test, and a flanker, listening recall, and Stroop tasks. Performance on two computational fluency tasks and on a task requiring students to identify and underline irrelevant information in word problems served as covariates. Performance on a set of word problems served as the criterion measure. The word problems contained different amount (none versus one versus three pieces) and type (Literal versus Numerical) of irrelevant information. Preliminary findings based on 66 students revealed a significant drop in problem solving accuracy from the no irrelevant to the one piece of numerical irrelevant information condition only. A significant relationship between

performance on the flanker task and accuracy on problems containing literal irrelevant information was observed. Accuracy on problems containing numerical irrelevant information was significantly related to performance on the underline task. The findings suggest that students maybe using different strategies depending on the type of irrelevant information. It is likely that the strategies are subserved by different cognitive processes.

Spoken language production in adulthood: Complex thought drives complex syntax

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Background: The use of complex syntax has a protracted course of development, beginning during the toddler years and gradually increasing throughout childhood, adolescence, and into adulthood. Less is known, however, about changes that may occur in syntactic complexity as healthy adults move into middle age and beyond. Moreover, little is known about cognitive factors that may prompt the use of complex syntax in young, middle-aged, and older adults. **Purpose:** The purpose of the study was to examine age-related differences in the syntactic complexity of spoken discourse in young, middle-aged, and older adults. The study was also designed to examine the role of complex thought in relation to the use of complex syntax. **Method:** Language samples were elicited from healthy adults in their 20s, 40s, and 60s ($n = 20$ per group). Each participant was prompted to speak in conversational and expository discourse, and the samples were coded for the use of all main and subordinate clauses. **Results:** No age-related differences occurred in syntactic complexity as measured by mean length of utterance, clausal density, or the use of left-branching clauses. Moreover, all age groups produced greater syntactic complexity in expository than in conversational discourse. In particular, when adults were presented with critical thinking questions that required them to analyse and comment upon complex human interactions (e.g., "What is a good way for Person X to deal with Person Y?" "What do you think will happen if Person X does that?"), their syntactic complexity increased dramatically and they spoke with greater clarity, precision, and efficiency. **Conclusions:** Adults employ robust spoken language skills well into their 60s, and are most likely to display their linguistic competence when called upon to engage in complex thought.

Physical activity and reduced tic symptomatology in Tourette's Syndrome: An observational study

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Background: Tourette's Syndrome (TS) is characterized by motor and/or vocal tics which are involuntary repetitive movements or vocalizations that vary in frequency and severity and can have a

detrimental global effect on daily functioning. It has been previously reported that certain contextual factors, i.e. emotional reactions to life events or different situations and settings, may exacerbate or attenuate tic expression. Experimental studies have examined the impact of contextual factors on tic frequency utilizing direct observation designs, usually in clinic settings. Despite descriptive accounts of the alleviating effect of physical activity on tic expression, there have been no attempts to date to directly observe the relationship between physical activity and tic frequency in a dynamic experimental setting. **Method:** This study employed a case-series approach with nineteen young individuals with TS (with no comorbid conditions), aged 10 to 20 years, participating in interview-based and exercise-based tasks in a single session whilst being video-recorded. The interview-based task engaged the participant in a non-clinical conversation and was followed by the physical activity task which involved performing kickboxing (on 360 X-Box Kinect), an aerobic type of exercise. In this paradigm, we compared estimates of motor and phonic tic counts occurring in 5-minute video-recorded segments sampled from each condition, i.e. the interview and the kickboxing tasks, including also a 5-minute segment from a non-clinical interview that took place after the kickboxing task was over. **Results:** Tic frequency counts decreased significantly during the physical activity session compared to tic occurrence at baseline, i.e. during the pre-kickboxing interview ($p < 0.01$). Tics also remained reduced relative to baseline during the post-kickboxing interview ($p < 0.05$), approximately 20 minutes after the kickboxing task was performed. **Conclusions:** The present findings provide robust experimental evidence for the attenuating effect of physical activity on tic symptomatology, bearing important future research and clinical implications.

Effect of Cognitive Modeling on Impulsive Behavior among primary school children in Bekwai Municipality, Ghana

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The major task of this study was to develop and assess one procedure for training primary school impulsive pupils in reflective problem solving skills. The study employed an experimental research design in which the independent variable of training style (cognitive modelling) was manipulated and its effect on the dependent variable (impulsive problem solving approach) was observed. Fifty four pupils participated in this study and they were assigned to experimental and control groups. There were a total of fifteen contact sessions. The experimental group was exposed to training procedures in reflective thinking whilst the control group was given a placebo in delayed response. The post test results indicated a significant improvement in the performance of the experimental group against the control group.

Results at delayed post-test measures also revealed a sustainable increased performance in the experimental group.

Children's understanding of the Earth and climate change

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Investigating children's concepts of the Earth can reveal a great deal about the nature, origins and development of scientific understanding. Vosniadou and colleagues (e.g., 1992, 2004) have shown repeatedly that children in several different cultures often say that the Earth is flat with people living only on top. Other children depict the Earth as hollow with people inside, or dual, with one flat Earth on which we live, and another, spherical one in the sky. Since no-one will have told children that the Earth is flat, hollow or dual, these concepts cannot be culturally communicated. Instead, Vosniadou claims that children must base their concepts on direct observations and strong intuitions that lead them to construct naïve, theory-like 'mental models' of the Earth. We will present evidence from a programme of studies that challenges this view. Three approaches have been taken: first, different methods from Vosniadou's drawing and open-question tasks have been used with children. Second, adults have been given the original tasks, which were designed for 5-year-olds. And third, these original tasks have been adapted by clarifying the meaning of the instructions and questions. Together, these studies indicate that children demonstrate surprisingly good understanding of the Earth, and that the naïve mental models of the Earth are methodological artifacts resulting from previous researchers' confusing and ambiguous tasks. We will discuss the theoretical and methodological implications of this research, and the importance of building on it to investigate children's understanding of climate change.

Statistical learning of word boundaries in native and non-native speakers of English

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One mechanism hypothesized to underlie language learning is the process of statistical learning. Statistical learning refers to the mechanisms involved in implicit learning of the surface distributional patterns and structures present in natural language, and the study of this phenomenon has only recently emerged as a potential contributing factor to language acquisition. Statistical information in language can be particularly useful in helping to define word boundaries. Within language, transitional probabilities of syllables within a word are higher than the transitional probabilities of syllables between words. In laboratory experiments, it has been shown that adults and infants are able to track

this information from an artificial language to successfully segment nonsense words from a stream of speech. However, to date, there has not been a test of statistical language learning abilities in participants who are non-native speakers of English. We compared the ability to segment words in an artificial language between native speakers of English ($n = 14$) and non-native speakers of English, who had been speaking English for four or more years ($n = 6$). We exposed participants to an artificial language containing six nonsense words, to which the only cues for word segmentation were the higher transitional probabilities between syllables pairs within words than between words. Results showed lower levels of learning by the English non-native group than the English native group. A possible explanation of these findings could be borrowed from previous findings related to nonword repetition tasks indicating that nonwords adhering to legal phonotactic rules or similar to existing words of a language are easier to repeat. It may be that native English speakers were at some advantage for learning the segmentation boundaries in our nonsense language incorporating the phonotactic rules of English.

Semantic short-term memory predicts reading comprehension performance

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It is well established that memory capacity is a prominent precursor of reading comprehension (RC) performance. Furthermore, a large body of evidence indicates that working memory (WM) is a better predictor of RC than short-term memory (STM). However, the contribution of STM to RC has possibly been underestimated, as studies typically focus on phonological STM, and ignore semantic STM. Haarmann, Davelaar and Usher (2003) demonstrated that, in 60 adults, semantic STM explained unique variance above WM for some of the assessed RC tasks (anomaly judgment and verbal problem solving, but not text comprehension). The aim of our study was twofold; 1) to replicate Haarmann et al. (2003), 2) to investigate the role of semantic STM in children's RC. Sixteen Dutch university students were assessed on phonological and semantic STM (forward digit span and conceptual span), phonological and semantic WM (backward digit span and listening span) and three types of RC tasks; anomaly judgement, verbal problem solving and text comprehension. Preliminary results revealed that semantic STM explained variance for verbal problem solving, over and above all other measures. Phonological STM was the only significant predictor for text comprehension.

Ninety Dutch primary school children (10-11 years of age) were assessed on all four memory tasks and one reading comprehension task, consisting of three levels: sentence, paragraph and text comprehension. Preliminary results demonstrated

that semantic WM explained variance on all three levels of RC above and beyond all other memory measures. To conclude, the current study revealed that semantic STM can outperform WM in RC tasks in adults, depending on the type of RC measure that is assessed. These findings are consistent with Haarmann et al. (2003). Semantic STM appears not to predict RC performance in children. This may be due to the used RC measure, and/or a matter of development.

Infant learning across 24 hours upon an object permanence task

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By 8 months infants have commonly learnt to search for an object hidden by a single occluder. This novel study investigated what types of experiences are involved in learning how to search. 6-8 month old infants were seen on two consecutive days. On the first day all infants first performed an object permanence task in which they searched for a toy covered by a piece of cloth. Next the infants played one of three 'games', according to their group. A "search" group practiced spinning a turntable, across the diameter of which was an opaque screen, in order to bring back into reach a toy hidden behind the screen. A "means-end" group also practiced spinning the turntable to bring into reach a toy on the other side of a screen, however, as the screen was transparent the toy could always be seen. Finally the "control" group played a deferred imitation game, in which they imitated an action performed by the experimenter upon a puppet. On the second day the infants first played the game specific to their group, and then again performed the object permanence task. Infants in the "search" group performed better on the object permanence task on the second day than either of the other two groups. They appeared to generalise from their experience with the turntable search task. One should note the two tasks used different toys, methods of hiding the toy, and methods of finding the toy. Such generalised learning was not seen to the same extent in the "means-end" group, who performed similar to the control group on the object permanence task on the second day. This suggests that the learning shown by the "search" group required the specific experience of bringing hidden objects back into perception through one's own actions.

Understanding of temporal and causal relations in good and poor comprehenders

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Improving children's ability to understand temporal and causal relations in stories is the goal of TERENCE, a EU funded Project. A first step was to examine

children's comprehension of temporal and causal relations expressed by explicit connectives, like *before*, *after*, *while* and *because*. Connectives are the main linguistic devices that help readers to establish relations between the events in a text. They appear early in children's language production (Spooren & Sanders, 2008) but understanding of them is still developing in 10-year-olds (Cain & Nash, 2011), especially those conveying simultaneous relations, such as *while* (Arfe, Di Mascio & Gennari, 2010). We report the results of a study where the understanding of temporal and causal connectives was assessed with tasks where support for the reader's understanding was either visual (pictures) or verbal (text). Sixty-three English children and 145 Italian children aged 8 to 11 years participated in the study. They were divided into skilled and less skilled comprehenders on the basis of reading comprehension tests (the Neale Analysis in English and the MT test in Italian). The results suggest that verbal tasks were not systematically more complex than ones accompanied by pictures. Pictures were particularly useful when they supported inferences about the relation between events on the basis of the child's world knowledge. The comprehension of simultaneous events (expressed using *while*) relations was, contrary to our predictions, easier than understanding temporal order and causal links.

Ambiguous idiom comprehension in schizophrenia- a tale of decision-making.

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In this study we hypothesised that problems with comprehension of ambiguous idioms accompanying schizophrenia are caused by defective central executive system and problems with decision making (Schettino et al. 2010; Larquet et al. 2010). Interpreting ambiguous idioms involves a choice between the literal and the idiomatic meaning. Dysfunctional central executive, which takes part in decision making and inhibition, might thus impair processing of such expressions. Therefore, we expected positive correlation between performance on central executive tasks and ambiguous idiom processing task in individuals with schizophrenia. We also speculated that deficits in the central executive would impair the comprehension of literal ambiguous sentences, which also involves a choice between two possible interpretations. To test these hypotheses we recruited two groups of participants. The first group consisted of 8 schizophrenic patients who were further divided into a deficit subgroup (characterised by cognitive deficits) and a non-deficit subgroup. The second group comprised 8 healthy individuals who had no history of neurological and psychiatric diseases. All participants have been screened with a reading test prior to the study. The study proper consisted of tests examining executive skills and decision-making (Iowa Gambling Task and Wisconsin Card

Sorting Test), as well as language comprehension tasks. The language tasks tested the interpretation of ambiguous and non-ambiguous idioms, as well as literal sentences and literal polysemous sentences. The first task had a multiple choice format, while in the second task participant had to give free oral interpretations of the sentences. The effects of ambiguity and idiomaticity of the stimuli on the participants' test scores were analysed with ANOVA. We furthermore investigated the correlations between the executive tasks scores and the language scores for each of the four conditions to answer the questions about the relationship between executive deficits and problems with interpretation of idiomatic and ambiguous sentences.

Effects of reciprocal teaching on the reading performance of primary school pupils

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This study sought to ascertain the effects of Reciprocal Teaching Primary Grade (RTPG) on the reading of Nigerian primary school pupils. The pre-test, post-test, and quasi experimental versus control group design involving two randomized groups was used. Forty pupils in Owerri North Local Government Area, Imo State Nigeria identified as performing low in reading constituted the sample for the study. One research question and one null hypothesis tested at 0.05 level of significance guided the study. The treatment groups were exposed to an eight week programme of (RTPG) while the Control group received life skills lessons. Six weeks after the post-treatment session, a follow-up session was carried out on all the subjects. The instrument for data collection was a researcher-made Reading Test. The differences between the treatment and control groups in the pre-test, post-test and follow-up scores computed using were ANCOVA. The major findings of the study are: that reciprocal teaching has positive influence on pupils' reading performance. Finally, the study ascertained reciprocal teaching is not gender biased. Among the recommendations made are: Government and curriculum planners should review the current school curriculum so as to accommodate the demands of reciprocal teaching primary grade strategies; Primary school education should be given adequate attention it deserves because orientation of certain programmes and teaching strategies are better done at that level.

Neural correlates of attachment-disturbed behaviours among Portuguese institutionalized children

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Everyday relational experience seems to play an important role in the development of neural processing of human faces (Halit et al., 2003). Indeed, early psychosocial deprivation in general (Vanderwert et al., 2010) and the experience of institutionalization in particular, appears to have an adverse impact on children's brain function assessed while visualizing faces (Moulson et al., 2009; Parker et al., 2005). On the other hand, one the most well documented effects of institutional rearing on children's development is the display of attachment-disordered behaviours. Accordingly, this study aims at analysing the relations between institutionalized children's neural responses while processing faces with their indiscriminate attachment-disturbed behaviours, based on both report and observational measures. To assess children's indiscriminate behaviours, we used a) the total score of the 3 items of the Disturbances of Attachment Interview (DAI; Smyke & Zeanah, 1999) that assess the disinhibited type of attachment disorders, based on the caregiver's report; and b) the Rating of Infant and Stranger Engagement (RISE; Riley, Atlas-Corbett and Lyons-Ruth, 2005), which is an observational measure based on the Strange Situation Procedure episodes, to assess children's attachment-related forms of engagement with the stranger, in comparison to the caregiver. To determine the time course of responses to facial identity, we used faces of children's caregivers and strangers as stimuli while recording EEG from children's scalp. Three components were derived: N170 and P400, which are implicated in faces' structural coding (Caharel et al., 2002; de Haan & Nelson, 1999), and P100, which is more related to selective attentional processes. Participants were 42 preschoolers (24 boys; age $M=56.2$, $SD=11.5$ months) and their institutional caregivers. Mean amplitudes of these components were calculated and the DAI interviews were coded, but the RISE coding is still underway.

Implicit language learning: An ERP study

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Little is known about the nature of ERP responses at early stages of language development, and even less about how ERPs relate to behavioural measures and conscious awareness of grammatical regularities. We report a study of implicit adult language

learning of semantic preferences of novel verbs. Participants are told that two novel verbs (e.g. MOUTEN, POWTER) mean to increase something, and two (e.g., CONELL, GOUBLE) mean to decrease. What they are not told is that two collocate with concrete nouns (MOUTEN the fertiliser, CONELL the calcium), and two with abstract nouns (POWTER the significance, GOUBLE the prestige). Participants are exposed to verb phrases in a reaction time task involving a judgment of the abstract/concrete meaning of the noun followed by a judgement of the increase/decrease meaning of the verb. After a period of consistent training with constantly varying nouns occasional violations of the collocational pattern are introduced (e.g. GOUBLE the chocolate). Whilst behavioural responses showed little evidence of disturbance to violations, ERPs showed a somewhat left lateralized N400 to violations as compared to grammatical controls. This effect was most evident on the increase/decrease decision. In order to reveal trial-by-trial changes in the ERP signal over time a novel method of signal analysis (Empirical Mode Decomposition) was employed. This revealed a linear change in the difference between violation and grammatical control trials over the course of the experiment, this time most pronounced on the abstract/concrete decision. All of these effects were obtained despite the fact that after the experiment none of the participants reported being aware of the collocational pattern. The results reveal implicit learning of a semantic generalisation in language, and suggest that ERPs can be used as a sensitive tool for investigating early stages of language learning, even in the absence of conscious awareness of the relevant regularities.

Order, order: serial order in short-term memory, Hebb effects, word-form learning and dyslexia

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With regard to the capacity for immediate serial recall of verbal materials in the short-term, the question has often been raised as to what wider function this capacity provides. Baddeley, Gathercole and Papagno (1998) hypothesized that a key role was in the learning of phonological word-forms. In this talk, I review some of our recent work with the Hebb effect (Hebb, 1961) that directly supports this hypothesis. Specifically, we have shown that long-term representations that are formed in the course of Hebb repetition learning with phonological materials, are incorporated into the phonological lexicon. Such incorporation is shown to be relatively rapid and not requiring of a period of sleep-based consolidation. In addition, we review some recent data that suggest that a deficit in serial-order learning across various modalities might be involved in dyslexia.

Reinforcement of motor skill learning in Tourette syndrome

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Reinforcement learning theory has been extensively used to understand the neural underpinnings of instrumental behaviour. A central assumption surrounds dopamine signalling reward prediction errors, so as to update action values and ensure better choices in the future. However, educators may share the intuitive idea that reinforcements not only affect choices but also motor skills such as typing. Here, we employed a novel paradigm to demonstrate that monetary rewards can improve motor skill learning in humans. Indeed, healthy participants progressively got faster in executing sequences of key presses that were repeatedly rewarded with 10 euro compared with 1 cent. Control tests revealed that the effect of reinforcement on motor skill learning was independent of subjects being aware of sequence-reward associations. To account for this implicit effect, we developed an actor-critic model, in which reward prediction errors are used by the critic to update state values and by the actor to facilitate action execution. To assess the role of dopamine in such computations, we applied the same paradigm in patients with Gilles de la Tourette syndrome, who were either unmedicated or treated with neuroleptics. We also included patients with focal dystonia, as an example of hyperkinetic motor disorder unrelated to dopamine. Model fit showed the following dissociation: while motor skills were affected in all patient groups, reinforcement learning was selectively enhanced in unmedicated patients with Gilles de la Tourette syndrome and impaired by neuroleptics. These results support the hypothesis that overactive dopamine transmission leads to excessive reinforcement of motor sequences, which might explain the formation of tics in Gilles de la Tourette syndrome.

Children's understanding of biology, diet and physical activity

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Research on children's reasoning about the human body, life and death, (e.g., Jaakkola & Slaughter, 2002; Slaughter & Lyons, 2003) suggests that some children as young as 5 years have a 'naive' theory of biology that is built around the concept of life. This 'life theory' allows children to organize their understanding of related biological facts (e.g., the function of vital organs) and concepts (e.g., death). The main aim of this study was to explore what children aged between 5-7 years know about the human body and how this knowledge might influence their ideas about two related concepts: diet and physical activity. It was predicted that

children who use a 'life theory' to explain the functioning of the human body would be better than those without a life theory at understanding what constitutes healthy and unhealthy foods and physical activities. Children aged 4-7 years and adults (N=125) participated in the study. First, they were given a structured interview that assessed their knowledge of the human body. Participants were asked to indicate the location of five vital organs, explain their function and predict what would happen if a person did not have these organs. Second, novel card-sorting tasks assessed their understanding of healthy meals and healthy activities. Sixteen combinations of four foods and drinks (e.g., burger vs. fish; juice vs. coke), and eight combinations of three activities (e.g., walking vs. being driven to school) were used. Participants were asked to rank each set of pictures from the healthiest to the unhealthiest and to justify their choices. We will report the findings and discuss both their theoretical implications and how they can inform the design of successful interventions for the promotion of health-related behaviours.

An investigation into the relationship between individual differences in infant fixation duration and later temperament and behaviour

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Fixation duration is thought to reflect the processing of foveal visual information. Research has indicated that fixation duration is a reliable measure of attention and is correlated with individual differences in cognitive performance both in infants and in children. The current longitudinal study attempted to associate mean fixation duration in infancy with temperament, behavioural problems and autistic traits in childhood. Seventy-eight infants completed eye-tracking tasks (M = 7 months; SD = 1.89 months). Eye-tracking data were recorded using a Tobii-1750 eye-tracker. Fixation duration was detected using fixation detection algorithms in Matlab. Hand coding was performed to the results derived from the algorithms in order to clean and validate the measure. Parents completed the Childhood Behaviour Questionnaire (for temperament), the Strengths and Difficulties Questionnaire (for behavioural problems) and the Social Communication Questionnaire (for autistic traits) at follow up (M = 42 months; SD = 5.76 months). Results showed that after controlling for age, sex, number of trials and total number of fixations, mean fixation duration in infancy was correlated with a number of temperament and behaviour problem scales in childhood, including anger ($r = -.32, p < .005$), shyness ($r = .34, p < .003$), activity ($r = -.26, p < .02$), impulsivity ($r = -.26, p < .02$), surgency ($r = -.32, p < .005$); and hyperactivity ($r = -.25, p < .02$). Fixation duration was not significantly correlated

with any autistic trait subscales. Finally, the total number of fixations was correlated with the duration of fixation ($r = -.51, p < .000$). This is the first study to show that fixation duration in infancy is associated with certain forms of temperament and behaviour in childhood. As a first step, this has implications for understanding how early differences in infant attention relate to later psychopathology.

Non-verbal communication and play in preschool children with expressive specific language impairment

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Nowadays the specificity of Specific Language Impairment (SLI) is questioned by studies demonstrating that the disorder is characterized by deficits in domain general abilities. The present study aims to contribute to this literature by examining non-verbal communication and play in young children with SLI. Participants were 5 children (4 boys and 1 girl) diagnosed with expressive SLI (SLI-E) and 5 typically developing children matched for age, gender, non-verbal IQ and receptive language. None of the children experienced audiological problems or any other socio-emotional problems. Nonverbal communicative abilities and play were assessed from video recordings of spontaneous mother-child interactions in a semi-structured situation taking place at home. The coding scheme included gaze direction, communicative gestures, functional play and symbolic play. Results demonstrated that, compared to typically developing children, children with SLI-E exhibited significantly more spontaneous functional play, more spontaneous communicative gestures, especially pointing, and more solitary play. On the other hand, children in this group showed significantly less cooperative play and less pretend play, while they followed less their mother's interest. These results imply that children with SLI may be more capable of producing communicative or play behaviors corresponding to a younger age, but they exhibit deficiencies in age-appropriate communicative or play behaviors. These findings are interpreted through the Theory of Intersubjectivity, which contrasts with the Theory of Mind and suggests that the development of language is heavily based on mutual understanding of intentions, purposes and feelings as well as on the sharing of arbitrary purposes regarding actions on objects.

A low-level saliency model to examine individual differences in Inattentive Blindness

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The probability that a salient stimulus is detected improves as the saliency of the stimulus against a homogeneous background increases. However, there are individual differences in the saliency level at which a difference can be detected. This difference in sensitivity may be relevant to why some people, but not others, fail to notice stimulus that appears unexpectedly in their visual field. Such a failure of attention is called 'Inattentive Blindness' (IB) and is more likely to occur when we engage in resource-consuming tasks. Here, we describe the development of a low-level model for saliency detection based on that of Verma and McOwan (2009). This model is used to generate artificial stimuli of varying saliency levels, and we then use these stimuli in three visual search experiments. These experiments serve to evaluate the power of the model to discriminate the performance of people who were and were not inattentively blind (IB). In all experiments, participants were classified as being IB or non-IB on the basis of a dynamic IB task. In Experiment 1, stimuli were exposed for 10 s whereas in Experiment 2 and 3, this was reduced to 1s. In Experiments 1 and 3, nine orientational filters were used whereas in Experiment 2 this was reduced to four (theoretically equivalent to Verma & McOwan). Results from Experiment 2 demonstrated that additional filters did improve the model's performance, suggesting that low-level images may require a higher number of orientational filters for the model to better predict participants' performance. Moreover, in all three experiments we found that given the same target patch image display (i.e. same saliency value) IB individuals take longer to identify a target compared to non-IB individuals. This suggests that IB individuals require a higher level of saliency for low-level visual features in order to detect in a target-patch.

Mothers' and fathers' views and participation in their children's play

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Many researchers have recognized the need to examine parents' views about children's development supporting the idea that these views underlie parenting practices and provide the context for parent-child interaction, thus mediating and influencing children's developmental outcomes. The purpose of the current study is to examine mothers' and fathers' views and participation in their children's play. This study was conducted in Athens, Greece and its sample consisted of mothers and fathers (n=416) who had

a child (mean age=4.5 years, SD=±1,2) attending public nursery schools and child care settings. Both parents were asked to complete two questionnaires, one regarding their views about their children's play (28 questions) and the second one regarding the frequency of the participation in their children's play (33 questions). The results showed that the internal consistency of the questionnaires was acceptable (Cronbach's- $\alpha > 0,7$). Exploratory factor analysis was performed for both questionnaires and 4 factors were revealed for each questionnaire. In comparison with fathers, mothers had higher mean on the dimensions "play as a means for development and learning" ($p < 0,001$), the "role of symbolic play" ($p < 0,001$) and had lower on the dimension "play as a means of enjoyment and companionship" ($p = 0,041$). Also, mothers participated more in "playful activities and educational play/games" ($p < 0,001$) and in "socialization play" ($p < 0,001$) compared to fathers. Furthermore, correlation analysis between the factors extracted from the two questionnaires showed overall a positive association for both parents between a) the view "play as a means for development and learning" and parents' participation in "socialization play", "entertainment and play", "playful activities and educational play/games" and "roles in play", and b) the view "the significance of joint play" and parents' participation in "playful activities and educational play/games", "socialization play" and "entertainment and play". Results are discussed in relation to the literature on parent-child play and suggestions for further analysis are presented.

Labels refer to object categories in adults and 9-month-old infants: An EEG study

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Previous research has shown that spoken words facilitate the categorization of perceptually similar objects in infants. The present study addressed the question whether labels alone, without perceptual similarities, could make adults and 9-month-olds group objects together. We measured the desynchronization of alpha-band EEG oscillations in a category oddball paradigm. Experiment 1: Seventeen adults learnt one of two pseudo-words for each of six unfamiliar objects without shared perceptual features. Subsequently, four of the six objects, three sharing the label and one having the other label, were presented without labels on screen, with equal frequency. Participants responded to the oddball category with stronger attenuation of alpha oscillation over the left frontal region ($t(16) = 3.95$, $p = .001$). Experiment 2: Fourteen 9-month-old infants were engaged in a live familiarization with an experimenter presenting them the six unfamiliar objects one by one, while uttering the two novel labels. Right after the familiarization, we presented them with the four objects the same way as above. Stronger alpha

attenuation in response to the oddball category ($t(13) = 2.29, p = .039$) suggested that 9-month-olds, just like adults, exploited the labels to form two object categories.

Effects of aging on eye movement control while reading

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The ability to read is of fundamental importance for people to function effectively and to meet everyday demands of living, working and citizenship. However, research suggests that older readers (aged 65+ years) have significant difficulty in reading, even when their visual abilities appear normal (e.g., Kliegl et al., 2004; Rayner et al., 2006, 2009). The extent to which this reading difficulty is attributable to impaired eye-movement control is uncertain, although ophthalmological assessments suggest that disparity in the location of the two eyes' fixations is greater for healthy older adults than for young adults (e.g., Yekta, Pickwell, & Jenkins, 1989). In addition, research using various non-reading tasks shows that saccadic eye movements are typically slower and less accurate for older adults than for young adults (e.g., Irving, Steinbach, Lillakas, Babu, & Hutchings, 2006; Warabi, Kase, & Kato, 2004). Accordingly, we conducted an eye movement experiment that compared the binocular eye movements of healthy young (18-30 years) and older (65-74 years) adults as they read lines of text that included target words which were matched for lexical frequency but varied in length. Consistent with previous research, older adults read more slowly than young adults, and also made more fixations, longer progressive saccades, and more regressions, and for target words had longer fixation times, made more fixations, and more regressions. Young and older adults also produced standard effects of word length, such that long words had longer fixation times and were skipped less often than short words. However, there were no age differences in the proportion of unaligned binocular fixations, the size of the fixation disparity, or in the locations of initial fixations on target words. The indication, therefore, is that the difficulty older adults experience in reading is not related to impaired eye-movement control, which appears to be preserved in older age.

Hemispheric lateralisation during rhyme judgement examined using fTCD

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Functional transcranial Doppler sonography (fTCD) is a fast and non-invasive way of establishing hemispheric dominance during cognitive tasks (Deppe et al., 2004). The technique measures changes in blood flow velocity in the left and right middle cerebral arteries. fTCD paradigms that

require word generation are reliable indicators of hemispheric lateralisation (Knecht et al., 2000; Bishop et al., 2009) and we have recently demonstrated similar lateralisation patterns regardless of whether overt or covert word generation is required (Gutierrez et al., submitted). In the current study we further examined the sensitivity of fTCD by determining hemispheric lateralisation during a task which does not require word generation, but that we reason involves pre-motor processing: rhyme judgement. Previous fTCD studies of rhyme abilities have used rhyme generation (Krach & Hartje, 2006). However, our recent study clearly demonstrated a positive correlation between the number of words generated during an overt fluency task and the strength of laterality index (LI) (Gutierrez et al., submitted). Thus the use of judgement instead of generation allows better control of the amount of material to be manipulated. Fifteen right-handed participants were tested on written rhyme judgment and line pattern judgement. Conditions were blocked and the order counterbalanced across participants. At a group level, and in agreement with fMRI studies, Lis were greater for rhyme than line judgements ($t = 3.06, p = .009, d = 1.2$). This indicates left and right lateralisation for rhyme and line judgement respectively. The data suggest that fTCD can be used to assess language lateralisation in a task that does not require speech production. This highlights the possibility of using fTCD to assess language lateralisation in populations for whom speech production is difficult to assess, such as children born profoundly deaf.

Haunted by scary television: Effects of clip valence on children's true and false memories

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The Deese-Roediger-McDermott (DRM) Paradigm has been used to create and measure false memory illusions of emotional content in children. Studies have shown that true negative items were recognized and recalled less frequently than true neutral items, but false recognition was higher for negative than neutral items. This indicated lower discernibility for negative emotional content. Studies also suggest that scary television has an impact on children's negative internalizing emotions (fear, anxiety, sadness) and that memories of emotionally negative television can persist over time. DRM lists have been embedded into story contexts with an increase in true but not false recollection. However, similar studies have not been conducted using television clips or directly comparing negative with positive emotional memories. The current study measured recognition of true and false items from positive and negative television clips in 7-11 year olds, to investigate whether similar effects were found in a more naturalistic setting. In addition, the recognition task included items relating to visual and narrative

content to investigate whether any emerging effects were associated with modality of input. Results showed main effects of clip valency, memory type and modality in the recognition tasks with more negative than positive, narrative than visual and more true than false items recognized. Results were similar to previous findings with significantly more true positive than true negative items recognized, and significantly more false negative than false positive items recognized. Additionally, more true narrative items than true visual items were recognized, with false recognition at a similar, lower level for both modalities. In line with previous studies, findings suggest a lower discernibility for negative compared with positive emotional content but also a lower discernibility for visual compared with narrative content. Findings are discussed in terms of relational processing theories and theories of emotional memory encoding and recall in children.

The unique and shared neuropsychological characteristics of ADHD and Conduct Disorder

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The most common comorbidities among children and adolescents with Attention Deficit/Hyperactivity Disorder (ADHD) are Oppositional Defiant Disorder (ODD) or Conduct Disorder (CD). Individuals with the comorbid form exhibit more severe symptomatology and impairment than individuals with one of the pure forms alone. This overlap has been explained in terms of the common genetic aetiology between the two disorders. However, it is as yet unclear which pathophysiological or neuropsychological features of ADHD and CD are shared and which are unique. The present research aims to clarify the issues surrounding the comorbidity between the two disorders by looking at shared and distinct neuropsychological profiles. In specific, the neuropsychological effects of ADHD, CD and ADHD+CD will be explored, with the intention to identify the pattern of neurocognitive deficits across the three groups. In order to accomplish this, groups with ADHD only, CD only, comorbid ADHD+CD, and a group of typically-developing adolescents (serving as a control group) are directly compared on tasks that cover two neuropsychological domains: i. Executive Function and ii. Reward Processing. The neuropsychological testing battery includes both Event Related Potential (ERP) and behavioural tasks. Data collection is currently ongoing. Results will be discussed in terms of the potential differences between neuropsychological subtypes that would implicate disorder specific versus more generic neuropsychological profiles.

The role of verb bias in structural priming: Evidence from children and adults

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The syntactic preferences of verbs have a significant impact on how adults interpret and produce language. This indicates that we must posit a close integration between syntactic structure and the verb lexicon in adult representations. Yet, how this relationship develops in children is less clear. One theory is that children's early syntactic knowledge is restricted to knowledge of how individual verbs behave, with generalisation across verbs occurring later (Tomasello, 2000). Another idea is that young children have broadly adult-like syntactic knowledge from early on (Valian, 1986). In two structural priming studies, we explored whether children and adults show the same sensitivity to verb biases. In the first study, children (aged 3-6) and adults were primed with double-object (DO; Dora gave Boots a rabbit) and prepositional-object (PO; Dora gave a rabbit to Boots) dative primes with DO-biased (give, show) and PO-biased (bring, send) verbs. In a second study, adults were primed with 12 different DO- and PO-biased verbs that were low in frequency (e.g. fling, chuck). In Study 1, all ages showed significant structural priming and produced more DO datives with DO-biased verbs, indicating that 3-year olds are sensitive to the syntactic preferences of these verbs. But, children showed stronger priming when there was a mismatch between the prime verb's bias (e.g. give) and its structure (e.g. PO; prime surprisal), whereas this effect was only marginal in adults. In Study 2, adults showed stronger structural priming for DO- than for PO-biased verbs, but overall, did not show significant evidence of prime surprisal. Overall, the findings suggest that young children have already built abstract syntactic representations and established links between these representations and some verbs. However, since prime surprisal was stronger in children, this also suggests that these links are more closely tied to high frequency verbs than those of adults.

Hearing where the eyes see: Children use an uninformative visual cue when localising sound

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Human adults integrate sight and sound optimally for spatial localisation (e.g. Alais and Burr, Curr Biol 2004), whilst children aged up to 12 years do not integrate sensory information and show visual dominance in similar spatial tasks (Gori, Sandini and Burr, Front Integr Neurosci 2012). Optimal use of sensory signals for localisation predicts that an uninformative signal should be ignored. However, children might not be able to ignore irrelevant information thus showing a suboptimal behaviour.

To test this we used an apparatus including 9 speakers positioned at the right side of a computer screen in a semicircle and asked participants to judge which one of two beeps (a standard and a comparison) was closer to the monitor in either a noiseless environment or one with added auditory noise. The comparison beep could be presented either with or without a synchronous flash positioned at the centre of the screen, while the standard beep was always presented alone. Twenty-four children aged between 7 and 10 years and 15 adults participated in the experiment. We compared the number of times that the comparison stimulus was perceived as closer to the monitor (as a function of beeps' spatial displacement) for the beep and the beep/flash conditions. Adults, as expected, were able to ignore the visual information and their sound localisation was not biased towards the position of the visual information in either noisy or noiseless condition. Children's sound localisation, in contrast, was significantly shifted towards the flash position in either noisy or noiseless conditions. Interestingly noise reduced the effect of the flash, in line with recent reports (Barutchu et al., JECOP 2010). Our results indicate that children are suboptimal in their use of sensory cues, because they attribute too much weight to unreliable cues.

The ADOS-C: A new outcome measure for autism intervention studies?

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Outcome measures for intervention studies for children with autism spectrum conditions (ASC) are currently limited. The Autism Diagnostic Observation Schedule – Change (ADOS-C; Lord, Carr, Grzadzinski, Morton, & Colombi, 2013) is a detailed observation of social behaviours coded from a videoed interaction between parent and child. We explore the ADOS-C as a possible candidate measure and how it relates to the ADOS and measures of general ability and language which have also been used as outcomes. Thirty-three children (age range=25-71 months) were administered the Mullen Scales of Early Learning, the MacArthur Communicative Development Inventory, the ADOS, and the ADOS-C. All met criteria for autism on the ADOS. We will report correlational analyses between the ADOS-C total and the following scores: ADOS calibrated severity algorithm totals for Social Affect and Restricted, Repetitive Behaviours, Mullen visual reception and fine motor raw scores, and MCDI words produced raw score. To determine whether ADOS-C scores are independent of IQ and language, the sample will be split into 2 groups: Nonverbal and verbal children with low and high Mullen scores, respectively. We will explore how ADOS-C scores relate to ADOS severity scores in each group. We will also include a

more detailed exploration of how individual ADOS-C and ADOS items map onto each other. Initial analysis of a subsample (n=14) reveals a positive correlation between ADOS-C total and ADOS RRB total ($r_s=.55$, $p<.05$). The ADOS-C total also correlates negatively with MCDI words produced and Mullen visual reception (both $r_s=-.55$, $p<.05$). We will discuss the potential of the ADOS-C as a valid outcome measure for use in intervention research, in particular its independence from measures of general functioning. We will further consider pragmatic aspects such as ease of scoring and administration.

Pitch discrimination in autistic traits and its relationship to IQ and language function

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Background. Superior auditory discrimination of pitch occurs in children and adolescents with autism spectrum conditions (ASC; e.g., Bonnel et al., 2003; Heaton, 2003). Also within this group, atypical processing of linguistic stimuli (e.g., Frith & Snowling, 1983) and uneven cognitive function (e.g., Rapin, 1997) are shown. Objective. To assess whether enhanced auditory discrimination of pitch occurs across the autism spectrum and to test whether this is related to IQ or language function. Methods. Sixty-five typically-developed adults were given the Raven's (Raven, Raven, & Court, 1998), the MillHill (Raven, Court, & Raven, 1988) the Autism-Spectrum Quotient (Baron-Cohen et al., 2001a), and two tests of pitch discrimination. Accuracy and reaction time of the listener's ability to discriminate real words and pitch analogue tone stimuli were measured. One of the tones in each pair was systematically varied in pitch height: Intervals were same, small, medium, and large. A subgroup of individuals (n=53) were also given measures of pragmatic language, reading, spelling, and nonword repetition, ability. Results. Performance on both pitch discrimination tasks was not related to autistic traits at any interval size. The Raven's correlated positively with accuracy of pitch contours with a medium interval difference ($r=.30$, $p<.05$). Reading and spelling correlated positively with accuracy of pitch contours with a small interval difference ($r=.36$, $p<.001$; $r=.35$, $p<.05$; respectively). Pragmatic language skills correlated negatively with RT of pitch contours with a large interval difference ($r_s=-.30$, $p<.05$). Conclusions. No relation between pitch discrimination and autistic traits was found in this neurotypical sample. The task used here was the same as that used by Heaton et al., (2008) for children with ASC. Further research is needed to assess whether enhanced processing of pitch is not captured by the current task or sample and to understand the relationships between nonverbal IQ and language ability in pitch processing.

Reading outcomes in teenagers born with hearing loss: Early confirmation of deafness matters

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Universal Newborn Hearing Screening (UNHS) programmes are an effective way of increasing early identification of children born with moderate to profound hearing loss. The aim of promoting early identification of these children is to enable them to receive early intervention to maximise the quality of their early language environment, and consequently to support their own language development. Previous work, including our own, has documented the benefits that UNHS and the associated early confirmation of hearing loss bring to deaf children's language and reading outcomes in the primary school years. However, to date no study has followed up children involved in trials of UNHS through to the teenage years to assess the longer-term impact of UNHS and early confirmation of hearing loss. In this talk I will present data from the Hearing Outcomes in Teenagers project, a unique long-term follow-up study of a large group of deaf teenagers involved in trials of UNHS when they were born. These data show that the beneficial effects of early confirmation of hearing loss on reading comprehension outcomes that were found in these children when they were aged 6-10 years have continued into the teenage years. We found that even when controlling for the effects of other variables that may impact on reading comprehension outcomes (severity of hearing loss, non-verbal intelligence, maternal education level), teenagers in the study who had their hearing loss confirmed at ≤ 9 months showed mean reading comprehension scores that were significantly higher than those teenagers who had their deafness confirmed later. However, this pattern of findings did not hold for the subgroup of teenagers in the sample who had received cochlear implants, suggesting that factors other than age at confirmation of hearing loss were more salient in determining the reading comprehension outcomes of these teenagers.

Individual differences in belief bias: Consideration of the Algorithmic and Reflective minds

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We report three studies investigating individual differences in belief bias in the domain of syllogistic reasoning, with a particular focus on the functioning of what Stanovich (2009) refers to as the "algorithmic mind" and the "reflective mind". The algorithmic mind concerns people's analytic processing ability and was operationalized in our research in terms of working memory capacity. The reflective mind relates to people's motivation to engage in open minded and critical thinking and was assessed in our research using the Actively

Open Minded Thinking scale (AOMT). In addition some of our studies also made use of the Rational-Experiential Inventory (REI-40) and the Cognitive Reflection Test (CRT), the latter to assess the ability to override intuitively compelling answers. Our results showed that whilst individuals with a higher working memory capacity took longer to process conflict syllogisms (those where logic and belief are in opposition) this did not translate into improved normative responding. What did predict more normative responding on such problems, however, was the inclination to engage in open minded thinking and the ability to override intuitive responses. In addition, rational ability on the REI-40 correlated positively with conclusion endorsements for valid-unbelievable conflict problems. In sum, it would seem that more effective normative responding with logic/belief conflict problems is most closely associated with dispositional tendencies toward open minded thinking and the resistance of intuitive responses, placing the concept of the reflective mind at centre stage in accounting for belief-bias effects in reasoning.

The effect of integration distance on children's production of bridging inferences

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We assessed the effect of a distance manipulation on children's ability to make bridging inferences. Children aged 6, 8 and 10 years listened to 16 6-sentence stories and answered questions at the end of each to assess their ability to make a bridging inference. For each story they were required to integrate the information from two sentences in order to generate the inference. In half of the stories the information to be connected was presented in sentences 4 and 5 (near condition); in the other stories this information was presented in sentences 2 and 5 (far condition). When a child gave an incorrect answer, checks were made to ensure that the child could remember the relevant information from the story required to make the inference and that they had the relevant background knowledge. Ten-year-olds were better at generating bridging inferences than 6-year-olds. In general, children in each age group made more bridging inferences in the near condition than in the far condition. An examination of the reasons behind inference failure will be presented to identify the locus of failure in inferential processing and whether this differs by age or distance manipulation. These findings have both theoretical and practical implications in relation to children's comprehension development and the design of interventions targeting inference making.

Cross-cultural evidence of perceptual narrowing toward adult faces in 3- and 9-month-old infants

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Adults show a perceptual processing advantage for adult faces over other-age faces (e.g., Kuefner et al., 2008) suggesting that face representation is shaped by visual experience accumulated with different face-age groups. As for species and race biases, this age bias may emerge during the first year of life as part of the general process of perceptual narrowing, as a result of the extensive amount of social and perceptual experience accumulated with caregivers and other adult individuals (Ramsey-Rennels, & Langlois, 2006). This hypothesis is consistent with the finding that Caucasian 3-year-old children without younger siblings manifest a processing advantage for own-race adult faces compared to infant or child faces (Macchi Cassia et al., 2009, 2012). These findings have been recently replicated in Chinese children, who are more experts at processing Asian adult faces than Asian child faces (Macchi Cassia et al., under review). In this work we aimed to extend existing evidence on perceptual narrowing to the facial attribute of age, and to investigate whether perceptual narrowing toward adult faces during the first year of life is a cross-cultural phenomenon. To this aim, we tested Caucasian and Japanese 3- and 9-month-old infants living in a racially homogeneous environment for their ability to discriminate and recognize own-race adult and newborn faces within variants of the habituation/familiarization and visual-paired comparison procedure. Experiment 1 was conducted with Caucasian infants ($n=60$) while data collection is still in progress for Japanese infants in Experiment 2 ($N=20$) with Asian infants tested with Asian faces. Preliminary data indicate that older infants of both ethnicities discriminated adult faces but not infant faces, while younger infants discriminated adult and infant faces with equal facility. Implications of the current results for the literature on the development of face recognition and face processing biases will be discussed.

Handwriting speed in children with Developmental Coordination Disorder: Are they really slower?

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Developmental coordination disorder (DCD), is the term used to refer to children who present with motor coordination difficulties, unexplained by a general-medical condition, intellectual disability or

neurological impairment. Difficulties with handwriting are often included in descriptions of DCD, including that provided in DSM-IV (APA, 2001). However, surprisingly few studies have examined handwriting in DCD in a systematic way. Those that are available, have been conducted outside of the UK, in alphabets other than the Latin based alphabet. Most work has focussed on very short tasks, usually copying, rather than longer 'free writing' tasks that are more common in the classroom. In order to gain a better understanding of the nature of 'slowness' so commonly reported in children with DCD, an assessment of the speed of the product was supplemented with a detailed examination of temporal elements of the handwriting process. Methods. Twenty eight 8-14 year-old children with a diagnosis of DCD participated in the study, with 28 typically developing (TD) age and gender matched controls. Reading, spelling and receptive vocabulary were assessed and children with dyslexia were excluded. The children completed two sentence copying, the alphabet task and a 10-minute 'free writing' task from the Detailed Assessment of Speed of Handwriting (DASH) on a writing tablet. Both the 'product' (words per minute) and the 'process' (speed of pen movements and time spent pausing) were analysed for the different tasks. Results. The children with DCD wrote fewer words per minute than the TD group on all tasks ($F[1,53]=19.75$, $p<.001$). There was no effect of group for execution speed ($F[1,53]=.009$, $p=.925$) but a significant group effect for the percentage of time spent pausing ($F[1,53]=10.40$, $p=.002$, $\eta^2=.164$), as children with DCD paused for longer during each of the tasks. A further examination of the pauses will be presented and implications for practice discussed. Poor verbal short-term memory in Down syndrome cannot be explained by poor phonemic discrimination

Poor verbal short-term memory in Down syndrome cannot be explained by poor phonemic discrimination

Harry Purser

Kingston University

Individuals with Down syndrome tend to have a marked impairment of verbal short-term memory (Mackenzie & Hulme, 1987; Marcell & Armstrong, 1982; Marcell & Weeks, 1988). Hulme and Roodenrys (1995) have argued that this impairment might be a consequence of language difficulties, because performance on phonological memory tasks is influenced by general language abilities. Successful performance on verbal short-term memory tasks is likely to depend on the ability to encode phonological representations (cf. Brady, 1997), since one cannot correctly output an item from memory that was not correct at the input to that memory system. Indeed, people with DS perform poorly on phonemic discrimination tasks (Brock & Jarrold, 2004). However, such tasks make demands on verbal short-term memory. Given that

individuals with DS show impaired verbal short-term memory, relatively poor performance on the task may simply reflect poor memory ability. The chief aim of this study was to investigate whether phonemic discrimination does, in fact, contribute to the verbal short-term memory deficit associated with DS. To answer this question, two tasks were used: a discrimination task, in which memory load was as low as possible, and a short-term recognition task that used the same stimulus items. Individuals with Down syndrome were found to perform significantly better than a nonverbal-matched typically developing group on the discrimination task, but they performed significantly more poorly than that group on the recognition task. The Down syndrome group was outperformed by an additional vocabulary-matched control group on the discrimination task but was outperformed to a markedly greater extent on the recognition task. Taken together, the results strongly indicate that phonemic discrimination ability is not central to the verbal short-term memory deficit associated with Down syndrome.

Higher self-efficacy in mothers who schedule-fed their infants at 6 weeks old, compared to those who demand-fed

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Research on mothers' infant feeding choices has primarily focussed on decisions around breast vs. bottle, with relatively little attention paid to decisions regarding demand-led or scheduled feeding. Iacovou & Sevilla (2012) found infants who had been schedule-fed had significantly lower IQs at age 8 than infants who had been demand-fed, yet mothers who schedule-fed reported higher levels of well-being, using the longitudinal Avon data set. We therefore explored three aspects of maternal personality identified as relevant in the breast- vs. bottle-feeding literature: self-efficacy, maternal sensitivity, and anxiety. Eighty-six mothers of children under 5 years old completed an online self-report questionnaire. Results showed that general self-efficacy and demand-feeding self-efficacy was significantly higher in mothers who schedule- rather than demand-fed, but there were no significant differences in sensitivity or anxiety. These results could explain the increased maternal well-being reported by Iacovou & Sevilla (2012) in schedule-feeding mothers.

Cooperative social context can increase perspective taking and cognitive flexibility in pre-schoolers

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Cognitive flexibility is the ability to switch back and forth among representations, task sets, and response strategies based on environmental

requirements. The current study investigates how a cooperative social context may yet influence preschoolers' cognitive flexibility, in particular, perspective taking. Five-year-olds ($N = 44$; M age = 65.6 months, $SD = 5.3$; 26 girls) were randomly assigned to either individual condition, during which the children performed the task by themselves, or passive-cooperation condition, during which the partner shared the essential goal of the task but did not suggest or model a solution. To measure perspective taking, we used four ambiguous figures (Doherty & Wimmer, 2005), each of which could be interpreted in two different manners. Additionally, in order to control for individual differences, we measured children's vocabulary, executive function, and theory of mind, as well as their mood and motivation before engaging the ambiguous figure test. Results showed that although they performed similarly on other measures, children in the passive-cooperation condition were more able to perceive different visual representations of the ambiguous figures. These suggest that working with a partner who shares the essential goal of the task can improve preschoolers' perspective taking and cognitive flexibility.

Guided role-play benefits the development of Theory of Mind in pre-schoolers

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Theory of mind refers to an individual's ability to ascribe mental states and to use these ascriptions in anticipating the behavior of oneself and others (Premack & Woodruff, 1978). False belief understanding is one of the milestones (Wimmer & Perner, 1983). Past research has indicated that adults' explanation on story characters' behaviors and mental states can improve children's understanding of ToM (Dunn et al., 1991). Role-play can facilitate the development of ToM as well (Schellenberg, 2004). Hence, we propose that guided role-play should improve the development of ToM in preschoolers. In particular, we developed a group-based Guided Role-play Intervention Program (GRIP). To examine this hypothesis, three studies were conducted. In each study, a between-subject (condition) and within-subject (test time) mixed design was used. Preschoolers who failed false belief tasks were randomly assigned to a condition. Each condition was conducted in the group setting, with 8 children per group, and two 50-minute training sessions over two weeks. In Study 1, 35 preschoolers (M age = 60.7 months, $SD = 7.0$) were randomly assigned to the guided role-play or free play control condition. In Study 2, 50 children (M age = 58.4 months, $SD = 5.7$) were randomly assigned to the guided role-play, guidance without role-play, or free play control condition. In Study 3, 65 children (M age = 60.4 months, $SD = 5.7$) were randomly assigned to the

guided role-play, free role-play, or free play control condition. Results of these studies have shown that compared to those in the other conditions, the children in the guided role-play condition improved their false belief understanding after the training significantly. These indicate that the GRIP, a comprehensive approach integrating both guidance and role-play in the intervention, can facilitate the development of ToM in preschoolers.

Infants' neural correlates of human action sounds: an event related potential study

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Most of the time object-related actions can be recognized based on both visual and auditory information and evidence exist of an audiovisual mirror system in adults (Pizzamiglio et al., 2005). Although many studies focus on exploring how infants perceive others' actions based on visual information, fewer investigated how infants process human action-related sounds. Since audition develops earlier than vision and infants can better rely on the former system to perceive and understand the surrounding environment during the first months, the aim of the present study is to investigate how infants perceive human actions through the auditory modality. More specifically we explored the neural correlates of processing frequently experienced stimuli pertaining human action sounds (e.g. footsteps), human vocalizations (e.g. coughing), environmental (e.g. rain) and mechanical sounds (e.g. car engine), by recording event-related potentials (ERPs) in 7-month-olds. A Geodesic EEG system (EGI, Corp., USA) with a 128-channel HydroCel Sensor Net has been used. Analyses focusing on the late slow wave component (500-800 ms), reflecting higher cognitive processing, revealed that human action sounds elicited an increased positivity in infants' ERPs compared to all other categories. This effect was lateralized to the left for temporal (44, 45 and 49) and frontal (26, 33 and 38) electrode sites. Moreover, hearing human vocalizations resulted in increased positivity over right frontal (118, 123 and 124) and central (104, 110 and 111) electrode sites, thus supporting current evidence on a potential role of the right temporal areas in voice processing (Grossman et al., 2010). The current findings demonstrate that early in development, the human brain differentially processes action-related sounds, and support recent evidence from adult studies showing a left-hemisphere dominance in the processing of this specific perceptual category (Giusti et al., 2010). The implications of the current findings for our understanding of action processing development are further discussed.

Investigating the ontogeny of the Mirror Neuron System: An EMG study with 6- and 9-month-old infants

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Despite the evidence supporting the existence of a mirror neuron system (MNS) in the adult brain, little is known about its origins and development in infancy. We explored the existence of mirror motor mechanisms in 6- and 9-month-olds by recording the electromyographic (EMG) activity of suprahyoid muscles (SM), which are responsible for mouth opening, contingent upon action observation, i.e. the observation of an adult agent reaching-to-grasp an object and bringing it either to mouth or to the head.. We found that SM activity was modulated by the goal of the observed action both in 6- and 9-month-olds. Specifically, in 6-month-olds SM activity increased during the observation of an object-to-mouth action, but it decreased during the observation of object-to-head action; such a modulation occurred only when the final goal was achieved. In 9-month-olds, SM activity increased in the object-to-mouth condition, but it was not modulated by the object-to-head condition. Crucially, for 9-month-olds SM activity was specifically modulated during the grasping phase, when the action goal is not yet achieved. This suggests that the ability to predict and anticipate the action's final goal is present at 9 months but not at 6 months, when infants' performance reflects an on-line simulation, and possibly an understanding of the observed action. Moreover, it seems that infants' motor skills, as assessed by ad hoc questionnaire and video recordings contributed to the difference in SM activation irrespective of participants' age. In particular, infants with more developed motor skills seem to have an earlier SM activation with respect to infants with less developed motor abilities, thus supporting the view that infants' motor skills influence the ability to encode and predict the final action goal. Overall, this evidence demonstrates an early involvement of the MNS in action understanding, but it also shows that mirror mechanisms gradually develop through experience.

Topic monitoring and comprehension during text reading in children

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High level comprehension skills include the ability to identify and extract information related to the topic of a passage as one core component. In recent years this topic has attracted attention in the context on the ongoing debate on comprehension monitoring. Our work examines strategies used by elementary school students attempting to master this task. Materials included five-sentence passages with either the first or last two sentences being

related to a topic (e.g. “volcanos” vs. “glaciers”) that was presented as a headline. Two factors were varied, the topical headline, as well as the position of the corresponding two sentences within the paragraph, resulting in a 2 (topic) x 2 (order) design. Elementary school students (5th and 7th grade, total n=120) were asked to read the passages and to subsequently answer comprehension questions, which were always related to the critical topic. We expected that, given the preferential processing of topic-related information, viewing times on the two sentences related to the headline should be increased, possibly with a larger effect for the initial two sentences. Looking at initial reading before presentation of the question, this prediction was confirmed only for slow readers (based on a median split of passage reading time), while faster readers showed no significant viewing time difference. However, these readers had a strong preference for the re-reading of relevant topic-related information during the second phase of text presentation after questions were presented. Further analyses are currently underway, based on a battery of individual difference measures. With regard to individual strategies it was apparent that specific differences between more and less successful students emerge primarily during re-reading. A major source of variability is the efficiency with which students find relevant information, pointing to spatial memory as a major determinant of success in comprehension monitoring.

Self-explanation to stimulate training in logical reasoning

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Logical reasoning is not a standard subject in the curriculum for primary schools in the Netherlands. Many children train it, however, in computer games at home but do not get any instruction. In an adaptive training environment for math training (MathsGarden.com) we added a nonverbal game that requires deductive reasoning, Flower Code (Gierasimczuk, Raijmakers & van der Maas, in press). As yet, children (N > 30.000) advance from low level to higher levels without getting any instruction. In an experimental study with a pretest, posttest, and delayed posted design (N = 98, Age 8 – 12 years) we tested the effect of self-explanation on children's training, contrasted with instruction and solving flower code items. Self-explanation is believed to stimulate children to make their knowledge more explicit and therefore easier to adapt (Siegler, 1995; Karmiloff-Smith, 1992). The study shows that there is an effect of self-explanation in the delayed post-test (compared to the control condition) on the reasoning ability only partly explained by more extensive play. In addition, working memory but not inhibition is related to reasoning ability. Hence, self-explanation has both a motivating and a training effect on logical reasoning in an adaptive environment. These results suggest ways to train

academic skills that are particularly difficult for primary school teachers to teach.

The influence of Age of Acquisition (AoA) on free recall of pictures in Turkish and English

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The advantage of processing early acquired items such as words and pictures in lexical tasks over late acquired items, i.e. the AoA effect, has long been documented (see Johnston & Barry, 2006 and Juhasz, 2006 for reviews). The role of AoA on free recall is however less understood, limited to English and the results are inconclusive. For example, whilst Morris (1981) reported that late acquired words were better recalled than early acquired words, Coltheart and Winograd (1986) and Gilhooly and Gilhooly (1979) found no effects of AoA on recall. Dewhurst, Hitch and Barry (1998) found reliable AoA and frequency effects in mixed lists only while late acquired, low frequency words were better recalled compared to early acquired, high frequency words. The aim of the present cross-linguistic study was to explore the role of AoA in a free recall task using 25 early acquired and 25 late acquired pictures from the Snodgrass and Vanderwart (1980) cohort in Turkish and in English. Furthermore, the stimuli were presented in either a pure list or a mixed list. In a mixed factorial 2 (language) x 2 (AoA) x 2 (list type) design participants were first shown a list of the items and following a distracter task were subsequently asked to recall as many of the items in the list as possible. The total number of correct scores were recorded. Data were subjected to a mixed ANOVA and the results show a main effect for AoA and for list type together with an interaction. The implications of these findings are discussed in view of picture and word processing in Turkish and English and the wider cross-linguistic context.

From specific examples to general knowledge during consolidation

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The ability to generalise knowledge from a limited set of exemplars is at the heart of our remarkable language abilities. We describe a set of studies investigating the role of consolidation on this generalisation process, using a new artificial morpheme learning paradigm. Participants learned new affixes (e.g. -nule) embedded in novel words (e.g. sleepnule is a participant in a study about sleep), then were tested immediately or after several days' delay to determine whether they could generalise their knowledge of the new affixes to untrained stem contexts (e.g. sailnule). Results of several studies suggest that participants can generalise their knowledge of the new affixes

immediately after training, but only when given a task that explicitly requires them to generalise, and that gives them sufficient time to do so. In contrast, when faced with a speeded lexical processing task that reflects access to abstract representations, participants show robust generalisation only in the delayed test condition. We consider these results within a complementary learning systems framework, which asserts that some forms of generalisation can be achieved on the basis of episodic representations of individual exemplars, but that a process of memory consolidation is required for the development of abstract representations that support generalisation in online lexical processing.

Anticipatory adjustments to being picked up in infancy

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Anticipation of the actions of others is often used as a measure of action understanding in infancy. Most existing research on the anticipation of others' actions sets up infants as observers of others' actions towards something or someone else. However, from the moment of birth infant experience of others' actions is primarily towards themselves. In the present talk we explore anticipatory postural adjustments made by infants to one of the most common adult actions directed to them – being picked up. In Study 1 we tested eighteen 3-month-olds, video-taping behavioural changes and recording postural shifts on a pressure mat. We compared infant responses in three phases: a prior Chat phase, after the onset of Approach of the mother's arms and after the onset of Contact. Infants showed systematic global postural changes during Approach and Contact, but not during Chat. There was an increase in specific adjustments of the arms and legs during Approach and a decrease in thrashing/general movements during Contact. In Study 2 we followed ten infants at 2, 3 and 4 months of age. Anticipatory behavioural adjustments during Approach were present at all ages, but with greater differentiation from a prior Chat phase only at 3 and 4 months. There was significantly greater gaze to the mother's hands during Approach at 4 months. The fact that infants show these appropriate adjustments at 2 and 3 months although they are not themselves able to engage in coordinated two handed reaches suggests that action production may not be a relevant explanatory factor here. Early anticipatory adjustments to being picked up suggest that infants' awareness of actions directed to the self may occur earlier than of those directed elsewhere, and thus enable the infant's active participation in joint actions from early in life. e development of eye-movement control and reading skill

The development of eye-movement control and reading skill

Erik Reichle

University of Southampton

A number of recent studies (see Blythe & Joseph, 2011) have documented both similarities and differences between the patterns of eye movements of beginning (i.e., children) and adult (i.e., skilled) readers. For example, whereas both groups tend to direct their eyes towards the centres of words (Joseph et al., 2009), children tend to make more fixations that are longer in duration and that are modulated to a greater degree by lexical variables (e.g., word frequency; Blythe et al., 2009). The goal of the research described in this talk was to use an existing computational model of eye-movement control, E-Z Reader (Reichle, 2011), to evaluate two possible theoretical accounts of the similarities and differences in children's versus adults' eye movements—one in which they reflect a “tuning” of the oculomotor system (e.g., more rapid saccadic programming), and one in which they reflect increasing linguistic proficiency (e.g., more rapid lexical access). The simulation results suggest that the developmental changes that have been reported as children become skilled adult readers reflect increasing linguistic proficiency, and in particular, increasingly rapid lexical processing. The implications of this conclusion with respect to aging (i.e., college-aged versus older readers) and individual differences in reading ability will be discussed.

Live social interaction influences infants' oscillatory brain activity

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We examined infants' oscillatory brain activity during a live interaction with an adult who showed them novel objects. Activation in the alpha frequency range, previously associated with access to an integrated knowledge system in the human brain, was assessed. Nine-month-old infants responded with desynchronization of alpha band activity when looking at an object together with an adult during a social interaction including eye contact. When infant and experimenter only looked at the object without engaging in eye contact, no such effect was observed. In line with previous accounts on human knowledge transmission, our results suggest that eye contact as an ostensive communicative signal prompts infants to access their nascent knowledge system in order to update or incorporate semantic information.

A longitudinal neuropsychological and clinical study of boys with ADHD: Improvements in Executive Functioning do not explain clinical improvement

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Background; ADHD often, but not always, persists into adulthood. Investigations of the associations between clinical and biological markers of persistence can shed light on causal pathways. It has been proposed that compensatory improvements in executive neuropsychological functioning are associated with clinical improvements. This is the first study to test this hypothesis prospectively. Methods; The clinical and neuropsychological functioning of 18 boys with ADHD and 18 typically developing boys (TYP) was tested on two occasions, 4 years apart (mean age 10 years at Time 1 and 14 years at Time 2), using a battery of standardised neuropsychological tasks that included both tasks with high and low executive demands. Results; Clinical improvements were observed over time. Neuropsychological improvements were also evident; the ADHD boys developed a similar pattern to TYP boys but with a developmental lag. Whilst there was an association between reduced symptoms and better performance at retest for one task with a high executive function demand (Spatial Working Memory), this was not evident for two further high executive demand tasks (Stockings of Cambridge testing planning, and ID/ED testing shifting) and there was no association between change in executive functioning and change in symptoms. Baseline performance on the ID/ED set shifting task predicted a better clinical outcome. Only change in performance on a short-term memory Delayed Matching to Sample task, with low executive function demand, predicted a better clinical outcome. Conclusions; These data highlight the importance of not over focusing on particular symptoms or cognitive aspects of functioning and highlight the complex relationships between cognitive functioning and ADHD symptoms.

Making social evaluations of faces in Williams syndrome

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Making accurate social evaluations of other people is critical to effective social communication, allowing us to adapt our behaviour during an interaction. For example, we must decide if someone is familiar to us, how they are feeling and whether or not to trust and approach them. These judgements guide our social interactions. The developmental disorder Williams syndrome (WS) is associated with hyper-social behaviour and

difficulties making social judgements, such as approachability. This social phenotype co-occurs with a level of mild-moderate intellectual difficulty. We present experimental evidence to assess the (a) typicality of trust evaluations by individuals with WS and the relationship between accurate trust evaluations and i) approach behaviours, ii) expression perception ability and iii) everyday social skills as reported by parents. The results indicated that participants with WS (n=16) had significantly more difficulty than typically developing individuals when making trust appraisals; differentiating between trustworthy and untrustworthy faces. The WS group rated all faces with higher approach than typically developing individuals, irrespective of the apparent trustworthiness of the face. They also had problems with recognising complex facial expressions and parents reported significant difficulty with several components of social behaviour. We propose that individuals with WS struggle to make a range of social evaluations from faces and that these problems are entwined with atypicalities of everyday social behaviour.

The role of working memory in children's mathematics achievement: Processing, storage and their co-ordination

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A growing body of evidence has demonstrated that working memory plays an important role in mathematical achievement. Standard complex working memory tasks involve the need to store information in the face of concurrent processing. Bayliss et al (2005) have shown that both storage and processing explain unique variance in mathematics performance and that the demands of combining both storage and processing is important for mathematics over and above their separate contributions. This study examined the contribution of these different components of working memory to two forms of mathematical assessment: a written arithmetic test and a set of mathematical word problems. 83 eight and nine year olds completed these two assessments alongside verbal and visuospatial complex span tests, short term span tests and speeded processing measures. Complex span performance accounted for unique variance in both types of mathematics assessments when controlling for processing and short term storage. There was no unique contribution of short-term storage alone. This suggests that it is the executive demand of coordinating both storage and processing that is important for mathematics. Speeded processing accounted for unique variance in mathematical word problems but not written arithmetic. This suggests that different forms of mathematical assessment rely on different aspects of working memory.

Semantics and word-level reading: Does the relationship change with age?

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Two cross-sectional studies address the proposal that semantic knowledge contributes to word recognition, especially the reading of words that contain irregular spelling-sound mappings (Ouellette & Beers, 2010; Tunmer & Chapman, 2012). So far, few studies have taken a developmental approach. Further, many studies have used performance on a standardised oral vocabulary measure as a proxy for semantics. The present study takes a novel developmental approach and uses two measures of semantic knowledge. In Study 1, a group of 350 children aged 6-13 years completed a standardised measure of oral vocabulary knowledge and read 30 nonwords, 30 regular words and 30 irregular words. In Study 2, an additional sample of 75 children aged 6-11 years read 20 regular and 20 irregular words and completed two semantic tasks; they provided oral descriptions of words, and the relationships between words. Regression analyses showed that performance on both semantic tasks predicted word recognition after controlling for age and decoding skill. The proportion of variance explained by semantic knowledge was relatively consistent across both word types (irregular vs. regular). Further analyses indicated that the relationship between vocabulary and word reading was moderated by age, with vocabulary explaining greater variance in word recognition in younger versus older children. These studies build on previous research by demonstrating a relationship between semantic knowledge and word recognition across a wide age range and that the nature of the relationship changes with age. The findings will be interpreted within the context of models of reading acquisition (Plaut, McClelland, Seidenberg, & Patterson, 1996; Share, 1995).

The neural basis of somatosensory remapping develops in infancy

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Goldsmiths, University of London

As adults, when our limbs change posture, our brains remap the relationships between somatosensory locations on the body surface and external space. Little research has investigated the developmental origins of postural remapping of somatosensory space, and behavioural findings contradict one another, either suggesting that this skill emerges by 10 months, or in middle childhood. Here we show that neural substrates of remapping of somatosensory space emerge in human infants within the first year of life. We recorded cortical somatosensory evoked potentials (SEPs) from 6, 8

and 10-month-old infants whilst presenting discrete vibrotactile stimuli to their hands across crossed- and uncrossed-hands postures. We observed SEPs over central regions contralateral to the stimulated hand, which, in 8- and 10-month-olds but not 6-month-olds, varied according to the posture in which the hands were placed. The effect was observed as early as 58 ms at 10 months but only much later at 300 ms in 8-month-olds. Interestingly, the somatosensory remapping effect in the 8-month-olds was observed in only those infants who demonstrated an ability to cross the body midline in a reaching task. In a further experiment, we investigated whether somatosensory remapping is affected by the sensory information available about the limbs, i.e. vision and proprioception or proprioception alone. We covered the arms of a group of 10-month-old infants while changing their hands posture. In covered-hands condition, there was no effect of posture on SEPs, suggesting that an ability to remap tactile space depends on visual cues to body posture. Overall, our findings demonstrate that developments in the functionality of somatosensory cortex, presumably in concert with parietal and premotor areas, underlie changes in the ability to represent the postural layout of the body during the first year of life.

How do four to seven year old children explain their withdrawn behaviour?

Katie Rix, Pam Maras, Claire Monks

University of Greenwich

This presentation will discuss findings from phase one of a longitudinal study which considers why children aged four to seven do or do not show withdrawn behaviour towards their peers in a school setting. Research has demonstrated many negative correlates of behaving in a withdrawn way (e.g. Rubin & Coplan, 2004) However, little research has considered why children behave in these ways, particularly through asking children themselves.

In this study, 141 children in their Reception Year (ages four to five) and 145 children in Year 1 (ages five to six) were shown videos of stick people demonstrating both passive and active withdrawal. They were asked to report on the frequency of their own withdrawn behaviours at school and then the reason for either behaving or not behaving in this way. Ratings of how frequently these withdrawn behaviours are shown by these children were also collected from Class Teachers, Teaching Assistants / Learning Support Assistants, and peers.

Initial findings from phase one have shown that there are significant differences in whether withdrawn children provide causal or consequential explanations; who is identified as the agent; and who is identified the target of each behaviour. In addition, results vary by both age group and gender. This presentation will discuss these findings and how further longitudinal analysis will be conducted.

In addition, it will give some consideration to whether the discrepancies between reports from children themselves and others are related to the reasons provided by young children.

MTFC: Can specialist foster programmes improve outcomes for looked after young children?

Rosemarie Roberts

South London & Maudsley NHS Foundation Trust

The Multidimensional Treatment Foster Care model was developed by Dr Patricia Chamberlain at the Oregon Social Learning Center over 30 years ago and has a strong evidence base of positive outcomes for young people with offending and conduct difficulties and younger children with complex behavioural, emotional and relationship difficulties.

The programme uses a team approach to support foster carers in providing a nurturing and structured environment. There are three programmes that stretch across the age ranges from 3 to 17 years that have been piloted in England as part of the DfE's agenda to improve outcomes for the most vulnerable children with complex needs. MTFC provides child and carer with intensive support from a multidisciplinary team and a clear programme and plan for intervention and skill building. Training and consultation is provided by the National Implementation Service who also collate and analyse data on presenting difficulties and outcomes.

Information on how the model works for the youngest children will be presented with some outcome data on follow on placements, including adoption, and improvements in intellectual functioning, behaviour and development.

The KEEP programme (Keeping foster and kinship carers trained and supported)

Rosemarie Roberts

South London & Maudsley NHS Foundation Trust

Foster carers have an increasingly difficult job to do in parenting children who have complex needs. Specialist treatment foster care programmes with research evidence of effectiveness such as Multidimensional Treatment Foster Care (MTFC) offer intensive support for foster carers but what about the majority of carers who are not in these schemes?

Following requests from their foster carers the US originators of the MTFC programme have developed a parenting programme for mainstream foster and kinship carers. The KEEP programme has been developed by Dr Patricia Chamberlain at the Oregon Social Learning Center and is designed to increase positive parenting skills, reduce carer stress and improve outcomes and placement stability for children looked after. The programme has been subjected to a large RCT with an ethnically diverse

population in San Diego which showed positive results.

KEEP has been rolled out in English local authorities since 2009 with a series of government grants and support from the Department for Education and from the National Implementation Service. This presentation will provide information about the programme and outcomes in England for carers and children including one year follow up data.

Do memory cues or communicative demands effect 3-year-olds' gesture production during recall?

Laura Robertson, Jane Herbert

University of Sheffield

Preschool children provide only limited information when asked to verbally recall an event. In adults and older children, gestures have been shown to provide information that complements speech and conveys unique additional information. It has previously been proposed that gestures may be part of communication, reflect cognition, or support the speaker's cognition. The aim of this research was, therefore, to determine whether 3-year-olds' use gestures during recall, and whether these gestures provide additional information which supplements their verbal and behavioural recall. Children (N=42) individually watched a video of a unique event and were immediately asked to verbally and behaviorally recall what they had seen. Given that young children's verbal recall and gesture production rates are low, in three conditions we compared whether encouraging and modeling gestures (Encourage) and having the experimenter leave the room during the video and then providing a photo cue to support recall after the initial free recall session (Absent+Photo), would increase gesture production and recall above spontaneous gesture rates (Natural). No differences were found between the conditions during the initial verbal recall session, indicating that social and communicative demands were not the main function of gesture production for this task. However, using the photo cue significantly increased gesture production and verbal recall. Unique information about spatial locations were conveyed only in gesture in this condition indicating that a visual cue is an effective method of increasing recall in 3-year-olds, and that gestures can be used as an additional measure for determining recall. Although interpersonal communication demands did have some effect on gesturing in this task, 3-year-old's gesture production appears to be primarily a reflection of overall memory for the event.

Mental toughness in educational settings and correlations with inhibition

Jamey Robinson

University of Hull

Mental Toughness is a rapidly growing concept of interest within psychology. A previously popular topic within sports and organisational domains, it is now expanding into educational establishments. Mental toughness has been described as an individual's ability to cope effectively with stressors, pressures and challenges. This factor is particularly pertinent within education as a child's ability to cope with challenges may be detrimental to academic scores, cognitive development and their peer relationships. In Study One, children aged 11-13 years completed the Mental Toughness Questionnaire (MTQ48) and the Social Inclusion Survey (SIS); scores on the MTQ (particularly confidence) were positively correlated with SIS scores. In Study Two, undergraduate students completed the MTQ48 alongside inhibition (stroop and flanker) tests; results found that positive significant relationships exist between scores on the MTQ (particularly commitment) and inhibition. In Study Three, adolescents completed the MTQ48 and SIS alongside four cognitive tests; stroop, flanker, reverse corsi block and reverse digit span tests. Additionally scores of attainment were recorded. Correlations between mental toughness, academic success, cognitive functioning and peer relationships were explored. Together these findings suggest the importance of mental toughness for children's relationships, attainment and cognitive development. The implications of the results in relations to these three domains will be discussed and future directions for research will be described.

The re-invention of primary and secondary memory: How does it contribute to our understanding of immediate free recall?

Hannah Roome, John Towse

Lancaster University

Traditional views of working memory propose a dynamic system based on short-term stores cooperating with an attentional system. But what characterises the storage component of this system? The conceptual framework of primary memory (PM) and secondary memory (SM) has been revived as a useful explanation of adult working memory capacity. We evaluated the dual memory framework and its contribution to working memory development among children aged 6-10 years. In the first experiment we varied presentation rate, list length and presentation modality of immediate free recall sequences alongside other short-term and working memory tasks. Analysis of serial position curves demonstrated age-related increases in total recall, pronounced recency yet little primacy. These results imply PM dominates

children's recall. Presentation rate and list length affected SM, contrasting with typical patterns of adult data. The recency effect differed with presentation modality, suggesting different PM capacity limitations for different types of input. To determine whether children might have more access to SM than is evidenced by a standard immediate free recall task, a separate study focused on a split-modality presentation with recall probes. Recall probes for early list sections showed improvements in the recall of pre-recency items across all age groups. This indicates that with an appropriate task focus children were able to recall items from SM. However, the pattern of recall was once again dependent on presentation modality. Overall, data provided evidence of both qualitative and quantitative differences between children and adults' use of PM and SM. Data also addressed the need to incorporate modality-specific phenomena within the dual memory framework.

The relation between Executive Function and Emotion Regulation in pre-schoolers

Claire Roper, Pamela Qualter

The University of Central Lancashire

Executive Function encompasses cognitive skills such as updating, switching and inhibition (Wiebe et al., 2011). The development of EF is linked with maturation of specific brain areas within the prefrontal cortex (Moriguchi & Hiraki, 2011). There is logically a relation between a child's inhibitory ability and their ability to regulate emotions. The pre-school years are characterised by development in both of these areas (Carlson & Wang, 2007) and similar brain regions (Bush, Luu, & Posner, 2000).

Existing research has measured this link with "on-line" inhibitory laboratory tasks (Carlson & Wang, 2007). Research examining children's behaviour within a natural setting demonstrates that they employ different skills within social interactions depending on the interlocutor (for example Dunn & Herrera, 1997). It is logical to assume that this influence of the social relationship will extend to young children's inhibitory skills. The child's lack of a meaningful relationship with the experimenter could result in less motivation to inhibit negative emotional responses. When interacting with a significant other the child will have more to lose by not successfully inhibiting negative emotional responses.

Very little of the literature has considered children's inhibition of positive emotion. This is a reasonable oversight, as it is sensible to assume that negative emotions are more likely to cause problems within social relationships. It is possible that an inability to inhibit positive emotions could be detrimental to the child.

The present study represents a preliminary investigation of the relation between EF and regulation of both positive and negative emotions in a natural setting. EF is measured using a 3 factor

model, incorporating measures of Inhibition, Updating and Switching capabilities. Emotion regulation was measured through observations of the children. These observations covered behaviour in a nursery setting and the child's home.

Cross-cultural differences in the early development of self-awareness

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15- to 18-month-old infants from three nationalities (Zambia, Turkey, Scotland) were observed interacting with their mothers and during two self-recognition tasks. Zambian interactions were characterized by proximal contact, Scottish interactions by distal contact, and Turkish interactions by a mixture of contact strategies. These culturally distinct experiences could be viewed as scaffolding collectivist (proximal) versus individualistic (distal) perspectives of self. In support of this claim, there was a significant interaction between nationality and performance on the self-awareness tasks. Scottish infants performed best in a task requiring recognition of self as a distinct individual (mirror self-recognition), whereas Zambian infants performed best in a task requiring recognition of self as an interdependent object (Moore's (2007) body-as-obstacle task). Turkish infants' performance patterned between the other nationalities. Individual social contact factors could also be related to self-awareness. Specifically, mother's use of infants as an extension of their own bodies (a proximal strategy) was negatively related to mirror self-recognition. Remarkably, this is among the first data to empirically substantiate the idea that social factors play a role in the early construction of self.

How to learn the meaning of verbs: Evidence from typically-developing children and children with autism

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There are two explanations for how children learn the meaning of verbs. The first proposes that children use knowledge of syntactic structure to narrow down the meaning of a verb (e.g. on hearing the transitive sentence the frog glorped the teddy children infer that the novel verb glorp refers to the action of the frog). The second suggests that children use socio-pragmatic skills such as intention reading to infer the meaning of novel verbs (e.g. interpreting eye-gaze to infer that the speaker's intention is to name the action of the frog).

We tested both explanations with 26 typically-developing three-year olds and 19 children with autism (6-11 years). We assessed children's ability to learn that a novel verb referred to the causal

action of an agent (the character causing the action) rather than the motion of the patient (the character being acted upon). During training, the children were taught three novel verbs via a) syntactic bootstrapping, in which the verb was embedded in a transitive sentence, b) an embodied intention-reading condition in which the child and experimenter took turns to perform action in response to 'syntax-free' instructions (e.g. it's your turn. Glorp!) and c) a control condition in which children saw videos and heard 'syntax-free' speech (e.g. look, glorping). At test, the children viewed videos of two new characters performing the actions and were asked to identify "who's glorping" by pointing to either the agent or the patient of the action.

The typically developing children were sensitive to both socio-pragmatic and syntactic cues; they were significantly more likely to point at the agent in both experimental conditions than in the control condition. However, the children with ASD only succeeded at mapping the novel word to the agent's action in the syntactic bootstrapping condition. We suggest that children with ASD may not be as sensitive to socio-pragmatic cues and, thus, rely on a more restricted range of cues when learning verbs.

How to pass the false-belief task before your 4th birthday

Paula Rubio-Fernández

University College London & Princeton University

The experimental record of the last three decades shows that children under 4 fail all manner of false-belief tasks, while more recent studies reveal that infants are able to pass indirect versions of the task. We argue that these paradoxical results are an artifact of the type of false-belief tasks that have been used to test infants and children: whereas indirect false-belief tests allow infants to stay with a protagonist's perspective during a series of events, direct tests tend to disrupt the perspective-tracking process in various ways, making it too hard for younger children to exhibit their capacity for perspective tracking.

We report the results of three studies that confirm our hypothesis. The first study reveals that 3-year olds can pass a suitably streamlined version of the verbal false-belief task (Rubio-Fernández & Geurts, 2013; *Psychological Science*). A follow-up study with 3-year olds replicates the original findings and further investigates the role of the false-belief question in young children's difficulty with direct false-belief tests (Rubio-Fernández, under review a). Finally, the results of an eye-tracking study with adults reveal that indirect and direct false-belief tests make different demands even on fully mature participants (Rubio-Fernández, under review b).

We conclude that, in order to pass the standard false-belief task, young children must be allowed to

track the protagonist's perspective with minimal disruption to this fundamental ability.

Eyewitness identification in a multiple-lineup procedure

Andrew Russ, Markus Bindemann

University of Kent

In criminal investigations, eyewitnesses frequently mistake innocent suspects for the perpetrator of an observed crime, and there is good evidence that this causes the wrongful convictions of many people. Despite this, many eyewitnesses are of course capable of making perfectly accurate identifications. The problem of eyewitness identification in police investigations therefore arises in differentiating accurate from inaccurate eyewitnesses. In this study, we explored a new identification method for diagnosing eyewitness accuracy, which is derived from cognitive theories of face processing. This method is based on a multiple-lineup procedure, in which the accuracy of an eyewitness in identifying a target person is tested repeatedly with different face images. For this purpose, observers were first shown a short video clip of a target person, which was followed by three successive identity lineups. In any of these lineups, observers could identify the target around 60% of the time. However, only 18% of observers managed to identify the target repeatedly, in all three identity lineups. These results suggest that a single identification might provide misleading information about the accuracy of an eyewitness, but it also demonstrates that eyewitness accuracy can be assessed better by testing the same witness repeatedly. We report four more experiments that further explore this method.

Investigation of infant development and mother-infant interactions in infants with visual impairment

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Introduction: Infants with congenital visual impairment (VI) show developmental delays compared to sighted infants (Reynell and Zinkin 1975). The degree of VI (e.g., light perception at best (PVI) vs. some 'form' vision (SVI)) has been shown to affect developmental outcome (Dale and Sonksen 2002). In this talk we discuss baseline cross-sectional findings from an ongoing longitudinal project that is examining the effects of severe and profound VI in a group of infants. We consider how vision level, maternal and infant characteristics are associated with current developmental outcome.

Methods: The sample consists of 38 9- to 17-month-olds with congenital disorders of the peripheral visual system. Developmental outcome was measured with Reynell-Zinkin subscales (including Sensorimotor Understanding - SMU) designed for

assessing cognitive and communicative development in infants with VI. Mother-infant interactions consisted of video observations of 5 minutes' play using standard toys. Maternal behaviours were coded for maintaining and redirecting the infant's attention and introducing a new focus. Infant behaviours were scored for accepting and rejecting maternal bids.

Results and Discussion: The results suggest that infants with PVI have more difficulty representing the external world and understanding the relationships between actions and objects (as measured by SMU), compared with infants with SVI ($p < .001$). Mother-Infant interactions were also influenced by the degree of visual impairment. Mothers spent less time maintaining attention ($p < .01$) and introduced more objects in the PVI dyads ($p < .01$). Infants in PVI dyads were more rejecting of maternal bids, compared with infants in SVI dyads ($p < .001$).

Multiple-regression analyses showed that i) vision level alone accounted for 20% of the variance of SMU, and ii) age, maternal and infant factors accounted for 55% of the variance. Having some 'form' vision at infancy is potentially a protective factor for greater advances in non-verbal cognition (SMU) and for more successful mother-infant interaction patterns.

Promoting scientific understanding of the day/night cycle: the role of conceptual change instruction

Sherin Salem, Alan Martin

University of Buckingham

The purpose of this study was to examine whether a conceptual change based approach to instruction could promote a scientific understanding of the day/night cycle among children between 8-10 years of age. Sixty children participated in the study. The children were interviewed prior to the instruction in order to identify their pre-instructional understanding of the day/night cycle. The children were then each allocated to one of three instructional conditions: a conceptual change based instruction condition ($N = 20$), a standard instruction condition ($N = 20$) or a control condition ($N = 20$). Children allocated to the conceptual change based instruction condition received instruction which presented them with scientifically correct information regarding the day/night cycle whilst accounting for the misconceptions found in their pre-instructional understanding. The standard instruction condition did not account for such misconceptions in the children's pre-instructional understanding; children were only presented with scientifically correct information regarding the day/night cycle. Children allocated to the control condition did not receive any instruction. The results indicated that the conceptual change instruction led to significant gains in understanding as compared to the standard

instruction and control condition. Implications of the findings and suggestions for future research will be discussed.

Sublexical phonological representations in advanced reader children: Evidence from priming paradigm

Karinne Sauval, Laëtitia Perre, Séverine Casalis
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The aim of the study was to examine the contribution and the nature of phonological representation involved during silent reading in French fifth graders. In the first experiment, we used a cross-modal priming paradigm in which targets were printed words following spoken non-words. Four experimental conditions were created by manipulating the onset phonological overlap between prime and target. There were four categories of primes: identity, matched on target's onset phonology (e.g., /bRə/-BREBIS), close variation (differed from targets by a single phonemic feature (e.g., /pRə/-BREBIS), distant variation (differed from targets by more than a single phonemic feature (e.g., /fRə/-BREBIS) and unrelated. Results revealed phonological priming in the identity condition only. This finding supported (1) the hypothesis of automatic activation of phonological representation in fifth grade readers and (2) that phonology accessed in visual word recognition was speech-based. In the second experiment, the same manipulation was applied to unimodal auditory priming and reveals that, just like to written word recognition, spoken word recognition involved phonemic processing. Together these results suggest that visual word recognition automatically activates spoken language representation in fifth grade readers. Moreover, at this level of learning to read, visual and spoken word recognition involved the same phonological representations namely phonemic units.

The Simple View of Reading as a Framework for National Literacy Initiatives: A Hierarchical Model

Robert Savage
McGill University

Background: The Simple View of Reading (SVR) describes Reading Comprehension as the product of distinct child-level variance in Decoding (D) and Linguistic Comprehension (LC) abilities. The model has become a framework for National Literacy Policy in England guiding classroom teaching (Rose, 2006). As a model of classroom-level literacy teaching, unique classroom-level influences of the components of the SVR model have been assumed but not demonstrated.

Method: Hierarchical Linear Modeling (HLM) of classroom-level variance in the components of the SVR is thus explored here.

Sample: The sample is based on a longitudinal randomized experiment of 701 children in 50 grade 1 (year 1) classrooms across Canada.

Results: Multilevel results suggested: a) independent unique classroom-level effects for both D and LC; b) a product model (D x LC), but not an additive model (D + LC), best fitted the nested classroom-level data concurrently at the end of Grade 1, however, the additive model best predicted RC longitudinally from the beginning of Grade 1 to the end of Grade 1, explaining 68% of the classroom-level variance in RC at the end of Grade 1.

Conclusion: The SVR model accurately describes both pupil-level and distinct classroom-level variance in D and LC on RC in year 1. The SVR is thus a useful framework for understanding RC in classrooms in year 1 where growth in both D and LC are strongly implicated in early reading success.

Mechanisms of risk and resilience through disorders of known genetic origin

Gaia Scerif
University of Oxford

Neurodevelopmental disorders diagnosed early in life with an identified genetic aetiology, and associated with high risk for a recognised phenotype, can provide important clues to understanding the neurodevelopmental origins of other disorders that are currently defined at the behavioural level (e.g., autistic spectrum disorders, ASD) or later in childhood (e.g., attention deficit / hyperactivity disorder, ADHD). Fragile X syndrome (FXS) represents a model disorder in this respect because it is associated with the silencing of a single X-linked gene affecting well-identified molecular and systems pathways. The average age of diagnosis is 2 ½ years, but cases can be identified as early as in infancy. Children with FXS are at an increased risk of ADHD and ASD symptoms, but, in this seemingly homogeneous genetic disorder, outcomes along dimensions that are relevant to ADHD and ASD are striking. I will argue that understanding mechanisms for individual differences requires mapping developmental changes longitudinally, even in this aetiologically homogeneous group. Findings from a large prospective longitudinal study of young boys with FXS demonstrate: a) similarities and differences in conclusions drawn from cross-sectional and longitudinal studies of the same population; b) differential cognitive predictors of ADHD and ASD symptomatology in this population; c) complex genetic, environmental influences and interactions on outcomes. I shall conclude on broader implications from neurobiologically constrained models such as FXS for the study of risk and resilience in complex functionally defined developmental disorders.

(How) does attentional control matter? The development of interactions with memory and learning

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Attentional control plays a crucial role in biasing incoming information in favour of what is relevant to further processing, and is in turn influenced by representations held in memory and those obtained through learning. The interactions between attention, memory and learning can be elucidated from studying cognitive systems with poorer attention, poorer memory and a great deal of learning to implement on a daily basis.

Here I aim to present data from two distinct but complementary lines of work targeting attention, memory and learning dynamics. Colleagues and I have investigated whether developmental differences in attentional control could mediate differences in the efficiency of encoding and maintenance in visual short-term and working memory in children, and we have tested ensuing novel predictions for the adult cognitive neuroscience of these processes (e.g., Shimi et al., in press, *Child Dev*). We have also evaluated experimental predictions and computational constraints derived from an understanding of how attention might facilitate learning in developing systems. In turn, we have applied these predictions to understanding the deployment of attentional templates in adults (e.g., Wu et al., 2013, *J Cog Neuro*).

In summary, then, data and hypotheses from developing systems cast light on the unfolding relationships between attention, memory and learning, and have implications for our understanding of adult attentive observers.

Immediate auditory repetition of words and nonwords: An ERP study of lexical and sublexical processing

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ERPs were elicited to (1) words, (2) pseudowords derived from these words, and (3) nonwords with no lexical neighbors, in a task involving hearing immediately repeated stimuli. There was a significant early (P200) effect of phonotactic probability in the first auditory presentation, which discriminated words and pseudowords from nonwords; and a significant somewhat later (N400) effect of lexicality, which discriminated words from pseudowords and nonwords. The expected effect of repetition was present in the ERPs to the second auditory presentation, however, there was no reliable effect of lexicality. We conclude that early sublexical phonological processing differed according to phonotactic probability of the stimuli,

and that lexically-based redintegration did not occur for pseudowords. Thus, in online word recognition and immediate retrieval, phonological and/or sublexical processing play a more important role than lexical level redintegration.

Interindividual differences in shallow processing of connectives – An eye-tracking study

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It is well-established that readers process written materials in a rather shallow manner in many real-life situations. However, little is known which verbal resources affect individuals' propensity for shallow processing. In the present study, 54 adult readers read short stories including a target sentence comprising a main and a sub-clause. We manipulated the coherence relation embedded in the target sentence (causal vs. concessive) and the type of connective ("because" vs. "but") in a 2 × 2 factorial design. As a consequence, half of the continuations was contextually plausible while the other was not ("John buys a new car although he has only very little money." vs. "John buys a new car because he has only very little money.").

Eye-movement measures showed that participants generally detected the inconsistencies early and engaged in extensive repair processing during later reading. However, there were large interindividual differences in the way participants reacted to the implausible sentences: Some showed strong inconsistency effects while others engaged in shallow processing and were insensitive to semantic violations. Participants also worked on a battery of verbal and cognitive tasks in this study (non-verbal IQ, working memory, reading fluency, ability to detect syntactic and semantic violations). These measures were used to predict their inconsistency effects in linear mixed effects models.

Results showed that verbal ability had large main effects on all eye-movement measures, but was unrelated to the early detection of semantic violations. By contrast, verbal ability influenced later repair processes: High-skill readers needed less time to re-read inconsistent materials. We argue that basic thematic assignment processes are automatic and not impaired in low-skill readers. By contrast, low-skill readers are less efficient in integrating semantic knowledge into the discourse representation which fosters shallow processing.

18-month-olds comprehend indirect communicative acts

Cornelia Schulze, Michael Tomasello

Max Planck Institute for Evolutionary Anthropology

Most human communication works by the communicator referring the recipient's attention to something, and then the recipient uses this referential act – and perhaps other information – to

infer what the communicator is intending to communicate. The referential act can be conceptually closer or farther from the communicator's social motive.

Previous studies have used referential acts very close to the communicator's social motive. Thus, Behne et al. (2005) pointed to one of two cups for 18-month-old infants. The infants understood that this referential act was intended to inform them of the location of a sought-for toy.

In the current study we wanted to know if infants this young would also be able to infer an adult's social motive if it was related to the referential act more indirectly and thus required a more complex relevance inference. Children were shown a chest containing toys that were needed for a game and a key that opened the chest. When the child needed another toy to complete the game, the adult either showed her the key (Ostensive Condition) or inadvertently moved the key in the direction of the child so that she noticed it (Accidental Condition).

Children of both 18 and 26 months of age identified the ostensive showing of the key as an indirect request to go open the chest and retrieve the toy, whereas they did not try to do so in the Accidental Condition (18-month-olds: $\chi^2 = 6.300$, $p = 0.033$; 26-month-olds: $\chi^2 = 6.667$, $p = 0.022$ (Fisher's exact, 2-sided)).

Young children thus are able to infer a communicator's social motives from rather indirect referential acts. The results of the study are discussed with regard to young children's inferential abilities and their cognitive requirements in gestural and linguistic communication.

Familiar face and voice processing as influencing cross-modal identity matching in children and adults

Mallika Sen, Josie Briscoe

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Information received and integrated from faces and voices is crucial in forming representations of people, as both are rich sources of identity information. Previous research has established that children, like adults, are proficient at recognising familiar people from their faces and voices and are capable of matching for identity across different modalities. Contemporary research has largely focused on processes that underpin face and voice recognition in isolation, and/ or the internal auditory and visual features that comprise cues to identity. Therefore, the present study investigated i) the combinatorial aspects of identity knowledge by probing the ability to learn cross-modal representations of identity information in relation to basic recognition of unimodal cues (i.e. familiar faces and voices) and ii) the influence of developmental time on the factors influencing cross-modal identity knowledge. Children (aged 6 to 10 years) and adults participated in three tasks

that probed familiar person recognition via a) familiar faces, b) familiar voices and c) familiar face-voice matching. Children and adults both demonstrated significant associations between unimodal familiar face and voice recognition abilities and cross-modal familiar face-voice matching ability, consistent with the activation patterns described by contemporary models of person recognition. A relative proficiency with the unimodal processing of faces and voices influenced the formation of cross-modal constructs of person identity, although this varied between children and adults: Adults largely relied more on processing of familiar voices, whereas children largely relied upon familiar face processing when matching faces and voices for identity. Findings will be discussed in terms of implications of developmental research for contemporary models of person recognition.

Cultural background affects the development of face and eye gaze

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The current study investigated the role of cultural norms on the development of face-scanning in adults (Experiment 1) and young children between the age of 1 and 6 (Experiment 2). British and Japanese participants' eye movements were recorded while they observed faces moving their eyes toward or away from the participants. In Experiment 1, British adults fixated more on the mouth, which contrasts with Japanese adults fixating mainly on the eyes. Moreover, eye fixations of British participants were less affected by the gaze shift of the avatar than Japanese participants, who shifted their fixation to the corresponding direction of the avatar's gaze. These cross-cultural differences were more prominent in male than in female participants. In Experiment 2, British children fixated more on the mouth whereas Japanese children fixated more on the eyes, replicating the results with adult participants. As in Experiment 1, these cross-cultural differences were more prominent in male participants. Unlike Experiment 1, no cultural differences were observed in the differential responses to direct and averted gaze. Cultural modulation of eye and mouth gaze, which were found both in adults and in children, were consistent with the different pattern of facial expression between Eastern Asian and Western European cultures, that the former uses subtle eye movements to express the intensity of emotion and the latter uses both eye and mouth movements to express categorical emotion. Differential response to direct and averted gaze, which was only observed in adults, are consistent with the Western cultural norms that value the maintenance of eye contact, and the Eastern cultural norms that require flexible use of eye contact and gaze aversion. The current

results suggest that the different cultural contexts, such as the display rules of facial expression and the norms on the use of eye contact, would affect the development of face gaze at the different point of development.

Development of a Food Dudes Healthy Eating Programme for preschool children

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The Food Dudes Early Years Programme has been designed to increase consumption of fruit and vegetables in 2- to 5-year-old children. We tested its effectiveness in a controlled study: 3 Nurseries in the West Midlands were randomly allocated to the Programme group and 3 matched Nurseries to a waiting control group (N=300+ children).

In the first phase of the programme lasting 32 days, children were presented with four different fruit and vegetable pairs, a different pair from day to day, and encouraged through peer modelling, song, stickers and occasional small prizes to taste and consume these healthy foods. The role modelling of healthy eating was achieved very effectively by showing the children a movie of the Food Dudes Junior characters specially designed for this programme. These are four attractive and dynamic young children who have great fun and are very active because they get special energy from eating fruit and vegetables.

In the second phase of the programme nursery teachers organised weekly “rainbow picnics” where new fruit and vegetable pairings were presented and eaten. Children were keen to collect colourful tokens to earn prizes for the whole class. Each child took home attractive eating utensils picturing Food Dudes Junior characters to cue healthy eating during family meals. Parents received DudeKit packs with tips and materials to enable them to continue running the programme at home.

The results showed that children’s consumption of fruit and veg was matched at the outset for the intervention and control schools, but the intervention cohort ate significantly more fruit and veg at the 3 month follow-up ($p < .0001$ for both food categories) with medium and large effect sizes respectively (Cohen’s $d = 0.65-1.29$). Overall, children in intervention school increased their consumption of fruit by 55% and that of veg by 129% by the end of the study.

Behavioural and electrophysiological correlates of cognitive control in children with tics with and without comorbid ADHD symptoms

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Tourette syndrome (TS) is a neurodevelopmental disorder characterised by chronic motor and phonic

tics, i.e. involuntary and repetitive movements and sounds. Tics tend to abate in adulthood yet they are associated with psychosocial dysfunction in childhood. Most children with TS learn to suppress their tics for limited periods in certain situations, e.g. in the classroom. Recent research has shown that children with TS have enhanced control of motor behaviour in experimental tasks (cognitive control). This likely reflects strengthened cognitive control neurocircuitry due to repeated activation during tic suppression, and may be indicative of the likelihood that tics will remit later in development.

Many children with TS have co-occurring (comorbid) symptoms of ADHD. ADHD is a neurodevelopmental disorder characterised by developmentally inappropriate and impairing levels of hyperactivity, inattention and impulsivity. ADHD is robustly associated with impaired cognitive control. This suggests that cognitive control will be impaired in children with TS and comorbid ADHD (TS+ADHD), which might negatively affect the ability of these children to engage in tic control and the long-term outcome of their tic symptoms.

To investigate this issue, this study examined behavioural and electrophysiological correlates of cognitive control in children with TS, ADHD, comorbid TS+ADHD and control children. Consistent with our predictions we found that behavioural measures of cognitive control (post-error slowing, RT variability) were significantly poorer in children with TS+ADHD compared with children with TS, indicating that comorbid ADHD symptoms impair cognitive control in children with TS. Thus, children with TS+ADHD are likely to have poorer control over tics than children without ADHD. These findings have important implications for treatment in comorbid TS+ADHD, e.g. these children might benefit from training in tic control. Analysis of electrophysiological activity associated with cognitive control is underway and is predicted to be weaker in children with TS+ADHD compared with children with TS.

False memories can increase over time – comparing the ‘better’ and ‘lesser’ DRM lists

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False memories (FM) for non-presented words can be created using the Deese-Roediger-McDermott (DRM) paradigm by presenting lists of associated words. FM is more persistent than correct memory but rarely demonstrates an actual increase over time except with specific non-standard stimuli. One possibility is that standard DRM lists display ceiling FM effects. We present 2 experiments comparing performance over time of DRM lists which elicit higher (better lists) and lower (lesser lists) levels of FM. The ‘lesser’ lists demonstrated an increase in FM over time, whilst the ‘better’ lists demonstrated a constant level of FM across time and the implications for theories of FM are discussed.

Recognising and representing depicted objects at 9 months

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Parents consider symbolic media (e.g., books, educational television) important to children's intellectual development, but very young children show limited ability to transfer learning from such media to reality. Toddlers' generalisation from pictures to real objects is particularly susceptible to pictorial iconicity. For example, 18-month-olds extend a newly-learned label from photos to target objects only when they are the same colour (Ganea et al., 2009). Almost nothing is known about such transfer in the first year of life. We bridge this gap by testing whether 9-month-olds could create a representation of an object from a picture and use it to guide action towards the real object in a preferential reaching task. We familiarized 9-month-olds with a life-size photo of an object for 80 sec. Half the infants saw a colour photo and half saw a black-and-white photo. We then showed infants the familiarised real object paired with a novel real object, and observed their preferential reaching. In one condition we kept both objects visible to test infants' recognition memory for the familiar object. In the other condition, we hid both objects to test infants' representation of their continued existence. Infants discriminated equally well between the familiar and novel object in both conditions, but with opposite preferences. They preferred the novel object in the visible condition and the familiar object in the hidden condition. Photo colour had no effect. We draw three conclusions. First, infants as young as 9 months can learn indirectly about a real object from its picture. Second, photographs depict objects realistically enough that colour does not necessarily facilitate infants' detection of the relation between them. Third, infants' object knowledge affected the direction of their preference: Stronger representations of familiar objects support novelty preferences when objects are visible, but greater sensitivity to their continued existence when they are hidden.

Using novel robotic interventions to treat children with movement problems

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Movement problems severely impede a child's development; cerebral palsy is the most common reason for severe childhood disability, whilst developmental coordination disorder affects a relatively large proportion (5%-6%) of the childhood population. Motor problems can be separate from cognitive difficulties but cognitive problems are over-represented in those with motor deficits, as predicted by theories of embodied cognition.

Therefore it follows that improving motor function in children who have problems with skilled control of their hands and arms has the potential to improve greatly their health and educational outcomes also.

It is known that intensive training yields improvements in upper limb control. Nevertheless, current methods of undertaking upper limb exercise are limited principally in the amount of appropriate exercise that can be undertaken. Exercises assisted by a therapist are inevitably labour intensive and therefore resource-limited. For these reasons, there is growing interest in technologies that offer the possibility of providing programmes of simpler exercises for children to pursue independently thereby releasing physical and occupational therapy time to focus on other complex treatments. In order to address this issue we have developed and evaluated a powered joystick system linked to a computer exercise workspace suitable for children with CP. The system provides controlled guidance to the child's arm to enable him or her to undertake the exercises. We also developed a method for the training of manual actions in children with developmental coordination disorder. Our solution is achieved by applying haptic virtual reality technology.

We report the results from our studies establishing the feasibility of such computer-assisted arm exercise systems for children and describe the effect of their use on the quality of arm movement and function. Our results show that children with cerebral palsy and children with developmental coordination disorder are able to improve motor skill when these training methods are employed.

Atypical processing of face and eye gaze stimuli correlates with ASD symptoms in children with ADHD

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Introduction & objectives: Many children with ADHD show co-occurring symptoms of autism spectrum disorder (ASD). However the basis of overlap between these two conditions is poorly understood (Rommelse et al., 2011 *Neuroscience & Biobehavioral Reviews* 35). In the Social Cognition in Children and Adolescents with ADHD/ASD (SOCCA) study, we set out to identify the neural mechanisms of social impairment in ADHD and to measure the effect of co-occurring ASD symptoms on these parameters.

Methods: Children aged 9 to 15 years with a diagnosis of either ADHD or ASD were recruited from local clinics. Symptoms of ADHD and ASD were assessed using the Conners ADHD Rating Scale and Social Communication Questionnaire (SCQ). All children completed a visual spatial cueing paradigm in which a left or right lateralised target was

preceded by a non-predictive directional cue. The cue was either an arrow or eye gaze. EEG data were recorded simultaneously. We predicted that the degree of differentiation between arrow and gaze stimuli, reflected in reaction time (RT) and in the amplitude, latency and topography of specific event-related potentials (ERPs), would be related to the severity of ASD symptoms in children with ADHD.

Results: Preliminary analysis in a sample of 20 children identified significant amplitude enhancement of the P2 ERP and greater right hemisphere lateralisation of the Early Directing Attention Negativity (EDAN) ERP, to eyes than arrows. Both parameters correlated negatively with SCQ scores, regardless of diagnostic group status. RT was significantly faster for validly than invalidly cued trials but did not differ between cue types and was not related to psychopathology on either the SCQ or Conners.

Discussion: These results suggest that children with ADHD demonstrate atypical processing of face and eye gaze stimuli and this is related to the degree of co-occurring ASD symptomatology. Further recruitment and data analysis are on-going.

Born Into the Military: Deployment status affects wife and child perceptions of family functioning

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A serving soldier's family may be the most valuable resource in terms of the well-being of the soldier: positive family functioning boosts a service member's morale, retention and work abilities (Shinsek, 2003). We looked at the effect of the deployment cycle on children's and spouse's perceptions of family functioning. Eighty-one British military families were recruited: husbands were either currently deployed, post-deployed, or non-deployed soldiers in the British Army. Thirty-four non-military families were also recruited. Spouses completed questionnaires assessing marital satisfaction and family functioning. Additionally children's drawings of their family were assessed for parent-child alliances (PCA), high levels of which are seen in disordered families (Leon et al, 2007). Results indicated that deployment stage significantly affected marital satisfaction, family communication and overall family satisfaction. Marital satisfaction was lowest in the currently-deployed group, contradicting research showing marital resilience during deployment (e.g. Karney & Crown, 2007). Combined scales of family cohesion and flexibility indicated family functioning to be healthiest in non-deployed families. Family functioning in non-military families differed from all deployment groups. The level of PCA in children's drawings was highest in those with currently deployed fathers, however there was no significant difference in PCA scores of children of currently deployed and non-deployed fathers. This study

therefore demonstrates the debilitating effect extensive deployments can have on the well-being of military families, which has been suggested to affect the service member himself both during operational deployment and post deployment when service members re-acclimate to life outside a combat zone.

Relationship between oxytocin and maternal affect attunement during mother-infant interactions

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Recent studies support the hypothesis that oxytocin plays an important role in mother-infant interactions. The aim of the present research was to investigate the connection between maternal affect attunement and levels of oxytocin in mothers and infants during early mother-infant communication, and to explore the relationship between maternal and infants' oxytocin levels. Forty three mother-infant dyads participated in the present study when infants were four months. They were observed in three conditions: 1) Baseline – where no communication took place, 2) Natural Interaction between mother and infant, and 3) Modified Interactions - where natural interaction between mothers and infants was disrupted in various ways. During this procedure four saliva samples from mothers and their infants were collected to determine levels of oxytocin at different time points. Maternal affect attunement (maintaining attention, warm sensitivity) was coded during the Natural Interaction to assess maternal interactive style. Results indicated that maternal and infants' oxytocin levels were stable at the four collection points. Maternal oxytocin levels at all collection points as well as overall mean oxytocin level were negatively related to her warm sensitivity. Significant positive synchronized as well as cross-lagged correlations were found between maternal and infant oxytocin levels. These results suggest that maternal salivary oxytocin may reflect individual differences in the degree of her warm sensitivity, and demonstrate further evidence that maternal and infants' oxytocin functioning is interconnected. Findings of the present study thus show the importance of examining the neurobiological correlates of mother-infant interaction.

Theory of mind, executive function, social competence and signs of ADHD in young Pakistani children

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Attention deficit/hyperactivity disorder (ADHD) has been characterized by impairments of executive function and social incompetence (Barkley et al., 2001; Hoza, et al., 2005, Shimon et al., 2012; Willcut et al., 2005). In recent years there has been

some evidence to link ADHD with theory of mind (ToM) deficits (Uekermann, et al., 2010); however, the findings have been inconsistent (Charman, et al., 2001; Dyck, et al., 2001). The aim of the current experiment was to investigate the relationship between EF, ToM, and social competence in young Pakistani children demonstrating symptoms of ADHD. Typically developing children (5-8 years of age; N=150) from 6 schools in Rawalpindi, Pakistan were given batteries of theory of mind and executive function tasks. Measures of social competence and attention deficit/hyperactivity were based on teacher's ratings. Sociometric status (an index of popularity in class) was also obtained as a subcomponent of social competence. The analysis revealed that ToM ability was only related to EF ($r = .39$, $p < .01$) and did not appear to have any significant relation to social competence or symptoms of attention deficit and hyperactivity. The children who exhibited better executive functioning skills were more popular ($r = .27$, $p < .01$) among their class mates after controlling for age. Whereas children experiencing difficulties with attention and hyperactivity were rated lower on social competence ($r = -.48$, $p < .01$) by their teachers. The findings will be discussed in relation to cultural aspects of ToM development in Pakistani children demonstrating signs of ADHD and its association with their social competence.

Do 12-month-infants learn and generalize conversation turn taking rules?

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The ability of infants to understand social interactions has been the object of recent and varied interest (e.g., Schmitow & Kochukhova, 2013). We tested 32 12-month-old infants (15 males, 17 females, mean age 376.6 days, $SD = 9.74$) with a simple social interaction task. Infants were familiarised to a video sequence where a speaker draws attention to a toy in front of her (asking, e.g., "Is my blue toy nice?"). Another person standing next to the speaker, with her own toy in front of her, turned towards the speaker's toy and said "yes". After habituation, two test trials varied the speaker (familiar or novel). Looking time and pupil diameter were recorded with a Tobii X120 eye tracker. Based on typical looking time measures, infants did not discriminate the test events per se, suggesting that familiarity of speaker do not significantly affect interest. However, temporal changes in pupil diameter over the course of test events do show sensitivity to the dynamics of the social interaction. Indeed, infants anticipate the response of the person spoken to, but only when addressed by the familiar speaker. This anticipation is not observed with the novel speaker. Infants thus learn the dynamics of a specific social sequence, but do not appear to generalize to other, highly similar situations. Our results also show better sensitivity of

pupil dilation measures compared to looking time. The relevance of these findings, and the role of learning in similar studies, is discussed in relation to the study of emergent social cognition in infants.

The impact of morphing on own- and other-race facial composites

Faye Skelton, Charlie Frowd

University of Central Lancashire

Facial composite images are visual likenesses of suspects constructed by victims of, and witnesses to, crimes. They are circulated via newspapers or television in the hope that they will be recognised and named, bringing a perpetrator to justice. In many situations there will be more than one victim/witness, and the Police have no way of knowing who has produced the best composite of the offender. Modern technology has enabled 'morphing', a technique that averages multiple composites of the same identity together to produce a single image for naming. There is now good indication that morphs are likely to be useful to criminal investigations, being named at least as well as the best individual composite, and much better than poorer quality composites (e.g. Bruce et al., 2002; Frowd et al., 2006; Valentine et al., 2010). One situation where this may be particularly beneficial is where the witness and offender are of different races, as memory for faces other-race faces is known to be poor and so other-race composites may be particularly poorly constructed (McQuiston-Surrett & Topp, 2008).

Previous research, however, has established the benefit of morphing for composites constructed after a short retention interval. Instead, the current study investigated the potential benefit with a forensically-relevant 2-day delay. Four EvoFIT composites were created for each of four black and four white footballer targets. The eight morphed and 32 original composites were named by other people, and likeness ratings were used to gauge similarity to the target photographs. Results will reveal whether there is an other-race effect in composite construction, and additionally whether the impact of morphing differs for own and other-race composites. Findings have not only practical significance for criminal investigations, but also theoretical significance in terms of the mechanisms by which morphing may reduce the appearance of error as compared to individual composite images.

Can parenting programmes improve children's development and attainment?

Katy Smart

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Government commissioned reports by Desforges (2003) and Field (2010) suggests parental input impacts on children's lifelong learning, behaviour and developmental outcomes. These reviews contributed to recent government initiatives aimed at promoting children's attainment through

parental interaction with their children and their children's school, with emphasis on local authorities' engagement with parenting programmes. However, there is little evidence on the medium or long-term impact on children's development and attainment of these interventions. This research explores the impact of parenting programmes on children's development and attainment by following families through one of three parenting programmes [Triple-P, Incredible Years and PEEP] and beyond. The research questions investigate any parental behaviour changes taking place post intervention and any subsequent developmental and/or educational impact this has on their children. Parents attending one of these programmes are invited to fill in questionnaires before, immediately after and one year after programme completion to capture their perception on the differences in their parenting skills and the impact this has on their child's development and education. A subsample of semi-structured interviews with parents and their child's educational setting will provide richer supporting data. Additional interviews with trainers gain their views on any changes in parenting skills and impact on the children. Initial results from pre- and post-programme questionnaires, and trainer interviews, suggest parents are adopting parenting skills learnt on the course and already observing a difference in both their own behaviours as well as their child's. It is too early to draw any conclusions as to whether this has any impact on the child's development and attainment; this will be established through the longitudinal perspective to my research, revisiting the parents one year later. This study will hopefully contribute to the emerging body of evidence on the importance of the role of the parent on children's development and attainment.

Consolidation of new vocabulary in Down syndrome

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Recent research has shown that despite their short-term memory weaknesses, individuals with Down syndrome can learn new oral vocabulary as well as typically developing controls when tested immediately after learning (Mengoni, Nash & Hulme, 2013; Mosse & Jarrold, 2011). However, individuals with Down syndrome show slow rates of vocabulary growth and language is considered a weakness in their behavioural profile. The current study aims to investigate this disconnect between immediate learning in training studies and real vocabulary growth, exploring the hypothesis that difficulties could be underpinned by weaknesses in consolidation of new vocabulary information over time. Thirteen participants with Down syndrome (aged 9-18 years) and fifteen typically developing children matched for existing vocabulary knowledge (aged 5-6 years) were explicitly trained to learn the

names of six novel items, presented with pictures. Participants were trained until they could name three out of the six pictures, or until they had completed a maximum of six training cycles. Knowledge of the new words was tested shortly after training using picture naming, picture recognition and phonological recognition tasks. These tests were repeated 24-hours and 1-week after learning. Both groups demonstrated consolidation over time on the two recognition tasks, with significant improvements on picture recognition after 24-hours and on phonological recognition after 1-week. Neither group showed significant improvement or significant forgetting over time on the expressive task. The only group difference lay in the overall level of performance of the individuals with Down syndrome on the phonological recognition task, which was weaker than the controls, although the pattern of improvement over time was similar. These results suggest that, when explicitly taught vocabulary items, individuals with Down syndrome do not show impaired consolidation of the new vocabulary over time raising further questions about vocabulary development in Down syndrome.

Children's induction from religion categories in Northern Ireland.

Kirsty Smyth¹, Conor Pendergrast¹, Aidan Feeney¹, John Coley², R. Cole Eidson², Ulrike Niens¹

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Inductive inferences are predictions individuals make about the world by extending old information to new situations (Murphy, 2002). Knowing grizzly bears eat people, individuals are likely to predict other bears eat people too. Individuals can make inferences about people using social categories, and often the most meaningful social categories in a society have the greatest inductive potential (Birnbaum et al, 2010).

Aims: To examine Northern Irish children's use of religion categories, and possible age and school trends, when reasoning socially about others.

An inductive inference task was used to examine generalisations children make about whether two characters share a novel property, based on which social categories they share, i.e. religion, gender, or a control category. Three studies were carried out. The first was a pilot study, the second a replication, and the third examined the role that visual cues may have played in the prior studies.

Across three studies children aged 6 to 11 made more inferences when two characters shared religion, than when they shared other categories. The oldest children made reliably more inferences using gender than younger children did. Study 3 also found that the youngest children were equally likely to base inferences on religion as the control category, but older children used gender reliably more. Furthermore, Study 3 found school effects

with children in integrated education being equally likely to make inferences for any category. However, children in segregated education treated religion as the most important category.

The high importance of religion could indicate that individuals in Northern Ireland treat religion as an essentialised social category (Gelman, 2003), i.e. as a naturally existing category rather than a social construction. Study 3 showed that children were not making inferences on the basis of matching perceptual features (i.e. Sloutsky & Fisher, 2004).

Testosterone, temperament and the sex difference in young children's physical aggression

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Research with animals and humans reveals a clear sex difference, favouring males, in physical aggression. Some sex differences in brain structure and function are thought to be influenced by levels of testosterone (T) present during prenatal development. The overall aims of this project were to 1) study the influence of prenatal T on children's physical aggression, and 2) explore the mechanisms underpinning any associations identified, focusing in particular on temperamental characteristics that have been related to children's physical aggression. Study measures were completed by 72 typically-developing children (39 girls, 33 boys), aged between five and eight years, for whom measures of amniotic T had been obtained. Measures of physical aggression and five temperament facets (activity level, anger, fear, high intensity pleasure, and inhibitory control) were obtained from primary carers and teachers. Group differences were assessed using independent-means t tests; within-sex relationships between amniotic T and the physical aggression and temperament measures were explored using Pearson correlations; and the relationships between child sex, physical aggression, and three of the temperament facets (activity level, high intensity pleasure, and inhibitory control) were studied using mediation analysis. As expected, boys showed higher levels of physical aggression than girls, $d = 0.71$. However, levels of amniotic T did not relate to children's physical aggression ($r = -.28$ for girls, $.17$ for boys) or temperament (r values ranged from $-.27$ to $.23$). Activity level and inhibitory control individually mediated the sex difference in physical aggression. Although the study findings do not support an influence of prenatal T on the sex difference in children's physical aggression, it is possible that this is due to the study's relatively small sample size. The findings do suggest, however, that this important sex difference may be mediated by temperamental characteristics that differ by sex.

Why do participants initiate the immediate free recall of short lists of words with the first item?

Jessica Spurgeon, Geoff Ward

University of Essex

Recent research has shown that when participants are presented with a short list of words for immediate free recall (IFR, e.g. "singer metal blanket"), they show a strong tendency to initiate their recall with the first list item and then they proceed in forward serial order (i.e., they often say "singer metal blanket"). The current experiments examined the role, if any, that a short-term buffer might play in underpinning this tendency. In Experiment 1, we examined the IFR, delayed free recall (DFR) and continuous-distractor free recall (CDFR) of lists of between 2 and 12 words. The to-be-remembered words were simultaneously spoken and presented visually, and the distractor tasks involved silently solving a series of self-paced, visually-presented mathematical equations (e.g., "3+2+1=?"). There was a tendency to initiate recall at the start of short lists in all three recall conditions. However, in Experiment 1, there was greater recency than expected, including recency in DFR. Experiment 2 was similar to Experiment 1, but participants verbally responded to a distractor every two seconds and the to-be-remembered items were presented only visually. We again found that participants initiated their recall of short lists with the first list item in all three conditions, but we now found that recency occurred only at longer lists in IFR; it was essentially eliminated in both DFR and CDFR. These results suggest that a short-term buffer cannot be fully responsible for the tendency to initiate recall from the beginning of a short list, and that differences in the magnitude of the recency effect in the current experiments may be due to differences in modality.

The cognitive underpinnings of mental toughness

Helen St Clair-Thompson, Myfanwy Bugler

University of Hull

Mental toughness describes how people deal with challenges, stressors and pressure irrespective of prevailing circumstances. The concept originated in sports psychology but has now been applied in many domains including education. Recent research has also started to explore the cognitive underpinnings of mental toughness. This symposium is comprised of a series of studies examining the correlates of mental toughness, mainly within educational settings, studies exploring perceptions of mental toughness and its development, and studies examining its cognitive and biological underpinnings. The results are discussed in terms of implications for practice and the development of mental toughness.

A novel free web-based tool for teaching cognitive psychological experiments

Gijsbert Stoet

University of Glasgow

PsyToolkit is a software package for programming and running experiments typical in Cognitive Psychology. This presentation reviews the features of the package, with a focus on the web-based tools that have recently been developed to facilitate the sharing of experiments and the use of PsyToolkit in education. One of the main aims of the software is to facilitate the teaching of experiments with working examples and the option to change experiments. The software's core feature is a Domain Specific Language and a cross-compiler which produces either Linux executables or Java byte code, which can run on all major desktop computers. Users can register for and freely use an interactive website to write and compile PsyToolkit scripts, store experiments, and publish experiments in a library. The main advantage of the freely accessible web-based system is that it makes PsyToolkit available on all major operating systems. Further, a library with well-known psychological experiments written in PsyToolkit is available and aims to educate about common experimental paradigms in cognitive psychology. Currently, the tool is being used around the world, and students respond very positively to it. A number of free booklets for teachers/lecturers will be available.

Maturation of event-related potentials: Sex differences and associations with psychopathology

Alexander Sumich

Nottingham Trent University

Progressive and regressive maturational changes in brain function occur throughout childhood and adolescence that are reflected in alterations in the event-related potential. During childhood, a decline in N200 and an increase in P300 amplitudes parallel improvement in behavioural performance. A series of studies will be presented that investigate sex-related maturation of ERPs during typical development and in relation to psychopathology.

In study 1, ERPs (N200, P300) during an auditory oddball task are assessed in typically developing children and adolescents as a function of age and sex. Study 2 and 3 investigate N200 amplitude in relation to psychopathology in two clinical populations: Callousness and impulsivity in adolescence with conduct disorder; and excitement (impulsivity, mania) in adults with schizophrenia.

During adolescence, both progressive and regressive development of P300 (elicited during auditory oddball performance) occurs that is dependent on sex. Inverse associations between N200 and age are seen in typically developing adolescents and those with ADHD, but this

association is disrupted in boys with conduct disorder, in whom right temporal N200 amplitude is positively associated with callous/unemotional traits. In men with schizophrenia, N200 amplitude is positively correlated with excitement. However, women significantly differ in this association, showing an inverse relationship between excitement and N200 amplitude.

Results implicate fronto-temporal networks in conduct disorder and schizophrenia, which may be underpinned by atypical development, and, at least in the case of schizophrenia, show sex differences.

Children with dyslexia: The influence of poor spelling on handwriting execution and pause behaviour

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It is often assumed that individuals with dyslexia are slower at handwriting and that the quality of their writing is much poorer than their peers. However, evidence of slow handwriting in children with dyslexia is mixed and it remains unclear whether poor spelling and/or motor skills affect performance. This study assessed speed of writing a text from a sample of 31 children with dyslexia (9;6 years), and compared performance to two typically-developing groups: the first was matched by age, and the second by raw spelling ability. Participants completed a narrative writing task on the surface of a digital writing tablet, which was analysed using Eye and Pen software. Results revealed that the written compositions produced by children with dyslexia were poorer in quality than their age-matched controls. Children with dyslexia wrote fewer words per minute than their peers and made a high percentage of spelling errors. No differences were found between children with dyslexia and their same-age peers for speed of handwriting execution, measured by the tablet. However, children with dyslexia paused frequently while writing, with a high proportion of pauses noted as being within-words; a pattern similar to the spelling-ability matched group. Thus, our findings reflect that handwriting execution is not impaired in children with dyslexia. The slow writing that is typical of children with dyslexia is due to pausing more often when composing and was found to relate to spelling ability. Findings are explored in relation to current theoretical models of writing development (Berninger & Swanson, 1994). Future research should aim to examine the writing process as well as the product to clearly identify constraints on writing development.

Domain-general cognitive constraints on grammar acquisition

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One of the major debates in cognitive science is to what extent human processing is domain-specific as

opposed to domain-general and because of its apparently modular nature grammar has been used extensively in this debate. The most prevalent view at the moment seems to be that in childhood, as grammar is acquired, grammatical processing gradually becomes specialised to the networks most suited to it; thus modularity emerges with development (e.g. neuroconstructivist theory, Karmiloff-Smith, 1994). The current study investigated whether in the last stages of grammar acquisition it is influenced by other cognitive processes or whether it is solely determined by the functioning of the emerging grammar module.

128 children from four primary schools were tested twice a year for three consecutive school years, starting from Year 1 (Mean age = 5 years 10 months).

The administered tests included established measures of non-verbal intelligence, seriation, short-term and working memory and grammar acquisition. All tests with the exception of intelligence test were administered individually in a quiet room at the schools.

Non-verbal intelligence and ability to seriate (Inhelder & Piaget, 1964) in Year 2 were significant predictors of grammar development in Year 3 ($\beta = 0.24$, $t(128) = 3.14$, $p = .002$ and $\beta = 0.20$, $t(128) = 2.78$, $p = .006$ respectively), independently of grammar performance in Year 1 and age differences.

Measures of verbal short-term memory in Year 1 significantly predicted grammar development in Year 3, on top of grammar development in Year 1, non-verbal intelligence and age differences.

Verbal short-term and working memory in Year 1 accounted for significant amount of variance (5-9%) in grammar performance in Year 3 in addition to short-term and working memory scores obtained concurrently with grammar.

Domain-general cognitive functions contribute to the late stages of grammar acquisition.

Improving reading speed through online training of fast word recognition: An effectiveness and feasibility study in two languages

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Some readers struggle with acquiring automatic (fast and effortless) recognition of printed words. This, in turn, may compromise their reading comprehension and make them uninterested in pursue reading-related activities. The problem is hard to remedy. Reading practice (especially guided repeated oral reading that included guidance from teachers, peers, or parents) typically leads to improvement, but it may be hard to arrange in a resource-squeezed school. Guided repeated reading practice in the form of computer games offers an opportunity to supplement more traditional forms of instruction and remediation.

To address this, we developed Graphogame-Fluent – a set of online computer games designed to improve reading fluency. It comprises of several games, exercising reading speed on the level of syllables, words, and sentences. The games implement an adaptive learning algorithm that adjusts the response time given to the player's accuracy, so that fast yet accurate responses are encouraged.

We report a series of small experimental studies on the use of Graphogame-Fluent, involving slow readers in Ireland and Poland. We addressed the following questions:

1) Effectiveness: Does playing Graphogame-Fluent make significant impact on reading fluency?

- Does the magnitude of that impact depend on the parameters of the games (the size of the orthographic units that were trained, and the frequency of those units)

2) User satisfaction and overall feasibility of Graphogame-Fluent as a pedagogical tool:

- What was the uptake of the games?

- What was the typical duration and intensity of play?

- What were the factors that predicted 'stickability' – children's willingness to persist at practice?

- What did children, parents and teachers think of the games?

We will present conclusions concerning a) the cognitive psychology of fluent and dys-fluent reading b) the technology of reading fluency games c) the pedagogy of game-assisted fluency training.

How does the consolidated pack impact on the initial learning of crime and safety on children?

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Crucial Crew is an educational intervention programme offered to all Year 6 pupils in South Yorkshire by the South Yorkshire Police and South Yorkshire Fire and Rescue. It provides scenario-based learning about crime and safety for the children. In order for the programme to be effective, information needs to be remembered in the long term by the children. This study aims to explore whether a consolidated resource learning pack delivered in the classroom after a Crucial Crew visit improves children's memory of the information learned in the sessions. The consolidated pack is based on 2 of the Crucial Crew scenarios and reinforces key learning outcomes of them. Delivery of the pack is teacher-led and takes place through group discussions, independent learning and role-playing.

The study used a 4 x 2 factorial design: 4 groups of participants (N=109) received the pack followed by 2 self-designed questionnaires about 1 week, 2 weeks, 3 weeks and 5 months respectively after the visit; and 3 groups of participants (N=74) received

no pack and the same 2 questionnaires were given about 1 week, 2 weeks and 5 months respectively after the visit. The 2 self-designed questionnaires (22 questions) were based on the same 2 scenarios as the pack and used to assess all children's initial learning of Crucial Crew. Some children also received informal discussion about Crucial Crew with their teachers.

Results showed that children who received the consolidated pack, regardless of the teacher's discussion, scored higher on the questionnaires i.e. they remembered better about the scenarios than children who received no pack ($p=0.006$). This study shows that consolidation in learning as a form of post-intervention has an efficacy only if it is delivered soon after Crucial Crew visit, but not in the long term.

Learning principle of recursion with a natural language

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Previous research has investigated learning of embedding using artificial grammars but very few used meaningful language. Most has focused on generalisation to new surface strings rather than generalisation of the principle of recursion itself. Few has investigated whether learning is implicit or explicit. We investigate the learning of the principle of recursion by looking at the learning of principles of Chinese relative clause construction by 32 English native speakers without prior knowledge of Chinese. The training task included 8 types of sentence with one level of embedded relative clauses (no embedding within embedding) made up of English words in Chinese word order plus the Cantonese relative marker, 'ge' (e.g. sowed seed ge farmer harvested grains). All sentences were transparent in meaning and world knowledge alone would allow the meaning to be deduced. Participants read the sentences under self-paced word-by-word presentation, attempted to understand them, and rated the usefulness of 'ge'. The surprise test task was grammaticality judgement (with confidence ratings) on new sentences that had greater levels of embedding (embedding within embedding). Awareness, scored on a scale from 1 to 7, was measured by verbal report and by think-aloud during an additional post-experiment grammatical judgement test. Subjects' working memory was measured by a reverse digit span test. The overall mean accuracy was 48%. However, there was a correlation between subjects' awareness and their accuracy, $r(30) = 0.65$, $p < .001$. The difference in confidence of accurate and inaccurate responses was marginally correlated with accuracy, $r(30) = 0.337$, $p < 0.1$. Working memory was negatively correlated with accuracy, $r(30) = -0.44$, $p < 0.02$. The results suggest a crucial role of awareness and a possible role of first language interference for the below-chance accuracy of the unaware subjects.

The negative effect of working memory requires further investigation.

The role of species essentialism in young children's reasoning about inheritance

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It has been claimed that young children rely on species essentialism to understand why offspring resemble parents (e.g. The baby will moo because it has cow nature passed down from mother cow). Alternatively, early understanding of parent-offspring resemblance relies on a simple heuristics postulating that the baby must be like its parent.

Studies showing that children fail to differentiate between (presumably species-orthogonal) mental features, from (presumably species-specific) physiological features are claimed to challenge the essentialist view because essentialism only supports inheritance of species-specific features. However mental-physiological distinction assumes, rather than manipulates species-feature relationship.

The present study implicitly manipulates species-specificity of features, thus providing direct test of the role of species essentialism in children's reasoning about inheritance.

5-6-year-olds were presented adoption scenarios in which a baby born on one farm was transferred to live on a different farm. A diorama with realistic figurines of eight animals supported the story. Birth-farm animals were attributed one feature value (e.g. yellow bones) while adoptive-farm animals had a different feature value (white bones). I manipulated feature-species correlation by varying the distribution of animals on farms. In orthogonal condition, birth farm (cows and horses), adoptive farm (cows and horses), the feature covaried with the farm but not species. In correlated condition, birth-farm (cows), adoptive-farm (horses), the feature covaried both with the farm and species. I also manipulated whether children were informed about individual identity of the birth and adoptive parent. Children projected two mental and two physiological features. The results showed significant effects of feature-species correlation and type of feature. Children made more birth-parent attributions in correlated than orthogonal condition and for physiological than mental properties. The results provide the first direct evidence that young children are sensitive to species-specificity of features, thus supporting the essentialist view of understanding parent-offspring resemblance.

Executive influences on school-age children's ability to generate taxonomic-thematic relations

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Organising and manipulating conceptual knowledge are core developmental skills. Early views state that a preference for deriving

taxonomic, not just thematic associates, undergoes protracted development, largely around eight years (shift hypothesis). Contemporary studies have probed category knowledge in preschoolers via preferences for taxonomic/ thematic relations (Blaye et al., 2006) stating that executive control facilitates 'categorical flexibility' as the ability to switch between multiple relations within concept knowledge. The present study investigated the involvement of executive demands in school-age children's performance on a modified picture match-to-sample task that probed their knowledge of thematic and taxonomic relations on a trial-by-trial basis using both accuracy and latency measures, rather than preferential responding in a single trial. Executive demands were manipulated through the inclusion of distractor items in the periphery of the display that were either congruent or incongruent with the matching criterion for the probe-target pairs. Children aged six to eight years (N = 41) accurately and flexibly identified targets drawing on both taxonomic and thematic relations. Detailed analysis revealed that latencies to taxonomic targets were slower than responses to thematic targets, only when these judgements necessitated access to category knowledge. This finding was contrary to the shift hypothesis that implies an age-related shift in the use of categorisation in older children > 8 years. Furthermore, the presence of congruent distractors was found to impede response latencies equally for judgements of taxonomic and thematic relations, suggesting that school-age children attend to, and inhibit, the broader conceptual context when making picture judgements. This finding extends evidence for executive involvement in the development of conceptual knowledge in two ways, first through emerging sensitivity to contextual demands when generating associative relations, and second, through evidence of children's ability to manipulate semantic relations when accessing conceptual knowledge i.e. semantic control.

Learning to read irregular and regular words: Combining artificial orthography learning methods with fMRI

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In cognitive models of reading, item-specific knowledge is necessary for irregular word reading (SEW, YACHT). In the Dual Route Cascaded model (Coltheart et al., 2001), item-specific knowledge is lexical (whole-word visual forms), but in the triangle model (Plaut et al., 1996) it is semantic. Neuroimaging contrasts can be confounded by difficulty, familiarity, and word meaning and, as such, have not discriminated between these accounts. This fMRI experiment used an artificial language to avoid these confounds and delineate the neural systems supporting irregular and regular

word learning. Twenty-two adults learned to read 24 new words written in novel symbols, whilst in an MRI scanner. Some words were regular - all symbols had one pronunciation, some words were irregular - vowel symbols had two pronunciations. Regular symbols occurred in 8 (high-frequency) or 4 items (low-frequency). Learning involved interleaved training (see word-hear pronunciation) and testing (read words aloud) blocks, and was followed by generalization to untrained words. Participants learned to read the trained words (regular high/low frequency-83%, irregular-73% correct) and generalized their knowledge to untrained words (70% correct). Activity in left mid-fusiform and parietal cortex was greater during irregular than regular word learning. However, this was also true for low relative to high frequency regular words. In contrast, activity in left inferior frontal gyrus was greater for irregular words than either type of regular word.

When confounds of difficulty, familiarity, and meaning are removed, irregular words do not engage brain regions representing visual form more than regular words, contradicting the DRC model. Learning infrequent or irregular spelling-sound mappings engages left parietal cortex, whereas left inferior frontal cortex specifically resolves phonological conflict from competing pronunciations available for irregular words. These latter two findings are in line with both the DRC and triangle model and previous neuroimaging research (Taylor, Rastle, & Davis, in press).

Comparing arousal and performance on two variants of the CPT-AX task in children: An ERP study

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Sustained attention and arousal are interdependent processes. Poor regulation of arousal levels has been implicated as a causal mechanism in the study of attentional disorders. This study compared behavioural performance and event-related potential (ERP) correlates of sustained attention on tasks designed to elicit different levels of arousal. Two variants of a Cued-Continuous Performance Task were produced that were identical except that one was designed to be more interesting and therefore elicit higher levels of arousal; It included a task storyline (vs. no storyline), cartoon character stimuli (vs. grey and black shapes), and accuracy feedback on 'go' trials (vs. no feedback). EEG data was recorded from ten 7-11 year olds while they completed both tasks. It was predicted that children would demonstrate increased levels of sustained attention on the high interest (HI) variant. Specifically, that on the HI variant children would have faster reaction times and lower error rates. Regarding ERP components, a greater amplitude for N1, and smaller for P2 was expected on the HI variant following the presentation of task-relevant

stimuli. As hypothesised, children responded significantly faster in the HI variant. There were no between-task differences in error rates because children performed at ceiling. For the N1 component, there was a greater amplitude in the HI variant when children viewed task-relevant stimuli (cues and cued targets), but this difference was not present when they viewed task-irrelevant stimuli (uncued targets). The P2 component showed a significantly smaller amplitude in the HI variant for task-relevant cue stimuli and no between-task differences for targets (cued or uncued). As predicted, these ERP results suggest greater attention to task-relevant stimuli in the HI variant. In summary, children were better able to sustain their attention during the HI variant of the task, as was reflected in behavioural performance and differences in N1 and P2 components.

A visit to a Natural History Museum

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People's folk theories or everyday beliefs inhibit their understanding of Darwinian evolution (Legare, Evans, Rosengren, & Harris, 2012). For example, people who endorse evolution often hold teleological (i.e., beliefs that entities evolve for a purpose), essentialist (i.e., that there is an immutable essence to each organism), and intentional (i.e., entities evolve because of desires or wants) beliefs (Spiegel et al., 2010; Kelemen, 1999). Others may hold creationist views.

Visits to museums, however, may facilitate understanding and acceptance of Darwinian evolution (Spiegel et al., 2009). The present study examined 75 secondary school students' views reasoning about evolution before and after a visit to the Natural History where they learned about the '1860 great evolution debate'. This group was compared to a control group of 23 students who did not attend the visit, but participated in the pre and post-test.

Students ranged in age from 13 to 17 (M age = 14.93, SD = 1.06). Based on Spiegel et al. (2006), students were asked to reason about a set of changes to different organisms, such as algae, finches, and humans. For example, after years of drought, finches on an island are discovered with long beaks capable of opening tough seeds.

Interviews were transcribed and coded. Coding included informed naturalistic reasoning, novice naturalistic reasoning (essentialism, teleological, and intentional reasoning), creationism, and other. Informed naturalistic reasoning was coded when participants referenced Darwinian evolution (e.g., "through the natural selection, like the finches had the longer beaks that could get more food, bred more.")

The findings suggested that students were more likely to engage in informed naturalistic reasoning

after visiting the museum than before and compared to the control group who did not visit the museum. The research will be discussed in relation to current theorising about people's reasoning about Darwinian evolution.

Complex visual discrimination in individuals with Autism Spectrum Disorder

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It has been argued that the fundamental problem that individuals with Autism Spectrum Disorder (ASD) have with social cognition may be due to a domain general impairment in cognition rather than a problem with social cognition per se (Gaigg, 2012). This impairment can manifest in social difficulties but also in problems with learning and memory (Boucher & Bowler, 2008). One brain region that has been implicated in this difficulty is the hippocampus, which is responsible for binding together parts of an event to form an episode and enabling flexible retrieval of studied material (Bowler, Gaigg, Lind, 2011). It is also involved in processing configurational aspects of visual stimuli. The current study adapts a test of configural learning from the animal literature (Sanderson, Pearce, Kyd & Aggleton, 2006), in which rats with hippocampal lesions showed impairments only on tasks which involved learning the structural arrangements of the stimuli (Sanderson et al, 2006). The current study predicts that individuals with ASD would show similar patterns of performance as hippocampectomised participants. Data were collected from typical adults and children, and adults and children with ASD, on these configural tasks. Participants were presented with pairs of stimuli on a touchscreen laptop, and after 4 training blocks were presented with a test block involving re-paired stimuli for two of the tasks. Preliminary data shows no significant differences between the tasks in either of the typically developing groups, however there is a significant group effect in the adult sample, with ASD individuals performing worse overall. This seems to be driven by their lower performance in studied compared to re-paired trials on structural test blocks indicating an interference effect between studied and test material. This supports the notion of impaired flexibility in the use of studied material, therefore potentially indicating a problem in hippocampal functioning.

A neurocomputational model of regression in autism

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Neurocomputational models are an essential tool for investigating the mechanistic causes of developmental deficits. Implemented models force specification of the details of the developmental processes that have gone awry. Models often lead to

novel testable predictions. Developmental regression occurs in a subset of children with autism. It constitutes an apparent reversal of cognitive development in the second year of life, including the loss of previously established skills. The profile of development and loss, as well as the variability in outcome, has proved hard to explain. In this presentation, I use a neurocomputational model to argue that regression in autism is caused by aggressive pruning of brain connections, an exaggeration of a normal phase of brain development that occurs during early childhood. The model has three main virtues. First, it can explain the source of variability observed in the severity and prognosis of regression, by specifying protective and risk factors for the pruning of network connectivity. Second, aggressive pruning may allow us to link the regressive subtype of autism to the wider phenotype; that is, pruning may explain other developmental trajectories of autism, where regression is not observed because the underlying development is slower and/or because the aggressive pruning occurs earlier. Third, the hypothesis generates a number of novel predictions that are both unique and testable via emerging research following the development of infants at risk of autism. Most notably, the pruning hypothesis predicts that the earliest symptoms in the emergence of autism should be sensory and motor rather than social, despite a deficit in social skills characterising the adult phenotype.

Creating synaesthetic brains? Noninvasive brain stimulation modulates learning of novel symbols

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Synaesthesia is a rare neurological phenomenon whereby one sensory or cognitive percept elicits a separate sensory experience. In grapheme-colour synaesthesia (GCS), individuals experience a specific colour on presentation of a number or letter. Our study investigated mechanisms of synaesthesia acquisition in a paradigm that taught adults novel symbols representing relative magnitudes, thus emulating the learning of numbers during development. We presented the symbols with built-in colour and orientation biases to measure the effects of irrelevant but consistent environmental cues, mimicking those found in developmental contexts (e.g. coloured alphabet blocks). During learning we applied sham or real transcranial random noise stimulation (TRNS), a non-invasive electrical stimulation previously shown to enhance perceptual learning. We found that: 1)TRNS over occipital cortex improved symbol-learning performance in non-synaesthetes, but had no effect on the GCS group. We suggest that because GCS has been associated with hyperexcitability of the primary visual cortex, these results may be explained by pre-existing ceiling levels of excitability in GCS participants. 2) The GCS

group (but not controls) showed a performance cost on unusual, “backwards” orientated trials, suggesting that they implicitly learned the built-in orientation bias. 3) The GCS group also showed interference effects of incongruent colours in a colour-priming task with the learnt symbols, suggesting they bound the (task-irrelevant) colours to the symbols more robustly than controls. These results firstly support the notion that occipital cortex anomalies (e.g. hyperexcitability) during development may be responsible for GCS. Secondly, the synaesthetes implicitly learned environmental biases built into the task, not only in their synaesthetic modality (colour), but also in another modality (spatial). Aligning with evidence that synaesthesia is inherited in general rather than by modality, and with strong links found between GCS and visuo-spatial forms of synaesthesia, our results suggest that synaesthesia may arise from a general propensity to form atypical associations.

EPEC: Understanding parents’ perspectives on becoming peer-leaders of a parenting intervention

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Peer-led interventions are increasingly common components of health interventions. Peer-leaders may be more credible than professionals because of shared characteristics and experience, thereby reducing barriers to help-seeking. Peer-led interventions can be cost-effective, fill gaps in services and benefit peer-leaders. Empowering Parents, Empowering Communities (EPEC) is a peer-led system designed to improve access to an evidence-based parenting intervention in socially disadvantaged communities in inner-city London. Positive effects were found on parental stress and well-being, parenting skills and child behaviour but little is known about peer-leaders’ experiences. Systematic evidence is required to understand peer-leaders’ perspective on the types of support they value, skill development and sustaining peer-led programmes. An understanding of barriers to effective delivery will allow improvement of peer-led interventions.

A qualitative cross-sectional design was used to acquire a detailed and in-depth understanding of peer facilitators’ experiences. Fourteen parents were interviewed using a topic guide. Qualitative interviews were transcribed verbatim and analysed using thematic analysis.

Peer-leaders valued formal training to initially develop and extend skills that were consolidated through practical experience and supported by formal and informal supervision. They observed positive changes in their own and others’ family lives that were rewarding and promoted continued involvement in EPEC. Peer-leaders described personal impacts such as becoming more self-

confident, empathic and accepting of others which provided new job and social opportunities. Peer-leaders' passion and enthusiasm for their role and mutual identification with families were important to the intervention's sustainability and success.

Peer-leader characteristics, formal training, practical and emotional support contributed to the efficacy and sustainability of a peer-led parenting intervention. Further research is required to clarify and replicate these findings.

Secondary school pupils' reasoning about the origins of living things

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Children's reasoning about the origins of species extends from their naïve theories about biology. Children as young as 4-years-old are able to accurately and consistently attribute characteristics of living things to animate object, and characteristics of non-living things to inanimate objects (Inagaki & Hatano, 1996). Evans (2000, 2001) documented a set of developmental changes in children's reasoning about the origins of species. For example, whereas 5- to 7-year-old children endorsed a mixture of creationist and spontaneous generationist reasoning patterns, 8- to 9-year-old children endorsed creationist explanations. By early adolescence, children's reasoning about evolution mirrored that of their parents' beliefs (Evans, 2000). There is reason to believe that children's reasoning about evolution continues to change through their secondary school years as their reasoning capacities drastically improve.

To date, there has been no research investigating children's reasoning about the origins of living during the secondary school years. 120 pupils from four secondary schools in Southeast London completed a 20-minute one-to-one voice recorded interview. These interviews were transcribed verbatim and coded. This study documents pupils' reasoning about the origins of living things at ages 12, 14, and 16.

Eye strain symptoms are common and not always due to genuine ocular defects

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Eyestrain and visual symptoms are often ascribed to clinical difficulties with ocular convergence. The Convergence Insufficiency Symptom Survey (CISS) was devised by optometrists to identify and monitor symptoms in convergence insufficiency (CI), which is said to have a prevalence of up to 8% of the population. Many of the questionnaire items, however, are not specific to ocular problems. This study assessed its usefulness as a screening tool for ocular problems in an asymptomatic student population.

The questionnaire was administered, followed by a full orthoptic clinical evaluation, to 167 university undergraduate and postgraduate students during the recruitment phase of another study. The primary criterion for recruitment to this study was that participants felt they had "normal eyesight". Since high scores on some of the questionnaire items result from a normal student lifestyle, we asked a supplemental question on 5 items. Attribution to non-ocular causes caused the score to be adjusted downwards.

Mean CISS score was 15.38 (9.13 adjusted). 17 (10%) of the participants were diagnosed with CI according to clinical criteria. 76 of the participants (45%)(29 (17.2%) adjusted) had a "high" CISS score (≥ 16). Sensitivity of the CISS to detect CI in this asymptomatic sample was 52% (35% adjusted); specificity 55% (84% adjusted); positive predictive value 11% (20% adjusted); negative predictive value 91% (92% adjusted). Area under a ROC curve was 0.59 (95%CI 0.46-0.73) (0.63 (95%CI 0.51-0.76) adjusted).

A student lifestyle often results in symptoms associated with close work. The CISS questionnaire may be useful in monitoring symptoms in established CI but many of the questionnaire items are not specific to ocular problems. A "high" score was common in asymptomatic individuals, and many people with true CI were found to be asymptomatic. The CISS should not be used in a screening context.

Executive functions and child pedestrian behaviour

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Unintentional injury is the leading cause of paediatric mortality, killing more children aged 1 – 18 than the next 20 causes of death combined (US National Centre for Injury Prevention & Control, 2010). Child pedestrian accidents pose a particular threat, producing a mortality rate four times that of adults in spite of children's much lower exposure to traffic and corresponding risk. Two recent studies (Barton & Morrongiello, 2011; Stavrinou et al., 2011) have implicated executive functioning (EF) in explaining the disproportionate involvement of children in pedestrian traffic accidents. EF develops slowly across childhood, is essential for the coordination of perception and action and comprises a number of related, though clearly separable component skills. Yet the only 2 previous studies to investigate EF and pedestrian skills don't specify which aspects of EF relate to unsafe pedestrian behaviour. This makes it difficult to apply these and develop effective interventions. Our study is the first to investigate which components of EF predict pedestrian skill level across childhood. We link performance on 4 subtests of the CANTAB to performance on tasks assessing pedestrian skills to reveal cognitive predictors of pedestrian safety in children aged 5 –

12 years. Results provide direction for future safety interventions targeting the at-risk child population by revealing how discreet aspects of EF predict specific road safety behaviours. Findings are explored relative to the development of future interventions and their implications for children with developmental disorders are discussed.

Higher analytic cognitive style leads to more motivated reasoning

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Motivated reasoning is the tendency for people to engage in additional reasoning when they disagree with the conclusion of a logical argument. In syllogistic reasoning this leads to increased reasoning accuracy for unbelievable compared to believable conclusions. Considering that conclusion believability is independent from logical validity, motivated reasoning is a type of belief bias. Previous research has shown that motivated reasoning is linked to individual differences in cognitive ability. In the current talk we present evidence from a large sample study using the signal detection theory framework that the effect of cognitive ability on motivated reasoning is mediated by analytic cognitive style. These findings are incompatible with all extant theories of belief bias. We discuss the implications for our theoretical understanding of motivated reasoning, analytic cognitive style, and belief bias.

Identifying misspelling patterns: Evidence from UK elementary school pupils with and without dyslexia

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Mastering spelling skills can be very demanding for primary school pupils and might also be problematic for children with reading difficulties. This study aimed to examine spelling abilities of both dyslexic and non-dyslexic children attending schools in Berkshire, UK. Moreover, it aimed to identify the most common misspelling patterns for English native speakers in this specific age group.

The sample consisted of 20 dyslexic and 130 non-dyslexic children (Years 3-6, age 8-11 years old). The dyslexic group was matched with chronological, reading and spelling age controls using standardized tests. Spelling and writing performance was assessed with three experimental tasks: single-word spelling, orthographic choice and text composition. 60 target words including various orthographic patterns (e.g. double consonants, silent clusters, plural suffixes) were used across tasks to examine the spelling performance among groups and to reveal any orthographic patterns that participants found particularly difficult to spell.

Results show higher misspelling rates when comparing the performances of dyslexic participants and their chronological controls. A number of orthographic patterns were found to be challenging for both groups, although older non-dyslexic pupils performed better in all three spelling conditions. The role of context (composition task), visual cues (orthographic task), age and cognitive abilities (memory, reading fluency, grammar knowledge, vocabulary) in spelling skill acquisition is discussed.

Word-based categorization in 14 to 20-month-old children: Evidence from a Slavic language

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The main goal of the study was to further explore early word-based categorization by following one sample of children longitudinally from the age of 14 through the age of 20 months. Specifically, we investigated the facilitating effect of labeling on:

- a) categorization of unknown objects with a similar shape and a shared label;
- b) categorization of unknown objects with a shared label, but no perceptual similarity.

An additional goal was to verify and extend previous research findings to a new, Slavic language (Serbian/Croatian/Bosnian).

Thirty fourteen-month-old infants (13 boys and 17 girls) from monolingual Serbian-speaking families in Bosnia & Herzegovina were recruited for this study.

Following the familiarization phase, each infant was presented with six triads of unfamiliar objects. Three of the sets were made up of a pair of similar-shaped objects and a third object that differed from the other two in shape, color, and texture. The remaining three sets were made up of three distinct objects, that differed in shape, color, and texture.

After the experimenter clearly labels the three objects, she puts one object into a basket and asks the child to choose „the one that goes with this one“ and puts it in the basket.

The results indicate that, starting at 16 months of age, children can categorize objects with a similar shape and a shared label, which is in congruence with previous research. However, the success at the task that included objects with a shared label but no perceptual similarity was at chance level at all ages in our sample - a result that differs from previous findings in other languages.

The results are discussed in light of both linguistic and cultural differences. Methodological issues including the use of longitudinal design are also discussed.

Twinkle twinkle little star: Exemplar variability affects early verb learning

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Although evidence from the noun learning literature suggests that within-category variability facilitates noun learning (Twomey & Horst, 2011), the effect of variability on verb learning remains unclear. The current study explored whether presenting infants with a variable novel action category versus a single, repeated novel action affected infants' verb-action mappings. Twenty-four-month-old infants were habituated to intransitive verb-action pairs. Children encountered a novel verb (e.g., "Look! He's dacking!") paired with a cartoon actor performing either a single action from a novel action category (single condition) or multiple actions from the same novel action category (multiple condition). Over four test trials, infants were presented with a new action from the habituated category and a completely novel action, paired with both the habituated verb and a new verb, in a switch design (Werker, Cohen, Lloyd, Casasola & Stager, 1998). Infants in both conditions discriminated novel verb-action pairs from the habituated verb-action pairs. However, infants in the single condition discriminated the new verb but neither the new nor completely novel action, while infants in the multiple condition discriminated the completely novel action but not the new verb. Taken together, these data suggest that exemplar variability affects verb learning and action categorisation, indicating that verb learning may be subject to similar low-level perceptual processes to those that underpin noun learning.

The influence of perceived motion on emotional evaluation

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Recognizing the emotional states of other individuals is crucial, for survival, for human beings. Facial expressions are at the heart of our social interactions allowing us to understand others' feelings. During social interactions, contextual information is also helpful to interpret ambiguous emotional expressions. Directly approaching objects produce a specific pattern of accelerating optical expansion - 'looming' - which has been found to evoke fear responses in both monkeys and human infants. We investigated whether the direction of a face's perceived motion - approaching or receding - influences the evaluation of the emotion expressed by it. Specifically we hypothesized that approaching faces would be judged as angrier and more fearful than receding faces. Happy, angry, and fearful faces of two male and two female models were morphed to create emotional expressions ambiguous between happy

and angry and between happy and fearful, at seven levels (20%, 30%, 40%, 50%, 60%, 70% or 80% happy). On each trial, the image either loomed or receded for 333 ms. Participants made unspeded two-alternative forced-choice judgments of whether the face was happy or angry/afraid. Our results showed that perceived motion has an influence on emotional judgments with the approaching faces perceived as being more afraid than receding ones. Interestingly, this effect was modulated by the starting size of the stimulus, only occurring for the larger images. This suggests that the perceived distance of the other facial expression alters the effect of approach on emotional perception. Approach is a cue for fear only for those expressions already near to us.

How long did we take? Groups are good at estimating task duration

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Many factors affect people's time estimation, e.g. for how long a task or event lasted. These include whether the duration is filled or not, the salience of time (e.g. high when rushing to catch a plane), and emotions (e.g. fear). Although most previous time estimation research has investigated individuals, many tasks for which timing could be relevant are performed by groups. This study investigated how individuals' prospective time estimates differ from those of groups.

There are two main time estimation paradigms: retrospective and prospective. Retrospective estimation occurs when the duration is only considered and estimated after the event, and relies heavily on memory processes. Prospective time estimation, used in this study, occurs when we expect to estimate a duration in advance, or when we are aware of the passage of time, such as in a waiting situation. This relies heavily on attentional processes, and can be explained by Zakay & Block's (1996) attentional gate theory: more attention to time causes the period to seem longer.

Eighty participants completed a word search task in groups of four. After the task, participants individually estimated how long the task took and then reached a group consensus on the time taken. Participants' individual estimates (M 746s) of how long their group took were significantly longer ($p = .01$) than the actual time (M 659s), but the group consensus (M 660s) were remarkably accurate, and significantly more so than the individuals' estimates ($p < .04$). Finally, thinking more about time during the task decreased participants' errors ($p < .02$).

This suggests that groups are more accurate at estimating duration than individuals, at least for this task. Future investigation should elucidate the reasons for this group advantage.

Zakay & Block (1996). The role of attention in time estimation processes. In *Advances in Psychology* 115, 143–164.

Promoting dialogic reading and infant language growth in an impoverished peri-urban South African community

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INTRODUCTION: Dialogic reading is recognised as a potent means for stimulating the development of a range of important early cognitive and language skills in children. However, it has as yet not been established whether the benefits to language and attention observed in the developed world may also be possible in developing countries, where it is known that children are at a substantial cognitive disadvantage.

METHOD: We report the results of two studies. The first, a small pilot study conducted in the impoverished community of Khayelitsha, sought to test the feasibility of conducting this sort of training program in this context (n=30; 17 received the intervention and 13 did not). Then the second, a full scale randomized controlled trial, evaluates the impact on mothers and young children of training mothers in an 8-week-long book-sharing program with their infants (n=91; 50 received the intervention and 41 did not). The program is based on that developed by Whitehurst and colleagues but modified for the context to include input on emotional literacy, employs both group presentations and individual tuition, and makes use of the video feedback technique.

FINDINGS: Mothers engaged well with the program during the pilot study and benefited from it. Compared to the control group, those who received the intervention became more sensitive, more facilitating, and more elaborative with their infants, and there appeared to be benefits for both infant attention and language. We also report preliminary outcome data from the randomized trial for three infant variables; namely, expressive vocabulary, comprehension, and attention.

CONCLUSION: Training in dialogic book-sharing for families under conditions of socio-economic adversity has the potential to be of considerable benefit to both mothers and their infants. These interventions pose much potential for combating the documented loss of developmental potential and cognitive under-stimulation of infants in the developing world.

The effect of parents' literacy skills and children's preliteracy skills on the risk of dyslexia

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Which children go on to develop dyslexia? The combination of investigating child characteristics and family characteristics sheds light on the constellation of risk factors that can ultimately lead to dyslexia. We present a longitudinal study following the progress of children with and without a family history of dyslexia. The study examines plausible preschool risk factors and their specificity for predicting reading development. Furthermore, it goes beyond testing the effect of having a parent with dyslexia to quantify the cognitive risks passed on from both parents to their offspring. Participants included at-risk children with (n = 50) and without (n = 82) dyslexia in Grade 3 and controls (n = 64). First, we found impairments in phonological awareness, rapid naming, and letter knowledge in at-risk kindergartners who later developed dyslexia, and mild phonological-awareness deficits in at-risk kindergartners without subsequent dyslexia. We also examined the specificity of these preliteracy skills. Although these skills were also related to later arithmetic, associations with later reading were stronger. Second, the literacy environment at home was comparable among groups. Third, literacy skills of both parents were related to their offspring's reading skills. Children from families in which both parents experienced literacy difficulties were 2½ times more likely to develop dyslexia than children from families with only one affected parent. This suggests that at-risk children who do and who do not develop dyslexia differ in genetic predisposition. Intervention can best be targeted at kindergartens with the highest liability, which are those who do poorly on preliteracy tasks and whose parents have literacy difficulties. Literacy abilities of parents might be viewed as indicators of their offspring's liability for literacy difficulties, since parents provide their offspring with their genetic and environmental endowment. We propose an intergenerational multiple deficit model in which both parents confer cognitive risks.

Anxiety, interpretation bias and the role of executive functioning in adolescents

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Childhood anxiety is associated with interpretation bias: Anxious children and adolescents tend to interpret ambiguous information in a threat-related way. Recently, dual process models have been proposed to explain variation in behaviour and psychopathology. The models assume that psychopathological behaviour like anxiety is the consequence of an imbalance between two distinct systems of information processing: A fast, impulsive

system such as interpretive bias, and a regulatory executive system that can moderate the impact of the impulsive system. Based on these theories and on the results of recent studies, we hypothesized that the relation between interpretation bias and anxiety is moderated by levels of working memory and inhibition. Furthermore, we wanted to explore if these relations differ according to levels of intelligence.

For the purpose of this study, a comprehensive test battery was administered to 109 adolescents (age range 12.02 - 16.00 years with a mean age of 14.02 years). Of the participants, 81 had a mild to borderline intelligence and 25 were typically developing adolescents. The battery consisted of the Youth Self Report, the Teacher Report Form, the Trait scale from the State Trait Anxiety Scales, an Interpretation Bias test, as well as the Listening Recall and Stroop test (to assess respectively working memory and inhibition), a verbal and visual-spatial short-term memory test and the Raven SPM to obtain an indication of intelligence.

Results indicate that inhibition, and not working memory, functioned as a moderator between anxiety and interpretation bias. Interpretation bias was more strongly related to anxiety in adolescents with weak inhibition than in adolescents with strong inhibition. These results were not influenced by intelligence. Furthermore, in accordance with the literature, girls experience more anxiety than boys. The results offer promising vistas for interventions in both ID and typically developing adolescents.

Landmark knowledge and route-learning strategies in Williams syndrome: Evidence from eye-tracking

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Successful navigation is crucial to everyday life (finding your way around a town, or your school, knowing when to alight a bus). Landmarks enable us to find our way from A to B by acting as beacons (e.g. a tall tree) or reference points (e.g. a postbox). In typical development (TD), the ability to use landmarks and to determine their relative usefulness develops with chronological age (CA). Individuals with Williams Syndrome become easily lost due to limited understanding of the spatial configuration of an environment (Farran et al., 2010). In addition, the ability to distinguish between useful and non-useful landmarks in WS is related to non-verbal maturity (Farran et al., 2012). To-date, the development of the ability to use landmarks has been assessed by measuring landmark recall after learning a route. By combining virtual reality and eye-tracking technologies, for the first time, in the current study we measured landmark use in 32 TD (10 6-year-olds, 10 8-year-olds and 12 10-year-olds) and 16 WS participants (mean age 28 year and 6-months) during route-learning. We measured the proportion of time that

each landmark was attended to, while participants learnt a novel route through a virtual environment, and how this related to the number of errors made while learning the route. We also explored the relationships between cognitive ability, age, landmark use, and route learning ability. Preliminary analysis demonstrates areas of both typical and atypical performance in WS.

The development of a mental number line in primary school children: influence of motor proficiency

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Arithmetic performance develops in a hierarchical manner, the ability to solve more advanced arithmetic problems builds upon fundamental capacities like counting. In the present study, we examine the development of a mental number line in primary school children. Previous research has shown small numbers to be associated with the left side of space, whereas larger numbers are associated with the right side of space. Moreover, numbers influence fine motor performance; small numbers facilitating left handed responses, while larger numbers facilitate right handed response; known as the Spatial-numerical association of response code (SNARC) effect. It is suggested that children develop this association between numbers and space around 7 years-of-age, with it becoming automatised at 9 years-of-age.

We examine whether the development of a mental number line in children is influenced by their motor proficiency, as would be predicted by theories of embodied cognition. Children of 7, 8 and 9 years-of-age will participate in an experiment in which they judge the location of a single-digit number on a horizontal line representative of a '0 to 10' scale (presented on a tablet computer); marking the line with a stylus like using a pen with paper. In the first condition, the line runs left-to-right from '0 to 10', with this sequence reversed in a second condition. A third condition presents both sequences the order of individual trials pseudo-randomised. A pilot study has been conducted among 20 adults. Data collection among children is currently in progress with the results to be presented at the conference.

The results will provide more in-depth knowledge on the development of a mental number line in primary-school children. More specifically, it will investigate the relative roles of cognitive and motor development in children's establishment of a mental number-line.

Curiosity in discovery learning

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Discovery learning is at the core of science education. Several studies have investigated how different factors, such as adult guidance, influence the discovery-learning process (Klahr & Nigam, 2004; Dean & Kuhn, 2006). However, few studies have examined individual differences in discovery learning. In the present study, we investigated how individual differences in curiosity affect the discovery-learning process, and the extent to which children profit from adult guidance during this process. Curiosity was defined as a preference for uncertainty (Jirout & Klahr, 2011). As discovery learning involves many unknown variables, and children are asked to come up with a strategy for investigating these variables themselves, discovery-learning tasks generate a high level of uncertainty. We therefore expected less curious children to demonstrate less exploration during discovery learning, and to profit more from adult guidance than more curious children.

187 7- to 9-year-olds were administered multiple curiosity tasks (Jirout & Klahr, 2011; Kreitler, Zigler & Kreitler, 1975), and a discovery-learning task. The discovery-learning task consisted of a balance scale on which transparent balls, each containing three coloured blocks, could be hung. Children were asked to figure out which colour block was the heaviest (Red/ Blue/ Green). This could be done by applying the Control of Variables Strategy (Chen & Klahr, 1999), that is, by comparing two balls that are identical except for one colour change, such as RGB versus RBB. Only in the guidance condition was the CVS principle explained. After task performance, children's knowledge on the weight of the blocks was assessed. We expected children who scored low on the curiosity measures to show shorter exploration times, and to perform fewer comparisons than children who scored high on the curiosity measures. In addition, low-curiosity children were expected to show higher knowledge levels in the guidance condition than in the control condition.

The development of acculturation behaviours (cultural practices) in British ethnic minority and majority children living in London

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Traditionally, acculturation has been primarily studied amongst adolescents and adults rather than children. Various models have been developed to describe the acculturation of individuals from minority cultures to the majority national culture (e.g., Berry, 1997, 2001; Bourhis et al., 1997). However, many minority individuals do not live

within bicultural societies, as most acculturation models assume. Many live in multicultural societies, where a range of different ethnic groups reside alongside one another. In addition, acculturation is not only experienced by minority individuals; majority individuals also change in response to intercultural contact. Furthermore, acculturation has historically been measured in terms of attitudes, with cultural practices and behaviours themselves rarely being assessed.

The present study examined the development of cultural practices in 7- to 11-year-old British children living in London. 244 English, Indian and Pakistani children participated in a quantitative study which examined: (1) their levels of appropriation of cultural practices drawn from ethnic cultures other than their own, (2) whether there were differences in children's acquisition of cultural practices as a function of ethnicity, gender, age, context (e.g., private vs. public spheres) and domain (e.g., music, festivals, food). Results showed that there was variability in the children's cultural practices as a function of ethnicity, gender, age, domain and context. These children also appeared to have adopted a multi-cultural integration acculturation strategy, drawing upon a mixture of practices drawn from their own ethnic group, the host British culture, and other minority ethnic cultures. These findings challenge the theoretical claim that acculturation processes can be adequately characterised in binary bicultural terms (Berry, 1997, 2001). It is argued that the existing dominant theories of acculturation cannot explain the patterns of variability found in the present data, and that there is a need for new theories relating to acculturation in multicultural societies.

Disruptive behaviours in adolescents with Tourette syndrome: Self, parent and school perceptions

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The University of Nottingham

Adolescents with Tourette syndrome have involuntary motor and phonic tics that may be viewed as disruptive, for example, facial grimaces, yelping or uttering words or phrases out of context. Individuals with Tourette syndrome are at risk of having, or developing, associated behavioural problems such as rage attacks and self-injurious behaviours. Furthermore, many young people with Tourette syndrome also have additional conditions such as ADHD that may affect behaviour. Determining appropriate management of these behavioural issues is a key challenge for parents, schools and clinicians - as well as the young people themselves.

Thirty-five young people (11-18 years), their parents and key members of staff took part in semi-structured interviews about challenges encountered because of Tourette syndrome, especially in the school environment. The

participants' accounts of disruptive behaviours, both voluntary and involuntary behaviours, are being analysed using theme analysis. The emergent themes will allow us to describe and better understand the nature of disruptive behaviours in Tourette syndrome. By including the perspectives of three important informants, we will be able to explore differences in the informants' understanding of the young people's behaviour and identify conflicts that have resulted from these. We will also discuss existing approaches to managing disruptive behaviour in Tourette syndrome, both successful and unsuccessful. Implications for educational and clinical professionals supporting adolescents with Tourette syndrome will be considered.

Multi Systemic Therapy- An evidence based programme working with families of antisocial adolescents

Juliette Wait

Berkshire Healthcare NHS Trust / Reading Borough Council

Multi Systemic Therapy (MST) is an evidence based programme, which has been well researched with multiple RCTs suggesting it is an effective intervention for anti-social and criminal behaviour in young people. Over the last 5 years, there has been a huge expansion of MST in the UK: there are currently over 30 MST programmes running over 25 sites.

MST is aimed at the family and key participants in the environment of young people with complex behavioural and conduct problems (such as aggressive behaviour, truancy and other anti-social behaviours) which are having an impact at home, school and in the community and putting the young person at risk of out-of-home placement.

MST typically works with cases where there are a variety of complex clinical, social and education problems, and makes the assumption that children's behaviour is strongly influenced by multiple factors in their environment (and vice versa), including the family, peer group, school and community. In order for interventions to be successful they need to have the capacity to address all the relevant risk factors present for each young person and family; individualised to the strengths and needs of each young person and family; and delivered in naturally occurring systems.

MST is short term, intensive and goal oriented, and interventions are based on a thorough cycle of case conceptualisation and frequent evaluation of the family's response to intervention. MST interventions draw from research-based treatment techniques including behaviour therapy (e.g. parent management training), CBT and Pragmatic family therapies.

This talk will provide evidence from the most recent studies of MST, including a current large scale RCT and a completed RCT in the UK.

The impact of oral language skills on lexical diversity in written texts

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Children with Specific Language Impairment (SLI) experience difficulties when producing written texts. In contrast to skilled writers, children with SLI produce texts of lower quality with fewer words and reduced lexical diversity (Dockrell, Lindsay, Connelly & Mackie, 2007). Research has identified links between limited vocabulary, seen in children with SLI, and poor text quality (Berninger et al, 1992; Dockrell et al, 2007). A reduction in the number of different words within a text may indicate limited vocabulary. Findings to date have been mixed, primarily due to issues with measuring lexical diversity (e.g. Scott & Windsor, 2000; Dockrell et al, 2007). Although many studies have used Type-Token Ratio (TTR), this is significantly associated with text length and fails to distinguish between children with and without SLI (Watkins, Kelly, Harbers & Hollis, 1995). Other measures, controlling for text length typically require longer samples, which is not always possible for children with SLI (Jarvis, 2002; Scott & Windsor, 2000). The current study investigated the lexical diversity using Guiraud's Index: an algebraic equation that controls for text length issues in TTR, and is reliable and valid in primary school children (Vermeer, 2000). Thirty-three children with SLI (aged 10:7) and their peers, matched on chronological age (N=33, aged 10:7) and language ability (N=33, aged 8:7) produced written narratives in five minutes. The SLI and language match groups had significantly lower levels of lexical diversity than the chronological age matches. Additionally, lexical diversity was significantly correlated with receptive vocabulary and writing quality. Stepwise regression found that lexical diversity and vocabulary accounted for 49% of the variance in text quality. These results highlight the important contribution of lexical diversity to the production of high quality written texts. Furthermore, the similar patterns of performance between children with SLI and their language age matches suggest developmental delays in writing for children with SLI. Implications for practice and instruction are discussed.

Theory of Mind-use in the Director task: What makes 6- and 7-year-olds more (or less) egocentric?

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Theory of mind (ToM) is the ability to think about others' mental states. This ability provides basis for

everyday social interaction and communication. Evidence suggests that our ability to use ToM improves continuously from childhood into late adolescence (Dumontheil et al., 2010). However, other studies indicate that at 6-years of age, children already show sensitivity to the common ground they share with a communicative partner (Nadig & Sedivy, 2002). In the present study we highlight an overlooked difference in the methodologies employed by the aforementioned studies: the magnitude of the children's perspective—the number of objects that had to be considered when computing one's own and others' perspectives. We attempted to address this discrepancy by manipulating the number of objects that 6- and 7-year-olds have to take into account in a communication game. We employed a procedure closely matched to the Dumontheil et al. study, with the exception that the original instructions to move objects to neighboring slot were simplified to clicking on the objects. Results suggest that 7-year-olds were better at taking a communicative partner's discrepant perspective into account than 6-year-olds. Although both age groups performed generally more accurately when their perspective contained few objects, perspective magnitude did not have an effect on the amount of egocentric errors observed. Interestingly, the present result also revealed much reduced egocentric errors compared to the Dumontheil et al. findings. This observation suggests that the complexity of the instructions may determine the cognitive load associated with the perspective-taking task, which in turn affects the amount of egocentrism observed (Epley et al., 2004). We will discuss the implication of this finding and propose an adult study using eye-tracking technique to address this issue more fully.

Word frequency effects in immediate free recall (IFR): A re-examination of IFR as a “two-component task”

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Immediate free recall (IFR) is sometimes referred to as a “two-component task”: variables known to affect long-term memory (such as word frequency) affect recall on the early and the middle list items, but do not affect recall of the later list items (which are thought to be largely output from short-term memory, which is unaffected by word frequency). Thus, when longer lists of say 15 words are presented for IFR, there is a characteristic U-shaped serial position curve, and word frequency influences only the early and middle list positions. By contrast, when shorter lists of say 6 words are presented for immediate serial recall (ISR), there are extended primacy effects, and word frequency influences all list positions. In the current study, participants were presented with lists of between 1 and 15 high frequency (HF) or low frequency (LF) words for IFR. We found: (1) the shape of the serial position curve and the extent of the word frequency effect was

greatly affected by the list length –typical “IFR-like” data were observed at “IFR-like” list lengths, whereas “ISR-like” data were observed at “ISR-like” list lengths; and (2) once one considers the probability of first recall, HF words are better recalled than LF words in all analyses and all list lengths. The classic two-component function arises because (a) HF words are better recalled than LF words in all circumstances, and (b) participants are more likely to initiate recall of longer HF lists with the first list item, but more likely to initiate longer LF lists with the recency items. These two effects of word frequency superimpose to produce a HF advantage at early list positions, but cancel each other out to result in an apparent lack of word frequency effect at later serial positions.

Young children's memory of conflicting and non-conflicting gender/occupation roles

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Awareness of gender stereotypical behaviour emerges as young as 2 or 3 years of age (Poulin-Dubois et al., 2002) with knowledge of specific personal and social attributes apparent at around 5 years (Huston, 1983). Existing research has shown that 8-9 year old children tend to remember more about male characters than female characters, regardless of the gender stereotypicality of their occupations, but find it harder to process information about males in counter-stereotypical roles (Wilbourn & Key, 2010). The aim of the current study was to investigate younger children's memory for stereotypical and counter-stereotypical gender occupations.

A pilot study carried out with 3- to 7-year-olds established 12 (6 male and 6 female) occupations regarded by this age group to be gender specific. In the main experiment, 4- to 7-year-olds (N=96; 45 males) were asked to remember pictures of a cartoon character in an occupational setting. The gender of the character either matched (3 stereotypical male & 3 stereotypical female) or conflicted (3 counter-stereotypical male & 3 counter-stereotypical female) with the occupation. Following a distracter task, children had to match a picture of each the faces of the 12 characters that they had previously seen, to one of three body pictures offered. One of the three bodies was the original (correct), one was an alternative occupation (opposite – either stereotypical or counter-stereotypical), and the third was a ‘neutral’ occupation.

The results showed that overall memory for the face/occupation pairs increased with age ($p < .001$). Interestingly, children remembered the male face/female occupation combination significantly more than the female face/male occupation combination ($p = .009$). No other effects or interactions were found. Children did not find it generally easier to remember male characters. We

discuss these findings in relation to the development of understanding conflicting social categories.

The role of comparison processes in young children's understanding of referential questions

Gillian Waters

University of Bradford

Answering a referential question requires recognition of what information will provide adequate identification to the questioner (Bowman, 1984). For example, when shown a selection of biscuits and asked, "Which one would you like?" one has to compare all possibilities and, a) understand how they differ (chocolate biscuit, ginger biscuit, or custard cream), b) be able to communicate that knowledge successfully in their response ("I'll have the chocolate one please"). Young children have difficulty dealing with general referential communications: they can struggle to distinguish the difference between objects (Apperly & Robinson, 1998) and cannot always effectively communicate information to others (Asher & Oden, 1976). The current research investigated why young children might have problems answering referential questions.

In two experiments, young children's understanding of the comparison process (recognising similarities and differences) was investigated in relation to their ability to answer referential questions. In Experiment 1, 4- to 7-year-olds (N=120) had to recognise the similarity and difference between pairs of objects (comparison task) by carrying out simple categorisation activities. They then answered a referential question ("which one...?") about one of the objects in each pair (communication task). All but the 7-year-olds found the comparison task harder than the communication task ($p < .001$). Children found it harder to recognise similarities than differences ($p < .001$). In Experiment 2, 4 and 5-year-olds (N=36) also carried out a comparison task and were asked for verbal justifications of similarity and difference judgements. Again, children had more difficulty judging objects as similar, than as different ($p < .01$). Verbal explanations of errors when recognising how objects differed were either ambiguous (55%) or based on colour matching (45%). However, explanations of errors in similarity judgements either related to colour matching (65%) or to themes/stories fashioned around the objects' identities (35%). The development of comparison judgements in referential communication will be discussed.

The effect of language-switch and time interval on false memory formation in bilingual speakers

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The Deese-Roediger-McDermott (DRM) false memory effect arises when a critical 'lure' (e.g. foot)

is falsely recalled following presentation of a list of semantic associates (e.g. toes, shoes, socks). Levels of false recall and recognition typically increase over time whereas correct recall decreases (Seamon et al., 2002). Furthermore, studies with bilinguals reveal a greater incidence of false memories when training and test is between languages compared to within the same language (Howe et al., 2007; Cabeza & Lennertson, 2005). Fuzzy-trace theory (FTT) postulates that we become more reliant upon gist-based memories as veridical memory traces decay.

To further investigate the timecourse of language-switch effects forty adult bilinguals proficient in two diverse languages (Kurdish-English) were tested for recall and recognition of 16 Deese-Roediger-McDermott (DRM) lists immediately and after a one week delay. The results revealed a robust false memory effect regardless of language switch or retention interval. Crucially, a significant language x time interaction was observed ($p < .05$) revealing more false intrusions between languages than within-languages at immediate test but similar levels, irrespective of language, at 1-wk retest. False intrusions increased for within-language lists but remained stable between -languages over the week. In contrast, correct recall was greater within- than between-languages when tested immediately, but accuracy declined to similar levels 1 week later. This is consistent with the view that switching languages causes an immediate reliance upon gist-based representations which are more sensitive to semantic intrusions. Interestingly, after a delay the rates of both false and correct recall were similar in both language conditions suggesting that both groups become reliant upon gist-based memory traces as access to veridical memory declines. A similar pattern of findings was observed for recognition. The results are interpreted as supporting fuzzy trace theory and the implications for other theories (e.g., IAT) will be considered.

A pupil dilation study of unimodal and crossmodal novelty perception in infants and adults

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What is the relationship between perceiving a novel object/sound pair and a new pairing of familiar objects and sounds? To answer this question we measured pupillary responses in 15-month-old infants and adults when hearing a novel sound while watching a novel object versus hearing a familiar sound paired with a familiar visual object in a new way. In a familiarization phase, participants were presented with two animated novel cartoon animals, each producing a characteristic novel animal calls. The subsequent test phase had three conditions: a familiar pairing condition (both of the same animal/call pairings as in the familiarization phase), a switched pairing condition (animal 1

paired with call 2 and vice versa), and a novel condition (a new animal producing a new call). The participants' pupillary responses in the test phase were recorded with a Tobii eye tracker. Starting at 1000 ms after sound onset, 15-month-old infants showed a larger pupil dilation in the novel pairing condition than in the familiar pairing and the switched pairing conditions, indicating a perceptual novelty effect. In addition, starting at 3950 ms after sound onset, 15-month-olds' pupils dilated more in the switched pairing and novel pairing conditions than in the familiar pairing condition, indicating an object-sound association novelty effect. Adults, instead, only demonstrated a perceptual novelty effect starting at 1000 ms after sound onset. These results indicate that pupil dilation is sensitive to both perceptual novelty and novel crossmodal association. More importantly, the effect of perceptual and association novelty can be dissociated in terms of their time-courses. Finally, that only 15-month-old infants but not adults demonstrated an association novelty effect may be due to infants' learning being less dependent on explicit attention (Aslin, 2012).

A computational model of brain imaging of the English past tense

Gert Westermann

Lancaster University

Brain imaging studies of English past tense inflection have found dissociations between regular and irregular verbs, which has been argued to be evidence for separate neural and cognitive mechanisms underlying the processing of regular and irregular verbs. Here I use synthetic brain imaging in a neural network model to provide a mechanistic account of the origins of such dissociations. The model suggests that dissociations between regional activation patterns in verb inflection emerge in adult processing systems as an outcome of experience-dependent structural brain development. Although these dissociations superficially appear to be between regular and irregular verbs they arise from a combination of different statistical properties of verbs relating to frequency, relationships to other verbs, and phonological complexity without a causal role for regularity or semantics. These results support the notion that all inflections are produced in a single associative mechanism. The model generates predictions about the patterning of active brain regions for different verbs that can be tested in future imaging studies.

Infants' ability to link objects and sounds

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Infants live in a multisensory world where objects make sounds, such as barking dogs and revving cars. Parents start to teach their infants knowledge of the sounds made by animals and objects quite early

through games, picture books and computer apps. However, despite a large amount of research on low-level multisensory perception it is unknown by which age infants are able to associate visual objects with natural sounds. In the present study we addressed this question with 10- and 12-month-old infants in an intermodal preferential looking experiment. In a familiarization phase, two novel animated cartoon animals were presented running or jumping from the periphery to the center of a computer screen while producing realistic but unfamiliar animal calls. Each animal-sound pair was presented 8 times. In the test phase, static images of both animals were presented side-by-side and one of the animal calls was played. Infants' looking times to each stimulus were recorded with an eye tracker. The results revealed that 12-month-old infants preferentially looked at the animal associated with the played sound ($t(17) = 2.82, p < .05, \text{Cohen's } d = 0.67$), while 10-month-old infants did not ($t(17) = 0.27, p = .79, \text{Cohen's } d = 0.06$). These results suggest that the ability to learn crossmodal associations between natural sounds and visual objects emerges between 10 and 12 months of age, which is comparable to the age by which infants can learn associations between linguistic labels and visual referents. We propose that a domain-general learning mechanism for crossmodal associations develops at the end of the first year.

Infants' sensitivity to the congruence of others' emotions and actions

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As humans, we are attuned to the moods and emotions of others. This understanding of emotions enables us to interpret other people's actions on the basis of their emotional displays. However, the development of this capacity is not well understood. Here we show a developmental pattern in 10- and 14-month-old infants' sensitivity to others' emotions and actions. Infants were shown video clips in which happy or angry actors performed a positive action (patting a toy tiger) or a negative action (thumping the toy tiger). Only 14-month-olds, but not 10-month-olds, showed selectively greater sympathetic activity (i.e., pupil dilation) both when an angry actor performed the positive action and when a happy actor performed the negative action, in contrast to the actors performing the actions congruent with their displayed emotions. These results suggest that at the beginning of the second year of life, infants become sensitive to the congruence of other people's emotions and actions, indicating an emerging abstract concept of emotions during infancy. The results are discussed in light of previous research on emotion understanding during infancy.

Sleep supports the generation of explicit knowledge in a motor sequence task in children

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The developing brain with its high capacity for plasticity has to acquire basic motor skills like running, writing or speaking. Children do not only have to learn much but their sleep contains great amounts of slow wave sleep (SWS) - a sleep stage that was found to be causally related to the consolidation of hippocampus-dependent memories in adults. In contrast to adults, sleep in children did not benefit offline gains in implicit performance on a motor memory task (Fischer et al., 2007; Wilhelm et al., 2008; Prehn-Kristensen et al. 2009). It was hypothesized that the lack of any sleep-dependent gain in motor skill memory might be caused by a competitive interaction between explicit and implicit knowledge on a motor memory task. More specifically, high amounts of explicit knowledge about the task might slow actual motor performance in a post-sleep retrieval test. Using a motor sequence memory task that contains a hidden eight-element sequence, we indeed could show that children aged 8-11 years exhibit a greater amount of explicit knowledge of this sequence when sleep follows implicit task training with this clearly outperforming that in adults. In children and adults the overnight gain of explicit sequence knowledge was significantly correlated with EEG slow wave activity (SWA) during post-training sleep. Moreover, enhanced explicit sequence knowledge after sleep in children coincided with greater activation of the hippocampus during sequence retrieval. These data indicate the superiority of the child's brain in generating explicit knowledge on an implicitly learned motor task during sleep, possibly due to an enhanced SWS-dependent reprocessing of hippocampal memory representations.

I do therefore I remember: Self-generation explains false memory priming success across age

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Several research studies have found that false memories [specifically those produced by the Deese/Roediger-McDermott (DRM) paradigm] can successfully prime related, insight-based problem solutions (i.e., Compound Remote Associate Tasks; CRAT) in both children and adults, much like true memories can. The priming efficacy of true and false memories is equivalent when CRAT problems are attempted immediately. However, when a one-week retention interval is introduced prior to CRAT completion, false memories serve as more effective primes than true memories. Furthermore, when the valence of the prime is manipulated, negative false memory primes exhibit a growth over the one-week delay interval, thus are the most effective primes;

this effect is heightened in child participants. We aimed to explain why false memories demonstrate a priming advantage following a retention interval and why negative stimuli enhance this effect. Consequently, we drew upon the well-known retention advantage of self-generated memories over other-generated memories. We predicted that because false memories are self-generated (usually unconscious), whereas true memories are other-generated (experimenter presented), the greater retention (and priming of CRAT problems) is due to this self-generation effect. That is exactly what we found: for both 11-year-old children and young adults, self-generated solution terms served as more efficient primes compared with other-generated solution terms after a one-week delay. This finding confirmed our prediction that false memories show persistence because they are self-generated. Furthermore, akin to recent research findings, emotional-negative self-generated solution terms were the most effective primes. We suggest that negative primes strengthen the aforementioned effect because their corresponding DRM lists have high inter-list association.

Episodic future thinking and prospective memory among individuals with autism spectrum disorder

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¹University of Kent, ²Bristol University, ³City University

Autism spectrum disorder (ASD) is a life-long developmental disorder that is characterised by core impairments in social-communication and behavioural flexibility. At the cognitive level, retrospective memory (memory for past events and experiences) has been studied extensively in ASD and it is clear that the disorder is characterised by limitations in episodic memory (conscious recollection of previous experiences). However, recently attention has turned to "memory for the future" among people with ASD. In the current talk, we will present data from our recently-completed studies of two aspects of so-called memory for the future in ASD, namely "episodic future thinking" (EFT) and "prospective memory" (PM).

EFT is the ability to mentally represent likely future experiences (e.g., imagine having breakfast tomorrow morning) and is considered crucial for flexible behaviour. PM is the ability to carry out an intended action at the appropriate point. Common examples of PM include remembering to give someone a message, remembering to pay a bill on time, or remembering to keep an appointment. It has been suggested that EFT contributes to PM, because at the time of forming one's intention to act in the future (i.e., at the time of being given a message to pass onto someone), mentally projecting oneself into the future to imagine the realisation of that intention (i.e., imagining giving the message to the intended recipient) increases

the depth of intention encoding and, thus, the chances of successful recall of one's intention at the appropriate point (i.e., upon seeing the intended recipient of the message).

In three studies involving children and adults with ASD, we found a particular profile of strengths and weaknesses in EFT and in PM. We will discuss the results from key experimental tasks, as well as explore cognitive correlates of task performance, and discuss the theoretical implications of the findings.

Prior linguistic knowledge and implicit learning

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Traditional research into implicit learning (IL), learning without awareness, has generally sought to minimise the effect of prior knowledge. But in many real life situations the learner may bring relevant domain-specific prior knowledge, so the question arises whether this affects IL. This study explores the effect of prior linguistic knowledge on implicit language learning by adult native speakers of English and Chinese. In Experiment 1 participants were introduced to four novel articles, and told that two are used with near objects (e.g. gi, ro) and two with far objects (e.g. ul, ne). But there was an additional hidden regularity - two articles went with living things (e.g. gi dog, ul mouse), and two with non-living things (e.g. ro book, ne house). Chinese participants received the same materials with nouns translated into Chinese. Noun phrases were presented in a reaction time task that required decisions on, first, noun animacy, and second, article distance. Towards the end of the experiment violations of animacy agreement were introduced. Chinese and English natives' animacy decisions were significantly slower on violation trials than matched control trials, even for the participants who remained unaware of the agreement rule (who were the majority). In Experiment 2, neither English nor Chinese participants showed implicit learning of the mapping between articles and an orthographic distinction (the number of capital letters in an English word or the number of strokes in a Chinese character), despite explicitly making the relevant decision on the noun. In Experiment 3, only the Chinese group showed evidence of implicitly learning a mapping between articles and a long/flat distinction (derived from the Chinese classifier system). We conclude that prior linguistic knowledge does constrain implicit language learning, and discuss the extent to which this might derive from linguistic universals or the first language.

The impact of age and temporal restrictions on face processing – an eye-tracking study

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University of Strathclyde

Using chimeric faces (where the left and right side differ on a specific dimension such as gender) it has consistently been found that perceptual and attentional biases are left lateralized (Burt & Perrett, 1997; Butler, Gilchrist, Perrett, Jones & Harvey, 2005). Therefore significantly more responses are based on the side of the face shown to the left with more fixations generated to the left side too. These leftward biases are thought to reflect the (opposite) right hemisphere's dominance in face processing. Theories of ageing, however, predict that the right hemisphere becomes less dominant in older age (e.g. Park & Reuter-Lorenz, 2009), thus reducing left lateral response and attention biases in older compared with younger adults, particularly in time limited conditions (Butler & Harvey, 2008). We used eye-tracking to quantify lateral bias differences between older (60+ years), and younger (18-30 years) adults using a chimeric gender judgment task in both a freeview and time limited (1 second) condition. Our findings revealed that both groups, in each time condition, displayed a left perceptual bias – and therefore based most of their gender decisions on the left side – with initial saccades also being leftward. However, age did not impact on participants' responses or scanning behaviour in either time condition. As these results contrast with accepted theories of ageing, potential reasons for this and avenues for future research will be discussed.

Goodnight sleep: The benefit of sleep consolidation on word learning and comprehension using children's storybooks

Sophie-Elizabeth Williams, Jane Oakhill, Jessica Horst

University of Sussex

Being read bedtime stories is a common activity for many children. Recent research demonstrates a large benefit in word learning after sleep consolidation (Davis, Di Betta, Macdonald, & Gaskell, 2009) however, whether bedtime stories are more effective for word learning than stories read at times when children cannot benefit from sleep consolidation remains unknown. In the current study, we examined the benefits of sleep consolidation on shared storybook reading with 3-year-old children who were read purpose-written storybooks. Half of the children routinely took afternoon naps and the other children did not. Children were either read the same story repeatedly or different stories (see Horst, Parsons & Bryan, 2011) and tested on both their immediate and delayed recall of novel target words, which occurred either after their naps (sleep conditions) or after the

same amount of time had lapsed (no sleep conditions). Children's story comprehension was also tested using questions about the story plots. Overall, children learned more words and demonstrated better comprehension if they heard the same stories repeatedly. Critically, children who were read different stories and then napped, demonstrated significantly better word learning and story comprehension than children who were read different stories but did not nap. Children performed better on the recall tests after sleep consolidation than on immediate recall tests. Further, children who were read different stories and napped performed as well as children who were read the same stories repeatedly. Taken together, these findings replicate earlier work on the benefits of repeatedly reading the same stories, but importantly, also present novel insight into the benefits of sleep consolidation for shared storybook reading in general. These data suggest that bedtime stories present young children with an optimal learning situation for promoting vocabulary growth.

Linking together action sequences: Changes with movement experience

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Oxford Brookes University

Movement experience results in the refinement of motor skill as internal models alert movers to error in one movement and update the movement plan for the next movement. For example, 46% of pointing error on one trial is corrected for in the next. In everyday life we rarely make a single movement, more often we will perform sequences of actions (e.g. reach, move, place). In a sequence such as this, movement kinematics of the reach differ depending on the demands of the place. However, it is unclear whether error in the place can influence the planning of the reach and result in motor learning. Eighteen adults were asked to perform reach and place movements either when placing a cylinder in a hole of the same size (tight place) or in a hole with twice the diameter (loose place). Each participant completed a block of 15 movements of one action type followed by 15 movements of the other action type. Movements of the hand were measured using a VICON 3D motion tracking system. Results demonstrate simple learning effects: with increasing movement experience both the reach movement is more closely tailored to the demands of the place action and the place movement becomes more accurate. Furthermore, a relationship was seen between the change in deceleration period and the change in adjustment period across time for the loose place action. A greater reduction in deceleration period across time resulted in a greater reduction in adjustment time. No such relationship was seen for the tight place action. This implies a direct relationship between the reach movement and the place movement, supporting the use of internal models in the planning of sequenced actions, with

error at the end of the sequence resulting in a change to an earlier component.

Semantic dementia offers unique insights into the nature of the reading system

Anna Woollams

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Semantic Dementia is a selective and progressive deterioration of conceptual knowledge associated with atrophy to the anterior temporal lobes. This disorder offers us a window into what reading aloud is like without semantics, which is directly relevant to differences in the nature of current computational models. To date, there is considerable evidence from behavioural case-series studies that establishes our reliance on conceptual knowledge to support accurate reading of exception words. These results agree with the predictions of connectionist models in which, over the course of learning, a division of labour develops between the direct and semantically mediated pathways between spelling and sound. Exception words, which are challenging for the direct pathway by virtue of their unpredictable pronunciations, therefore come to be represented more strongly along the direct pathway. Alternative computational models of the reading process have suggested that subword processing in normal reading aloud is a serial procedure, however an explicit investigation of this issue in semantic dementia patients will be presented that does not support this view. Turning to disyllabic words, it has also been suggested that stress assignment during reading aloud occurs via subword mechanisms, but evidence from semantic dementia patients will be presented that clearly indicates the key role of meaning in this process. Lastly, to the extent that the learnt division of labour in the reading system is a bidirectional and interactive process, we might expect to see stronger connections along the direct pathway for those items that are weakly represented along the semantic pathway, namely low imageability words. This prediction was confirmed by the observation of reversed imageability effects in semantic dementia patients' reading aloud. The features of dyslexia seen in semantic dementia therefore provide a clear illustration of the role of meaning in reading.

Consumer culture ideals, extrinsic motivations, and well-being in children

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Internalising consumer culture ideals of materialism and appearance has been shown to be negatively related to adults' well-being, as has being motivated to achieve them for extrinsic, rather than intrinsic, reasons. However, to date, there is little evidence that these links exist in children. Throughout two

studies we use new, age-appropriate scales to test our predictions derived from self-determination theory that being extrinsically motivated to achieve materialistic and appearance ideals will predict their internalisation, which, in turn, will negatively predict children's well-being. Study 1 found that extrinsic motives were negatively related to well-being in a sample of 150 children aged 8-11 years old, but that intrinsic motives were not. In Study 2 we modelled materialism and appearance as a single consumer culture construct, and, in a sample of 160 children aged 8-15 years old, found support for our hypothesis that being extrinsically motivated to achieve these consumer culture ideals predicts their internalisation, which negatively predicts well-being. We discuss the possible mechanisms involved in these processes and the implications of these findings for future research.

An fMRI study of visual attention span deficits in English speakers with compensated developmental dyslexia

Taeko Wydell, Liory Fern-Pollak
Brunel University

This study examines the neural correlates of visual attention span (VAS) in native English-speaking university students with 'compensated developmental dyslexia' and their controls, using fMRI. Previous fMRI studies with French-speaking children and adults conducted by Valdois and her colleagues (Peyrin, Lallier & Valdois, 2008; Valdois, Peyrin & Baciú, 2009; Peyrin, Demonet, N'Guyen-Morel, Le Bas & Valdois, 2011) have shown the importance of VAS in skilled reading, where the neural correlates of VAS were associated with activation in the left superior and inferior parietal cortex. Valdois's team further reported that reduced activation has been observed in these regions in French dyslexics with VAS disorder.

In this study, native English university students and graduates performed a visual letter/shape categorisation task previously used with French participants by Valdois's team. Similar to previous behavioural findings, the English compensated dyslexics were significantly slower in performing the task, but similarly accurate to the controls. Moreover under fMRI both groups activated the left inferior and superior parietal cortex. However, the compensated dyslexics showed greater activation relative to controls within the parietal cortex, and further revealed activation within bilateral frontal and occipito-temporal regions which were not seen in the controls. This 'uneconomical' use of neural resources may underlie compensatory strategies used by these English dyslexics, in order to perform the task as accurately as controls, albeit considerably slower.

How getting noticed helps getting on: Capturing attention with a technology-augmented toy stimulates children's cooperative play

Nicola Yuill, Steve Hinske, Sophie Williams
University of Sussex

Cooperative social interaction is a complex skill that involves maintaining shared attention and continually negotiating a common frame of reference. Privileged in human evolution, cooperation provides support for the development of social-cognitive skills. We hypothesise that providing support for capturing playmates' attention will increase cooperative play in groups of young children. Attention capture was manipulated via a technology-augmented toy giving audio signals to boost children's attention bids. Study 1 (48 6- to 11-year-olds) showed that the augmented toy yielded significantly more cooperative play in triads compared to the same toy without augmentation. In Study 2 (33 7- to 9-year-olds) the augmented toy supported greater success of attention bids which were associated with longer cooperative play, associated in turn with better group narratives. The results show how cooperation requires moment-by-moment coordination of attention and how we can use technology-mediated manipulation of the environment to reveal mechanisms of social interaction.

Attentional processing pertaining to own-gender bias in face recognition: An eye movement study

Layla Tedis Zainabid Akber, Steve Kelly, Stephen Butler
University of Strathclyde

Recent studies have shown a consistent advantage for females in face recognition, particularly in the recognition of other female faces, i.e. an Own-Gender Bias. This finding is less consistent for males. The reasons behind this phenomenon remain unclear, with some suggestion that attention at encoding plays a crucial role in this bias (e.g. Palmer et al, 2013) while others suggest that encoding is unimportant (e.g. Loven et al, 2012). The present study employs eye-tracking in an old/new recognition paradigm to directly examine the attentional processes underlying Own-Gender Bias. Perception of face gender was manipulated by presenting the same androgynous (gender ambiguous) faces with labels that in some cases indicated a gender and in other cases did not. Preliminary data analysis indicates that female participants seem to be paying attention to only the eye and the nose region for male faces, however for female faces the mouth region is also being attended to. These findings were also mirrored on the androgynous faces. This could be acting as an additional piece of information, which may contribute to the Own-Gender Bias. Results are discussed in favour of the Perceptual Expertise Models of own-group biases in face recognition and

the implications these might have for eyewitness memory.

The effect of visual complexity and word frequency on eye movements during Chinese reading

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Frequency and complexity (number of strokes) of a word are key factors determining whether, and for how long, readers fixate that word in normal reading. However, the joint influence of the two variables is not clear. We monitored eye movements of native Chinese readers when they read sentences containing single-character target words orthogonally manipulated for frequency and complexity. Both factors yielded strong main effects on skipping probability but no interaction, with readers skipping visually simple and high frequency words more often. However, frequency and complexity did not show main effects on fixation times on the target words and only a marginal interaction with slightly longer fixations for the low frequency, visually complex words. In all likelihood, fixation times were influenced by high skipping rates creating a paucity of data for the analyses and also compromising fixation times when readers erroneously landed on the target words. The weak interaction does suggest a frequency effect in fixation times for the conditions with the lowest skipping rates (i.e. high complexity). The results demonstrate that word complexity and frequency have independent influences on saccadic targeting behaviour during Chinese reading. Results will be interpreted in relation to the nature of lexical processing in reading.

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