

Neurodevelopmental Disorders Seminar Series 2015

22nd June 2015
St. Catherine's College
University of Oxford



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Oral Presentation Schedule

Time	Session A JCR lecture theatre	Session B Mary Sunley Building
8.45	<i>Registration opens</i> JCR	
9.10	<i>Welcome by Gaia Scerif</i> JCR	
9.20	<p><i>THEME: Attention and executive control</i> <i>CHAIR: Gaia Scerif</i></p> <p>Electrophysiological correlates of cognitive control in young people with Tourette syndrome with and without co-occurring ADHD symptoms <i>Elizabeth Shephard</i></p>	<p><i>THEME: Motor control and learning</i> <i>CHAIR: Oliver Braddick</i></p> <p>Global motion, mathematics and visuo-motor spatial skills: possible links in dorsal stream sensitivity related to children's individual differences in regional brain development <i>Janette Atkinson</i></p>
9.40	<p>Reduced visual exploration when viewing photographic scenes in individuals with Autism Spectrum Disorder <i>Megan Freeth</i></p>	<p>Visual motion sensitivity and motor competency in typical and atypical development: the importance of sample selection <i>Fleur Corbett</i></p>
10.00	<p>Applying cognitive training to target executive functions during early development <i>Sam Wass</i></p>	<p>Sequence Learning with Stochastic Feedback in a Cross-Culture Sample of Boys in the Autistic Spectrum <i>Maren Hentschel</i></p>
10.20	<i>Discussion session</i>	
10.30	<i>Coffee Break</i> JCR	
10.50	<p><i>THEME: School outcomes</i> <i>CHAIR: Emily Farran</i></p> <p>Assessing the contribution of automatic letter-sound integration in the reading performance of typically developing and dyslexic children <i>Francina Clayton</i></p>	<p><i>THEME: Emotion</i> <i>CHAIR: Deborah Riby</i></p> <p>Deconstructing emotions in Autism <i>Gabriella Rundblad</i></p>

11.10	Consolidation of new vocabulary in children with and without dyslexia: the role of sleep <i>Faye Smith</i>	The role of alexithymia in emotion processing and empathy across disorders <i>Rebecca Brewer</i>
11.30	Using Eye Tracking to Explore the Impact of Classroom Visual Distraction on Attention and Learning for Pupils with Autism <i>Mary Hanley</i>	Effect of Adult Familiarity and Nature of Interaction on Social Anxiety and Motivation in Fragile X, Rubinstein-Taybi and Cornelia de Lange Syndromes <i>Robyn Dowlen</i>
11.50	<i>Discussion session</i>	<i>Discussion session</i>
12.00	Keynote Dr Rachael Bedford JCR lecture theatre	
1.00	<i>Lunch (St. Catherine's College Dining Hall)</i>	
2.00	<i>THEME: Williams and Down syndromes</i> <i>CHAIR: Annette Karmiloff-Smith</i> Neurocognitive memory-related phenotypes of infants with Down syndrome may predict protective/risk markers for Alzheimer's disease <i>Esha Massand</i>	<i>THEME: Autism Spectrum Disorders</i> <i>CHAIR: Brianna Doherty</i> Personal space regulation in young people with Autism Spectrum Disorders and Williams syndrome <i>Deborah Riby</i>
2.20	Predictors of language development in infants with Down syndrome <i>Vesna Stojanovic</i>	Theory of Mind usage in adolescents with Autism Spectrum Disorder <i>Elisa Back</i>
2.40	Which Cognitive Abilities Influence the Development of Reading Abilities in Williams Syndrome? <i>Conor McNeilly</i>	Do adults with ASD know their own minds better? <i>Sarah White</i>
3.00	Interpreting Complex Syntax in Individuals with Down Syndrome (DS) and Williams Syndrome (WS): Evidence from Cross-Linguistic Comparisons <i>Nikolitsa Stathopoulou</i>	Heterogeneity within the ASD profile: A Latent Profile Analysis of a large dataset <i>Elizabeth Milne</i>
3.20	<i>Discussion session</i>	<i>Discussion session</i>
3.30	<i>Coffee Break</i> JCR	
4.00	Keynote Prof Dorothy Bishop JCR lecture theatre	
5.00	<i>Posters and Wine Reception</i> JCR	
6.30pm	<i>End of conference</i>	

Poster Presentations

POSTER PRESENTATIONS
1. Response inhibition in children with developmental coordination disorder and motor difficulties <i>Marialivia Bernardi</i>
2. Surrogate Outcome Measures' of Cortical Timing, Early Attention, and Cognitive Vision in the Oxford 'Dolphin' Dietary Intervention Trial of Children at High Perinatal Risk of Cerebral Palsy <i>Oliver Braddick</i>
3. Resolving ambiguity by children with autism: Psychological and linguistic perspectives <i>Laura Brown</i>
4. Cognitive phenotypes in typical development and Autism Spectrum Disorder <i>Victoria Brunson</i>
5. Using Dynamic Assessment to Explore Early Risk Markers for Communication Difficulties <i>Helen Cain</i>
6. Are pragmatic language impairments in Autism Spectrum Disorders and Attention-Deficit/Hyperactivity Disorder the same? Profiles, severity and cognitive underpinnings <i>Sophie Carruthers</i>
7. Generalisation from learned exemplars rather than prototype abstraction during categorisation tasks by adults with Autism Spectrum Disorders (ASD) <i>Rosannah Cormack</i>
8. Peak gamma frequency in autism spectrum conditions <i>Abigail Dickinson</i>
9. Complex Sequence Learning in Developmental Dyslexia <i>Cristina Dye</i>
10. Executive function and working memory in pupils with literacy and / or language impairment <i>Katherine Hall</i>
11. Studying risk and protective factors that might link Down syndrome in children aged 4 to 16 years to subsequent Alzheimer's disease <i>Kate Hughes</i>
12. Ensemble Perception of Emotions in Children with Autism is Similar to Typically Developing Children <i>Themis Karaminis</i>
13. How efficient is the brain? Attention development in term-born and premature infants <i>Louisa Kulke</i>

<p>14. Visual word learning in adults with dyslexia <i>Rosa Kwok</i></p>
<p>15. Cognition and Behaviour in Sotos Syndrome: A Systematic Review <i>Chloe Lane</i></p>
<p>16. Phonological awareness and cognitive abilities in Down syndrome: the search for precursors <i>Aline Lorandi</i></p>
<p>17. Inferencing from text: It's vocabulary that matters <i>Rebecca Lucas</i></p>
<p>18. Too much or too little? The Comprehension of Overstatements and Understatements in Typically Developing (TD) Individuals and those with Autism Spectrum Disorders (ASD) <i>Yani Malai</i></p>
<p>19. Do children with autism change their behaviour in response to volatility in the environment? <i>Catherine Manning</i></p>
<p>20. The effects of co-occurring alexithymia on emotion recognition, mentalizing and well being in adolescents with ASD <i>Bosiljka Milosavljevic</i></p>
<p>21. Relationship Between Season of Birth And Educational Attainment in ALPSAC Support Existence of Relative Age Effect <i>Dianne Newbury</i></p>
<p>22. The clinical features of Attention Deficit-Hyperactivity Disorder (ADHD) in 22q11.2 Deletion Syndrome <i>Maria Niarchou</i></p>
<p>23. The relationship between temperament and brain development in infant siblings with autism spectrum disorder <i>Sarah Paterson</i></p>
<p>24. Oculomotor function in children with and without Developmental Coordination Disorder <i>Emma Sumner</i></p>
<p>25. Processing speed does not mediate the relationship between interference control and inattention in VP children <i>Jennifer Tellett</i></p>
<p>26. Dominant face processing patterns in Autism: A novel prompting paradigm and eyetracking study <i>Sarah Thompson</i></p>
<p>27. The effect of visual perceptual load on auditory awareness in Autism Spectrum Disorder and across typical development <i>Julian Tillmann</i></p>

Keynote Speaker Abstracts

Dorothy V. M. Bishop.

Department of Experimental Psychology, University of Oxford, UK

How and why does an additional sex chromosome affect neurodevelopment?

There are three types of sex chromosome trisomy – trisomy X (XXX girls), Klinefelter syndrome (XXY boys) and XYY (boys). Each trisomy has a prevalence of around 0.1-0.15%, but many go unrecognised because the impact of the extra sex chromosome is relatively mild. I shall discuss the reasons why an additional sex chromosome has a much smaller impact than other trisomies, review some of the logistic difficulties of research in this area, and then describe findings from a study conducted in Oxford in which we used parental report to evaluate neurodevelopment in both prenatally and postnatally diagnosed cases of all three trisomies. On the basis of previous research we had expected to find increased rates of language impairment in children with an extra sex chromosome, and this was confirmed. More surprising was the finding that around 20% of boys with XXY or XYY had received a diagnosis of autism spectrum disorder (ASD), and for those without an autism diagnosis, we found a high rate of language difficulties characteristic of autism. Nevertheless, there was a wide range of outcomes and some children were doing well with no indication of any problems at school or home. We are now following up these findings with a further study in which we are directly assessing children's language and other skills. We are interested in the wide variation from child to child, and hope that by studying relationships between genes and behavior we might be able to find out more about why some children make good progress while others have more serious social or language problems.

Rachael Bedford

Institute of Psychiatry, King's College London, UK

Modelling multiple risks and multiple outcomes: Are there autism-specific trajectories of atypical social and attentional development?

Emerging findings from the prospective study of infants at high familial risk for autism spectrum disorder (ASD) suggest that risk markers are present from the first few months of life. These early autism biomarkers are highly diverse, which is consistent with genetic and neurobiological multiple impairment models. In this talk I will address two key questions: 1) How do risk markers *work together* to predict emerging autism symptomatology? Unlike the majority of high-risk studies which have looked at isolated risk markers (i.e., gaze following, attention disengagement), in this presentation I will combine risk markers to statistically differentiate additive and multiplicative models of autism development; Also, 2) Given the high co-occurrence and overlapping symptomatology between ASD and other developmental disorders (e.g., attention-deficit/hyperactivity disorder and callous-unemotional traits), how can we determine the *specificity* of early risk factors to the subsequent development of ASD? The application of more complex statistical techniques offers the potential to separate out the unique variance related to autism. Here, I present a 'bifactor model' to test the association between 5-week-olds' face preference and subsequent ASD- and CU-traits. In addition to furthering our understanding of how ASD develops, in the longer term this could inform the development of more efficiently targeted diagnosis and intervention strategies.

Abstracts for Oral Presentations

Global motion, mathematics and visuo-motor spatial skills: possible links in dorsal stream sensitivity related to children's individual differences in regional brain development

Janette Atkinson¹, Oliver Braddick², Natacha Akshoomoff^{3,4}, Erik Newman³, Holly Girard⁵, Anders Dale^{6,7}, and Terry Jernigan^{3,4,6,8}

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Sensitivity to global visual motion is impaired, relative to global static form, in many different developmental disorders. These measures reflect extrastriate dorsal and ventral stream processing respectively, suggesting a general 'dorsal stream vulnerability' (Braddick et al, *Neuropsychologia* 2003) associated with visuo-motor, spatial, and attentional deficits. Within the large scale PLING study (Paediatric Longitudinal Imaging, Neurocognition and Genetics), we examined how global motion and static form thresholds in 154 typically developing children (ages 5-12 years) correlated with a range of cognitive abilities, and with quantitative MRI measures of regional brain development. Children's global motion thresholds, but not form, showed significant correlations with visuo-motor integration (VMI test, shape copying), with Woodcock-Johnson tests of mathematical achievement, and with Panamath numerosity estimation. We computed age- and gender-adjusted association maps of coherence thresholds with cortical surface area over a grid of vertices defined in FreeSurfer. Higher motion coherence sensitivity correlated with relative expansion of parietal cortex and negatively with occipital cortex. No such relationships were found for form coherence. Within parietal cortex, the strongest relationship was with an area on the lateral bank of the intraparietal sulcus, partly overlapping with the pattern of expansion associated with calculation and VMI scores. It seems that in typical development, as in disorders, dorsal stream motion sensitivity is closely associated with cognitive abilities, particularly visuospatial and mathematical. This associated region of parietal expansion may represent a variable bottleneck within a wider network for these domains, which may be delayed in many developmental disorders. *Supported by the Leverhulme Trust and by grants from the US National Institutes of Child Health and Human Development, and National Institute on Drug Abuse*

Theory of Mind usage in adolescents with Autism Spectrum Disorder

Elisa Back¹, and Ian Apperly²

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Theory of Mind (ToM) involves understanding that other people can have a different perspective to your own. It has been proposed that individuals with Autism Spectrum Disorder (ASD) lack

ToM, which may explain their difficulties with social interactions. However, research suggests that individuals with ASD pass level 1 visual perspective taking tasks (whether another person can see an object or not). If this is the case, then can adolescents with ASD readily use this information during an online task? Eighteen adolescents with ASD (12-16 year olds) were compared to a chronological age- and IQ- matched sample of 18 typically developing (TD) adolescents. The task was a computerized version of Keysar, Barr, Balin, and Brauner's (2000) visual perspective taking paradigm. Participants were presented with grids on a screen containing objects in different slots and they were asked to move certain objects around the grid from another person's perspective (ToM condition). A non-ToM condition was also included that required no perspective-taking (follow a rule to only move objects in clear slots) to see if any difficulty was specific to a problem with ToM. Accuracy scores, response times and eye-movements were recorded. Overall, both groups had difficulty in using ToM information. Adolescents with ASD were less accurate than TD adolescents but this wasn't specific to the ToM condition and they performed similarly to TD adolescents with regards to speed of responding and in their patterns of eye-movements.

The role of alexithymia in emotion processing and empathy across disorders

Rebecca Brewer

MRC Social, Genetic and Developmental Psychiatry Centre, Institute of Psychiatry, Psychology and Neuroscience, King's College, London

Alexithymia is associated with reduced ability to identify and describe one's own emotions, and impaired recognition of others' emotions. Despite being a sub-clinical phenomenon, alexithymia frequently co-occurs with psychological disorders, including Autism Spectrum Disorders (ASD) and Eating Disorders (ED). While emotion recognition and empathy deficits are widely believed to be a core feature of these disorders, evidence has been equivocal. The alexithymia hypothesis predicts that co-occurring alexithymia, rather than disorder symptomology *per se*, predicts one's ability to make judgments involving emotional processing. In our recent studies, we investigated the independent contributions of alexithymia and disorder symptomology to emotion recognition, empathy and moral reasoning. Results indicated that, once matched for alexithymia, clinical and control groups did not differ in these abilities. Further, it was alexithymia, rather than disorder symptom severity, which predicted ability to empathise, recognise emotions and perform moral judgments. These results suggest that co-occurring alexithymia, present in numerous clinical disorders, can explain emotion-related deficits, where observed, in these individuals. These findings also help to disambiguate the literature on emotion recognition and empathy in ASD and ED, suggesting that where impairments have been observed, this may be due to higher levels of alexithymia severity in clinical than control groups.

Assessing the contribution of automatic letter-sound integration in the reading performance of typically developing and dyslexic children

Francina Clayton¹, Charles Hulme¹, and Hannah Nash²

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It is widely acknowledged that learning to read requires the alphabetic principle (understanding the systematic relationship between letters and their corresponding speech-sounds). Recent research has applied this principle to a novel theory of dyslexia, suggesting that problems learning to read arise from a specific deficit establishing automatic associations between letters and speech-sounds (Blomert, 2011). The present study uses behavioural measures to assess the contribution of automatic letter-sound integration in the reading performance of both typically developing and dyslexic children. Twenty-four children with dyslexia and 78 typically developing children, matched for reading-age, completed several reading-related measures and an experimental priming task designed to measure the extent to which letters and speech-sounds are automatically integrated. Both typically developing and dyslexic children were significantly faster to identify an auditory speech-sound when primed by a congruent visual letter than when primed by a novel symbol ($p < .001$) and also when primed by an incongruent visual letter ($p < .001$). Furthermore, results from this study found that children's performance on this task did not predict unique variance in reading performance. Contrary to the aforementioned novel hypothesis of dyslexia, the results from the present study indicate that both dyslexic and typically developing children automatically integrate visual letters with their corresponding speech-sounds. Furthermore, the extent to which letters and speech-sounds are automatically integrated does not appear to predict variation in children's reading performance. Results from this study will be interpreted in the context of findings from a larger cross-sectional study of typically developing children

Visual motion sensitivity and motor competency in typical and atypical development: the importance of sample selection

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Is there a relationship between co-occurring impairments in visual motion sensitivity and motor competency often found in developmental disorders? Developmental Coordination Disorder (DCD) is characterised by poor motor competency, with contradictory reports of visual motion sensitivity status (Wilmot & Wann, 2008; Sigmundsson et al., 2003; O'Brien et al., 2002). The current study first examined global visual motion sensitivity and motor competency in typical development. Eighty-five 6-14 year olds were assessed with the Movement ABC-2 and BPVS-2. Sensitivity to radial, rotational and translational motions embedded in noise in random dot kinematograms and equivalent static patterns was measured with a 2AFC psychophysical task. An adaptive staircase modulated coherence across trials. Visual motion sensitivity did not predict motor competency ($p > 0.5$ for all motion types). No difference in motion or static pattern sensitivity was found ($p = 0.789$) in a comparison of high and low motor ability groups ($n = 28$), matched for age and verbal ability. In contrast, Sigmundsson et al. (2003) reported reduced visual motion sensitivity in their low motor ability group, also selected from a non-diagnosed sample. Verbal ability alone predicted motor competency ($p = 0.005$) in this group. Previous research has not always assessed differences in mental age, which might mediate the

relationship between visual motion sensitivity and motor competency. However, verbal and motor abilities may be dissociated in DCD and we further report assessments on a group of children and adults diagnosed with DCD (varying in mental ability) to examine whether global motion sensitivity is associated with motor competency, independent of verbal or performance IQ.

Effect of Adult Familiarity and Nature of Interaction on Social Anxiety and Motivation in Fragile X, Rubinstein-Taybi and Cornelia de Lange Syndromes

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Background: Increased social anxiety, alongside a willingness to interact, have been reported to describe the social impairments in individuals with Fragile X (FXS) and Cornelia de Lange (CdLS) syndrome, whereas typical social interest and intact social skills are reported in individuals with Rubinstein-Taybi syndrome (RTS). In this study, the effects of adult familiarity and type of social interaction on anxiety and motivation were investigated. **Methods:** Individuals with FXS (n = 20), RTS (n = 20), CdLS (n = 20) and Down syndrome (DS; n = 20) participated in four social tasks, each with a familiar and unfamiliar adult. Social anxiety and motivation was assessed using the Social Anxiety and Motivation Rating Scale, developed for this study. **Results:** Analyses revealed that whilst participants with FXS and RTS exhibited high levels of social anxiety during all social interactions, participants with CdLS showed increased social anxiety during interactions with an unfamiliar adult, particularly when interacting was voluntary. Further analyses revealed that social motivation was similarly influenced by the social interactions with familiar adults in all groups. **Conclusion:** These results indicate that social anxiety is high but consistent across interactions with familiar and unfamiliar adults in individuals with FXS and RTS. However, in CdLS, social anxiety is more likely to be influenced by the social situations and interacting adult. Furthermore, the results show that whilst social anxiety and motivation are related constructs, they are not dependent on one another.

Reduced visual exploration when viewing photographic scenes in individuals with Autism Spectrum Disorder

Megan Freeth¹, and Timothy Heaton²

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² School of Mathematics and Statistics, University of Sheffield, UK

Individuals with Autism Spectrum Disorder (ASD) often display enhanced attention to detail and exhibit restricted behaviour. However, due to a lack of comprehensive eye-movement modelling techniques, it is currently unknown whether these behavioural effects are evident during scene viewing. Free viewing eye-tracking data from observation of everyday photographic scenes were recorded during two experiments involving high functioning adolescents with ASD and matched typically developing (TD) controls (Expt1 ASD n=23; TD n=24; Expt2 ASD n=24; TD n=23). Five novel methods of eye-tracking time-course analysis were developed, enabling detailed characterisation of viewing strategies. Participants' verbal descriptions of scenes were

also assessed. ASD participants displayed significantly less exploration of new areas over time compared to their TD peers. Analyses of scanpath length and recursion suggested a greater tendency to explore areas close to the current fixation in the ASD group, termed visual persistence. Differences were not accounted for by fixation rate. Significantly more areas within the scenes were also missing from the verbal descriptions in the ASD group. Differences were found even in the absence of prominent social content suggesting a domain-general difference in ASD rather than a specific impairment related to social processing. Individuals with ASD naturally fixate on less of the visual array overall when free-viewing and areas of interest tend to be more restricted. This may explain relative superior processing of local level information in individuals with ASD.

Using Eye Tracking to Explore the Impact of Classroom Visual Distraction on Attention and Learning for Pupils with Autism

Mary Hanley, Rachel Wilson, Mariam Khairat, Korey Talyor, and Debbie Riby
Durham University

Eye-tracking studies show how attention in autism is atypically captured by non-social information (background, objects, etc.). Emerging evidence highlights how the physical classroom environment, loaded with task irrelevant information, has a detrimental impact on typically developing (TD) children's learning. We report data from a novel eye-tracking investigation exploring the impact of visual distraction on learning for children with autism (CWA) compared to TD children. We used bespoke video stimuli, which simulated classroom activities (story time X 2, mini lessons X 2). Two versions of each video were made, one with low visual distraction (LVD), and one with high visual distraction (HVD), and each participant saw 2 videos with LVD and 2 with HVD. We tracked the children's eye movements while they watched the videos in order to explore the effect that HVD has on their attention patterns. Attention patterns revealed that all children spent more time looking at the background in the high visual distraction condition. This effect was even greater for the CWA. Furthermore, data from the mini-lessons worksheets showed that HVD had an impact on the children's learning. Scores from lessons in the HVD condition were lower than scores from LVD lessons for all children. This innovative design allowed us to explore attention, distraction and learning in a carefully controlled manner and it adds to an emerging evidence base showing that irrelevant visual distraction from the classroom environment has a negative impact on attention allocation and learning for typically developing children and for children with autism.

Sequence Learning with Stochastic Feedback in a Cross-Culture Sample of Boys in the Autistic Spectrum

Maren Hentschel, and Christiane Lange-Küttner
London Metropolitan University, School of Psychology

The study investigated sequence learning from stochastic feedback in boys with Autistic Spectrum Disorder (ASD) and typically developing (TD) boys. We asked boys with ASD from Nigeria and the UK as well as age- and gender-matched controls (also males only) to deduce a sequence of four left and right button presses, LLRR, RLLR, LRLR, RLRL, LRRL and RLLR from a feedback signal. Results revealed no significant differences between the boys with ASD from Nigeria and the UK as both groups of boys improved during the task. Most interestingly,

the ASD and TD groups' learning differed for certainty, but not uncertainty of feedback. It is concluded that boys with ASD did not benefit from true, logical and reliable feedback.

Neurocognitive memory-related phenotypes of infants with Down syndrome may predict protective/risk markers for Alzheimer's disease

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Virtually all individuals with Down syndrome (DS) will, by as early as age 30, present with the common histopathological brain features of the Alzheimer's disease (AD) (particularly the build-up of beta-amyloid plaques). This is because the amyloid precursor protein (APP) gene lies on chromosome 21 and is thus over-expressed in DS. Yet, not all individuals with DS go on to develop dementia. Moreover, other genes are also involved, and it remains unclear why some individuals with DS develop dementia while others do not. However, since one of the major genes contributing to AD is overexpressed early in development, and given that individuals with AD demonstrate decline in their explicit object-location memory (Kessels et al., 2005b), we set out to identify individual differences in memory abilities of infants with DS that may be similar to DS memory phenotypes seen in adults with or without AD dementia. We will present our data from 58 infants with DS, aged 6-60 months, from three eye-tracking memory tasks measuring object-change, location-change and context-change. Combined, these tasks reveal an interesting profile of memory performance and individual differences among children with DS. We hope that these findings yield potential clinical markers (endophenotypes) for the cognitive variation in individuals with DS.

Which Cognitive Abilities Influence the Development of Reading Abilities in Williams Syndrome?

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Williams syndrome (WS) is a neurodevelopmental disorder characterised by moderate learning disability and an uneven cognitive profile with relative strengths in language and social skills, in contrast to visuo-spatial and number ability (Mervis et al., 2003). Individuals with Down syndrome (DS) have similar IQ scores to individuals with WS, but their cognitive profiles include strengths in visuo-spatial skills relative to verbal short-term memory and expressive language abilities (Abbeduto, Warren & Conners, 2007). Those with WS and DS have been found to show great variability in reading ability and impairments have been linked to phonological deficits and oral language weaknesses (Griffiths, 2011). However, phonological awareness scores in WS are often above what is expected for their mental abilities (Menghini, Verucci & Vicari, 2004). Thus, as poor reading ability is present despite strong phonological awareness relative to mental age, phonological awareness alone cannot explain the variability in reading abilities observed in WS and DS. Using a developmental trajectories approach, this study investigated the relationship between cognitive factors including phonological awareness, rapid automatised naming (RAN), visuo-spatial awareness, working memory, executive function, and

reading ability. The study examined which of these potential factors are predictive of, and important to the development of reading ability in WS and DS. Furthermore, participants included both child and adult groups in order to determine if the development of reading ability and comprehension is delayed or atypical. Data collection will continue until May 2015 and thus far testing sessions have been completed with 15 participants with WS, 2 with DS, and 9 TD participants aged between 8 and 16 (child group) and 18 and 40 years old (adult group).

Heterogeneity within the ASD profile: A Latent Profile Analysis of a large dataset

Elizabeth Milne

University of Sheffield

There is substantial variability in the symptom-, cognitive- and behavioural-profiles of individuals with ASD. Numerous authors have suggested that there may be subclasses of ASD. This is an enticing prospect as it raises the possibility that what is currently termed as ASD may in fact represent a constellation of distinct disorders that, while having core-symptoms in common, may have different underlying genetic pathways and aetiologies. Here I addressed the question of whether sub-classes of individuals with ASD can be empirically derived from behavioural variables. Data were obtained from the Simons Simplex Collection, which contains data from 2,643 children with ASD aged between 4 and 18. Variables representing social function, communication and repetitive behaviour were obtained from the ADI-R and / or the Repetitive Behaviour Scale-Revised, and analysed with Latent Profile Analysis, a powerful method that uses goodness of fit statistics to identify latent subclasses within continuous data. The analysis identified five subclasses within the data. These five subclasses ranged in severity of social and communication difficulties, but showed distinct clusters in terms of repetitive behaviours. A subclass of individuals with high levels of repetitive behaviour was identified which cut-across all levels of social / communication impairment severity.

Personal space regulation in young people with Autism Spectrum Disorders and Williams syndrome

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Personal space refers to the distance that individuals strive to maintain between themselves and other people (Hall, 1966). Intrusion of another person's personal space can have significant implications on the social interaction, prompting feelings of discomfort and anxiety, or transferring fallacious social intentions. In the current study, we investigated personal space awareness in two groups known to have difficulties with social functioning – Williams syndrome (WS) and Autism Spectrum Disorder (ASD) – and compared them to their typically developing (TD) peers. Parent report questionnaire data and a stop-distance paradigm showed that individuals with WS and ASD were significantly more likely than their TD peers to invade the personal space of others. The results showed that WS individuals had the least awareness of

the personal space boundaries of others. These findings suggest that despite the disorders having differing social profiles, individuals with WS and ASD can both struggle to regulate their distance during social interactions. This is discussed in relation to the amygdala, and the real-world implications of such behaviour for these socially vulnerable groups.

Deconstructing emotions in Autism

Gabriella Rundblad¹, Simona Skripkauskaitė², and Jennifer Mayer²
¹KCL
²Roehampton

This presentation seeks to add to the considerable knowledge about emotion perception in Autism, by assessing the perception and understanding of emotion and emotion words in adults with Autism. 30 autism participants and 30 controls, all adults, completed a series of tasks: matching emotions to faces, categorising emotions, and a semantic judgment task of 30 emotion words. 10 participants from each group also completed a semi-structured interview. The interview featured a series of questions ascertaining how participants acquired their understanding of emotions and emotion words and how they feel about their understanding. The interview also included a cognitive task that linked emotions to colours. This presentation will outline how performance on standard emotion perception tasks might map on to atypical categorisation and understanding of emotion words, and how individuals with autism might actively seek to improve their performance.

Electrophysiological correlates of cognitive control in young people with Tourette syndrome with and without co-occurring ADHD symptoms

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“Cognitive control” refers to a set of self-regulatory processes that facilitate voluntary control of thought and action. Efficient cognitive control is implicated in the control of tic symptoms in young people with Tourette syndrome (TS). Attention-deficit/hyperactivity disorder (ADHD) frequently co-occurs with TS and is associated with impaired cognitive control. Young people with TS and ADHD (TS+ADHD) show poorer cognitive control performance than those with TS, but how co-occurring ADHD affects underlying neural activity is unknown. We investigated this issue by examining behavioural and event-related potential (ERP) correlates of cognitive control in young people with these conditions. Participants aged 9-17 with TS, TS+ADHD, ADHD and unaffected controls performed a visual Go/Nogo task during EEG recording. Measures of behavioural performance (D-prime, RT, reaction time variability, post-error slowing) and underlying neural activity (the N2, P3, error-related negativity (ERN), error positivity (Pe) ERPs) were derived and analysed in a 2 (TS=yes, TS=no) x 2 (ADHD=yes, ADHD=no) factorial analysis to investigate effects of TS, ADHD and their interaction. ADHD was associated with poorer performance and reduced amplitude of all ERPs, reflecting widespread cognitive control impairments. TS was associated with slowed RTs, which might reflect a compensatory slowing of motor output to facilitate tic control. There was no interaction between the TS and ADHD factors for any behavioural or ERP measure, indicating the impairing effects of ADHD on behaviour and electrophysiological markers of cognitive control were present in TS+ADHD, and

that RT slowing associated with TS was unaffected by co-occurring ADHD symptoms.

Consolidation of new vocabulary in children with and without dyslexia: the role of sleep

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In adults and children, word learning is a prolonged affair that depends upon consolidation, with sleep playing an important role in strengthening new phonological representations and integrating them with existing lexical knowledge. Children with dyslexia have difficulty learning new phonological forms and have also been found to show subtle differences in sleep architecture. This study examined spoken vocabulary acquisition and consolidation in children with and without dyslexia and investigated whether individual differences in word learning were associated with sleep dynamics. Fifty-two children (27 typical readers and 25 with dyslexia; mean age= 10 years) were taught sixteen spoken novel words (e.g., “dolp heg”). Explicit memory of the new words and lexical integration were assessed via cued recall and pause detection tests respectively, immediately after learning and after 24-hour and 1-week delays. Overnight polysomnographic recordings were collected on the night after learning. Preliminary analyses suggest that, as expected, children with dyslexia recalled less novel word forms than typical readers at all time points. However, the pattern of consolidation over time, as reflected by improvements in explicit memory across time, did not differ between groups. Notably though, the typically developing children were generally slower to detect pauses in real words with a novel competitor (e.g. “dolphin”) than those without, whereas the children with dyslexia showed a smaller difference, suggesting that the new words were not as well integrated with existing lexical knowledge in the group with dyslexia. Relationships between word learning outcomes and selected features of sleep will also be discussed.

Interpreting Complex Syntax in Individuals with Down Syndrome (DS) and Williams Syndrome (WS): Evidence from Cross-Linguistic Comparisons

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University of Bristol

This two-year EU-funded fellowship at the School of Experimental Psychology in the University of Bristol investigates the links between memory and language comprehension and production among individuals with neurodevelopmental conditions. We will present some preliminary results from cross-linguistic comparisons, namely, two groups of English-speaking individuals with DS and WS and two groups of Greek-speaking individuals with DS and WS, both aged between 8 to 25 years. Their results are compared with two groups of English-speaking and Greek-speaking typically developing children. Cross-linguistic comparisons serve to circumvent certain confounds that may exist in one language alone. In this case, the comparison will indicate whether the difficulties in language function and performance observed in these conditions are the same or different across languages, in turn highlighting the fundamental difficulties that are universal to a given condition. We investigated the syntactic development of the individuals with DS and WS by testing their ability to interpret relative clauses. We employed an act-out task, that is, a task where participants were encouraged to play with a number of toys and perform the commands given by the experimenter. An example of a relative clause type

that the participants were asked to interpret is the following: 'The man who is holding the girl is hugging the baby'. Between-groups comparisons revealed significant differences in performance between the typical and atypical populations. By reporting these preliminary results we will attempt to answer the following question: Is the nature of these difficulties comparable in languages of different levels of morphological enrichment?

Predictors of language development in infants development in infants with Down syndrome

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Individuals with Down syndrome (DS) typically have marked delays in language development relative to their general cognitive development, with particular difficulties in expressive compared to receptive language, and syntax compared to vocabulary. Yet knowledge is limited with regard to which factors in very early childhood (ages between 18 and 26 months) may predict language outcomes at age 3. The aim of this longitudinal study was to assess longitudinally a group of infants with DS (n=14) and a group of typically-developing (TD) infants (n=35) matched for non-verbal ability on a variety of factors that have been shown to be related to language in typically and atypically developing infants, in order to investigate which of these factors are the strongest predictors of later language. These factors included: non-verbal mental ability, speech segmentation, initiating joint attention, initiating behavioural requests and responding to joint attention. Longitudinal analyses of the relationships between predictor measures and language outcome measures showed that speech segmentation and initiating joint attention at 9-10 months of age were the most important predictors of language at age 2 in the TD group; in the DS group however, non-verbal ability at 18 months and responding to joint attention at 26 months were the strongest predictors of language outcomes for infants with DS at age 3. These results of different precursor skills in the group with DS are discussed within a neuroconstructivist view of language acquisition.

Applying cognitive training to target executive functions during early development

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Developmental psychopathology is increasingly recognising the importance of distinguishing causal processes (i.e., the mechanisms that cause a disease) from developmental outcomes (i.e., the symptoms of the disorder as it is eventually diagnosed). Targeting causal processes early in disordered development may be more effective than waiting until outcomes are established and then trying to reverse the pathogenic process. In this talk, I evaluate a priori evidence suggesting that neural and behavioral plasticity may be greatest at very early stages of development. I also describe correlational evidence suggesting that, across a number of conditions, early emerging individual differences in attentional control and working memory may play a role in mediating later-developing differences in academic and other forms of learning. I review results from a number of completed and ongoing studies that have attempted to apply gaze-contingent training targeted at improving attention control in infants and young children.

This includes work with typical children as well as children from 'high-risk' backgrounds - including low-SES and family histories of psychiatric disorders. I also discuss a number of ways in which early, targeted cognitive training may be used to help us understand the developmental mechanisms subserving typical and atypical cognitive development

Do adults with ASD know their own minds better?

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It is well known that we have a tendency to think positively about ourselves and be overly optimistic when making predictions about our future actions. In fact, we are more accurate in our predictions of others' than of our own behaviour. Furthermore, we are less likely to help another person when in a group than when alone. Is this also the case for individuals with autism? 31 typically developed (TD) adults were compared to 36 adults with autism spectrum disorder (ASD) of comparable age and IQ. They made predictions about themselves and other people in a wide range of situations, and later experienced some similar situations in the lab, including an opportunity to help the experimenter, either in a group setting or alone. ASD adults were just as likely to help as TD participants; both groups helped more often when alone than in a group. The groups differed in the accuracy of their predictions however: TD adults thought they'd be more helpful than they really were, whilst accurately predicting how helpful other people would be. ASD adults showed a more complex pattern - they accurately predicted how helpful they would be when they were alone but thought they'd be more helpful than they really were in a group situation, whilst they fairly accurately predicted how helpful other people would be. In some situations, individuals with autism seem to know their own minds better than typically developed adults. This may be a benefit of not continuously monitoring other people's thoughts and feelings.

Abstracts for Poster Presentations

1. Response inhibition in children with developmental coordination disorder and motor difficulties

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AIMS AND METHODOLOGY: The study investigated response inhibition (RI) in 7-11 year-old children with a clinical diagnosis of Developmental Coordination Disorder (DCD; $N=23$) and motor difficulties (MD) but no diagnosis ($N=30$). Their performance on the Verbal Inhibition Motor Inhibition test, in which the response to inhibit was either a word (verbal task) or a gesture (motor task), was compared to that of typically developing (TD) children ($N=38$). It was expected that children in the DCD and MD groups would be less accurate and slower at inhibiting motor responses than TD children, while performing appropriately when inhibiting verbal responses. **RESULTS AND DISCUSSION:** Children with DCD and MD demonstrated significant difficulties in completing the motor task. They produced more errors than TD children but did not take longer to complete the task. It may be that the motor demand of the task impacted on their ability to respond accurately and discouraged them from taking extra time to attempt to perform well. In the verbal task, children with DCD and MD were as accurate as TD children but the DCD group was significantly slower than the other groups at inhibiting verbal responses. The slower performance of children with DCD in the verbal RI task may reflect inefficiency with the process of inhibiting a response, such that typical levels of accuracy can only be obtained at the expense of very slow and careful responding. These differences were evident even after subclinical symptoms of inattention and hyperactivity were taken into account in the analysis.

2. Surrogate Outcome Measures' of Cortical Timing, Early Attention, and Cognitive Vision in the Oxford 'Dolphin' Dietary Intervention Trial of Children at High Perinatal Risk of Cerebral Palsy

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'Dolphin' is a controlled trial of a dietary intervention (DHA+UMP+choline) to promote neuronal growth and synaptogenesis, with 60 treated and 60 untreated infants with perinatal brain injury (PBI) graded for severity, tested between 0-24 months on a range of visual, visuospatial and developmental measures. Transient pattern VERP latency reached adult values for most PBI infants, as for typical development, by age 6 months. In contrast, a new 'calculated' latency measure (based on the steady-state VERP phase, Lee et al, 2012) showed marked delays in PBI infants up to 1 year of age. This calculated latency, which includes timing of intracortical processing, provides the more sensitive indicator of brain development. On Fixation Shift testing

between 4-8 months post-term, PBI infants showed longer latencies and poorer accuracy to shift attention compared to typical development (Atkinson & Braddick, 2012), with performance worsening across PBI severity. In particular, PBI infants show poor cortical control when two targets compete for attention, a potential predictor of executive function deficit. On the ABCDEFV functional vision battery (sensory, cognitive and spatial vision; Atkinson et al, 2002) many PBI infants showed deficits particularly on visuo-motor, visual field and visuo-cognitive spatial tasks related to dorsal stream function, e.g. manual shape sorting, block construction. Further follow-up, including the ECAB (Early Child Attention Battery) for ages 3-6 years and motion and static form coherence measures, is currently underway. *Acknowledgments for support: The Leverhulme Trust; Castang Foundation; Oxford Biomedical Research Centre; Nutricia Advanced Medical Nutrition* to investigate if lateralisation of the identified component coincides with developmental delays.

3. Resolving ambiguity by children with autism: Psychological and linguistic perspectives

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Previous research reports a deficit in use of context to resolve ambiguous linguistic information in autism (Brock, Norbury and Nation, 2008). Seminal work by Happé (1997) demonstrated that autistic children make more errors by selecting the incorrect pronunciation of homographs than typical controls, regardless of contextual cues. However, uncontrolled confounds in homograph tasks used previously may have underestimated true levels of contextual processing in autism (Brock 2013). The current experiment controlled for these factors, and additionally assessed the extraneous factors of language and executive abilities as further determinants of performance. 32 children with autism and 32 typically developing children participated. A comprehensive cognitive assessment of children's intellectual, language and executive function abilities was conducted. Confounds in previous research were addressed by adapting the sentence items in order to match for linguistic and semantic content. Relative accuracy measures for the sentences, including both language and executive measures as covariates, assessed which, if either, contributes to the homograph effect in autism in addition to use of context. Analysis revealed significant group differences remain on the homograph task, replicating earlier research. More detailed analysis exploring the effect of language and executive ability suggest group differences remain when means are adjusted for language ability. Instead, variation in inhibitory executive control appears the key determinant of performance in autism.

4. Cognitive phenotypes in typical development and Autism Spectrum Disorder

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Objective: To investigate if different cognitive subtypes occur within typical development and Autism Spectrum Disorder (ASD). Cognitive atypicalities in central coherence (CC), executive function (EF) and theory of mind (ToM) are highly prevalent in ASD. These cognitive atypicalities could potentially be cognitive endophenotypes of ASD. Latent class analysis (LCA)

was used to identify more homogenous cognitive subgroups in typical development and ASD based on cognitive task performance. 158 adolescents diagnosed with ASD, 71 of their unaffected co-twins, and 159 controls completed twelve cognitive tasks to assess cognitive domains of local processing, central coherence (CC), executive function (EF) and theory of mind (ToM). Performance on cognitive tasks was used to index if a participant had an atypicality in a cognitive domain, defined as atypical performance in at least one task in that cognitive domain. This index was used in 6 LCAs conducted separately for each participant group. The best LCA model had 4 subgroups for ASD, 3 subgroups for co-twins and 4 subgroups for the control group. For ASD: subgroup 1 had CC, EF, ToM atypicalities, subgroup 2 had CC atypicalities, subgroup 3 had no atypicalities, and subgroup 4 had multiple atypicalities. Few individuals had cognitive atypicalities in typical development. However, multiple cognitive atypicalities were highly prevalent in ASD. These cognitive subgroups may be useful for informing diagnosis and treatment options.

5. Using Dynamic Assessment to Explore Early Risk Markers for Communication Difficulties

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Background: Recent work has established that dynamic assessment (DA) is a useful tool for language research and therapy. This methodology has been cited as particularly useful for client groups who are harder to assess using standardised procedures, such as bilingual children or those with Autism Spectrum Disorders. It may also provide a useful means of assessing infant communication development, as adults typically scaffold their interactions with infants and encourage learning by providing activities within the Zone of Proximal Development. However, the role of DA in investigating infant communication remains to be established through research. **Methodology:** The present study is using a prospective longitudinal design to explore early communication development in infant siblings of children with Autism Spectrum Disorder and/or language impairment (n=20), as compared to control children (n=40). DA of imitation, receptive language, turn taking and joint attention is being conducted at 9-15 months of age, and the ability of this procedure to predict language and social communication outcomes at age 2 is being investigated. **Results:** Results will be presented based on analysis of the Time One assessment data. Preliminary results indicate that using DA adds to the ability of standardised measures to predict concurrent receptive language development. Motor imitation ability in infancy appears to have a particularly strong relationship to language skills. **Conclusions:** Dynamic assessment appears to be a useful emerging tool for investigating infant communication development. Replication in further studies will be needed in the future.

6. Are pragmatic language impairments in Autism Spectrum Disorders and Attention-Deficit/Hyperactivity Disorder the same? Profiles, severity and cognitive underpinnings

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Autism spectrum disorders (ASD) and attention-deficit/hyperactivity disorder (ADHD) are associated with overlapping symptomatology and there is a debate in the literature around how

best to discriminate these disorders. Empirical research into one of these overlapping symptoms, pragmatic language impairments, was evaluated. It was predicted that consistent means by which to distinguish between the disorders' relative profiles, extent, and cognitive underpinnings of the impairments would be identified. Following a thorough review, it was concluded that there is evidence to suggest impairments in communicative intent, presupposition, and discourse management in both ASD and ADHD populations. Despite considerable overlap in their impairments, individuals with ASD have greater difficulties in inferring the informational and emotional state of others, and using context to infer meaning. The ASD population were also found to have more severe pragmatic impairments overall, with individuals with ADHD exhibiting impairment levels intermediate to ASD and neurotypical individuals. In addition, though inconclusive, there are multiple cognitive underpinnings associated with the impairments in ASD (theory of mind, executive dysfunction, weak central coherence), relative to just one with ADHD (executive dysfunction). Further studies including participants from both clinical groups are needed for valid direct comparisons, as well as individuals with each subtype presentation of ADHD symptoms. From a clinical perspective, a greater knowledge of the specific pattern of impairments could assist more accurate diagnoses and furthermore, given that pragmatic impairments have been shown to mediate the relationship between ASD/ADHD and their respective social difficulties, a greater understanding could lead to more effective interventions.

7. Generalisation from learned exemplars rather than prototype abstraction during categorisation tasks by adults with Autism Spectrum Disorders (ASD)

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Differences in categorisation processes have been proposed to contribute to the social and non-social symptoms in ASD (Plaisted, 2001), yet the existing literature is inconclusive as to their nature. We relate this to the stimuli used in previous studies. Concrete, pictorial stimuli, whose features vary qualitatively, are generally categorised well in ASD. Conversely, abstract stimuli, which vary quantitatively, pose more of a challenge. We assessed categorisation in adults with ASD using dot pattern stimuli. Using two different methods to create exemplar distortions of the prototypes (Vladusich et al., 2010), we produced 'discrete' and 'continuous' stimuli, analogous to the pictorial and abstract stimuli used in previous research. Following categorisation training on medium distortion stimuli, participants categorised novel prototypes, low, medium, and high distortions and familiar medium distortions learned during training. For continuous stimuli, control adults demonstrated typicality effects, whereby accuracy increased for stimuli closer to the prototype. In contrast, ASD adults demonstrated a steep drop in performance from familiar medium distortions to all novel stimuli. For discrete stimuli, neither group showed typicality effects and both showed greatest accuracy for familiar medium distortions. We suggest that categorical processing in ASD relies on generalisation from memory of specific exemplars, and perhaps the application of rules, even for complex stimuli which are less amenable to rule use. Such a processing style appears to be recruited more flexibly in control individuals depending on stimulus type and utilised alongside more associative, similarity-based processing.

8. Peak gamma frequency in autism spectrum conditions

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Atypical sensory perception is common in individuals with autism spectrum conditions (ASC). For instance, in the visual domain, individuals with ASC display enhanced orientation discrimination thresholds (Bertone et al., 2005). As increased neural inhibition is highly implicated in the orientation discrimination process, the aim of the current study is to see whether this neural mechanism might be altered in ASC. Peak gamma frequency has been suggested to measure the balance between excitation and inhibition, with a higher peak gamma frequency indicating higher levels of neural inhibition (Brunel & Wang, 2003). In line with this, peak gamma frequency and orientation discrimination thresholds are related (Edden et al., 2009; Dickinson et al., under review), with those with a higher peak gamma frequency displaying better orientation discrimination thresholds. We measured orientation discrimination thresholds and separately recorded electroencephalography (EEG) to measure gamma activity in individuals with ASC and a matched control group. Data collection is in the final stages of completion (N=86). Initial analysis suggests that orientation discrimination thresholds are lower in individuals with a diagnosis of autism. Analysis of EEG data will inform us whether a higher peak gamma frequency co-occurs with this enhanced visual ability. Measuring peak gamma frequency is a novel technique in ASC, and may provide insight into whether the excitation/inhibition balance is altered in autism. In addition, measuring this alongside orientation discrimination will allow us to see whether this neural mechanism may be contributing towards altered visual perception in ASC.

9. Complex Sequence Learning in Developmental Dyslexia

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Implicit learning underlies the acquisition of various critical skills, including reading. Previous research has reported that certain implicit learning tasks are impaired while others are spared in developmental dyslexia (e.g., Pothos & Kirk, 2004; Vicari et al. 2005; Howard et al. 2006; Russeler et al. 2006). In the present study, we used the Alternating Serial Reaction Time (ASRT) paradigm (Howard & Howard, 1997; Nemeth et al., 2010) to assess implicit probabilistic sequence learning in both children (18 dyslexic and 20 normally-developing 12-year-olds), and adults (15 dyslexic and 22 normal 20-year olds). The ANOVA revealed sequence-specific learning ($p < 0.001$), as well as general skill learning ($p < 0.001$). The two groups (dyslexic and control) did not differ either in overall sequence-specific or in general skill learning, regardless of the age group (all p 's > 0.34). However, dyslexic children were generally slower compared to the typically developing children ($p = 0.015$), though this difference disappeared in the adult groups ($p = 0.71$). Results are discussed with regard to previous findings. In particular, it is suggested that the mixed pattern of results of implicit sequence learning in dyslexia can be accounted for by the type of the sequence, the explicitness of the stimuli, and the nature of the task demands.

10. Executive function and working memory in pupils with literacy and / or language impairment

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The presence of additional oral language difficulties (language impairment) in dyslexic pupils is common but this overlap is not well understood. This session presents the findings of an ongoing PhD project, which aims to disambiguate the overlap between language impairment and dyslexia in terms of verbal and non-verbal executive function and working memory. It is anticipated that those with literacy impairment will show verbal but not non-verbal short-term memory, working memory and executive function impairment. Individuals with additional language impairments will show both verbal and non-verbal working memory and executive function impairment. Language impaired individuals will show verbal but not non-verbal short-term memory impairment. Pupils aged 12-15 years with literacy, language or both literacy and language difficulty completed a range of tasks. These included a verbal Auditory Stroop task and a non-verbal Arrow Simon task assessing inhibition. They also completed the verbal Digit Span task and non-verbal Corsi Blocks task both forwards, assessing short-term memory, and backwards, assessing working memory. Results for all three impaired groups are presented in comparison to a chronological age matched group and younger literacy and language matched groups. We suggest that verbal short-term memory difficulty leads to verbal working memory and executive function difficulty in dyslexic pupils. For language-impaired pupils, difficulty in both verbal short-term memory and the domain general central executive leads to verbal and non-verbal working memory and executive difficulties. By establishing the underlying cognitive profiles of pupils with language and literacy difficulty we hope that more targeted intervention can be developed.

11. Studying risk and protective factors that might link Down syndrome in children aged 4 to 16 years to subsequent Alzheimer's disease

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Objectives: Down syndrome (DS) is caused by the presence of an extra chromosome 21, where the amyloid precursor protein gene lies. This gene produces amyloid protein, the main component of β -amyloid plaques that, along with hyperphosphorylated neurofibrillary tau tangles, make up the pathological brain characteristics of Alzheimer's disease (AD). 100% of people with DS will develop this brain pathology but, although there is higher rate of AD than the typically developing population, (around 50% age 50 display symptoms); it never reaches full penetrance. This study investigates the presence of individual differences that increase or decrease the likelihood of individuals with DS developing AD. The genetic nature of DS ensures that the changes leading to potential AD are present from conception; indeed, β -amyloid deposition has been observed in children with DS from aged 8 onwards, which is why the study of children is viable. **Methods:** Seventy children between the ages of 4 and 16 were recruited, with and without DS. These individuals were assessed for genetic, neural, cognitive, behavioural, and environmental factors, in order to create rich individual profiles and to compare these to identify genetic links to altered behaviour or phenotypic alterations linked to atypical neural pathways. **Results:** I present the preliminary results of our analysis of the first year of

research, where we expect (from early analysis) interesting relationships between changes in behaviour/memory over time, correlated to parental scores in education and sleep measurements.

12. Ensemble Perception of Emotions in Children with Autism is Similar to Typically Developing Children

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Ensemble perception, the ability to assess rapidly and automatically the summary of large amounts of information presented in visual scenes, is available early in typical development (Sweeny et al., 2014). This ability might be compromised in children with autism, who are thought to present limitations in maintaining and/or using summary statistics representations for the recent history of sensory input (Pellicano & Burr, 2012). Here we examined ensemble perception of emotions in 27 children with autism and 27 age- and ability-matched typical children, all aged between 6 and 14 years, and 21 typical adults. Participants received three tasks: a) an average (ensemble perception) emotion discrimination task, assessing their ability to judge the average happiness of a set of ‘morphs’; b) a non-average emotion discrimination task, evaluating baseline emotion discrimination; and c) a face identification task, estimating their ability to identify morphs previously presented to them. Unexpectedly, children with autism were indistinguishable from typical children in their precision and accuracy on all three tasks. The two groups of children performed qualitatively similar to adults on all three tasks but presented worse precision and accuracy. Computational modelling suggested that children with and without autism used ensemble-encoding strategies to the same extent, but both groups used such strategies to a lesser extent than adults. Eye-movement data showed no group differences. Our findings suggest that ensemble perception of emotions in autistic children is maturing in a largely similar fashion to typical children, as are abilities for baseline emotion discrimination and identification of previously-seen faces.

13. How efficient is the brain? Attention development in term-born and premature infants

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The ability to shift attention improves during infancy. Developmental delays in attention shifts can predict developmental disorders, including ADHD and autism (cf. Atkinson & Braddick, 2012). They can be detected from early infancy onwards using the Fixation Shift Paradigm (FSP, Atkinson, Hood, Wattam-Bell & Braddick, 1992), which measures the latency of a saccadic shift from a central stimulus to a peripheral target. We used eye-tracking as an automated measure of overt attention shifts in the FSP and combined it with electroencephalography (EEG) to simultaneously monitor saccades and brain responses in 80 infants between 1 and 8 months and 27 adults. Results show a significant decrease of saccade

latency with age, confirming an improving ability to shift attention. Frontal areas of the cortex, coinciding with the Frontal Eye Fields (FEF), are involved in attention shifts in all age groups. Frontal positivity is broadly distributed in infants, becoming more lateralised with age and only occurring in the hemisphere contralateral to the target stimulus in adults. This change might reflect a more efficient cortical organisation in adults compared to infants, allowing them to shift attention more rapidly. Results will be discussed in relation to the development of cortical and subcortical attention systems. The lateralisation of the developing ERP component could be an indicator of maturation of cortical systems. We are currently testing mildly premature infants who are more susceptible to attention deficits

14. Visual word learning in adults with dyslexia

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We investigated word learning in university and college students with a diagnosis of dyslexia and in typically reading controls. Participants read aloud short (4-letter) and longer (7-letter) nonwords as quickly as possible. The nonwords were repeated across 10 blocks, using a different random order in each block. Participants returned 7 days later and repeated the experiment. Accuracy was high in both groups. The dyslexics were substantially slower than the controls at reading the nonwords throughout the experiment. They also showed a larger length effect, indicating less effective decoding skills. Learning was demonstrated by faster reading of the nonwords across repeated presentations and by a reduction in the difference in reading speeds between shorter and longer nonwords. The dyslexics required more presentations of the nonwords before the length effect became non-significant, only showing convergence in reaction times between shorter and longer items in the second testing session where controls achieved convergence part-way through the first session. Participants also completed a psychological test battery assessing reading and spelling, vocabulary, phonological awareness, working memory, nonverbal ability and motor speed. Regression analyses found that decoding ability, measured as the speed of reading aloud nonwords when they were presented for the first time, was predicted by a composite of word reading and spelling scores (“literacy”). Word learning was assessed in terms of the improvement in naming speeds over 10 blocks of training. Learning was predicted by vocabulary and working memory scores, but not by literacy, phonological awareness, nonverbal ability or motor speed. The results show that young dyslexic adults have problems both in pronouncing novel words and in learning new written words.

15. Cognition and Behaviour in Sotos Syndrome: A Systematic Review

Chloe Lane, Elizabeth Milne, and Megan Freeth

A systematic review of all published literature providing data on cognition and behaviour in individuals with Sotos syndrome was conducted. Web of Science, PubMed and Scopus were searched for relevant articles written in English and published in a peer-reviewed journal between 1964 and 2014. In addition, only primary research providing data on cognition and/or behaviour in an individual or individuals diagnosed with Sotos syndrome were reviewed. Forty-one journal articles met inclusion criteria. Within this literature, data relating to cognition and behaviour in 577 individuals with a diagnosis of Sotos syndrome were reported. Sixteen papers reported experimental data on cognition and/or behaviour. The remaining papers employed a case study design. In terms of the behavioural literature, key themes that emerged were

increased incidence of ASD, ADHD and aggression/tantrums within the identified research population. In relation to cognition, intellectual disability was present in the majority of individuals with Sotos syndrome. As measured by a standardised research quality checklist, the papers scored in the range of 1.7 – 9.5 (out of 10) highlighting the varying quality of the literature in this area to date, with many studies being rated as moderate or low quality. In order to establish whether there is a cognitive profile associated with this syndrome, future research should focus on investigating ability and disability in specific cognitive domains in a representative sample of individuals with Sotos syndrome.

16. Phonological awareness and cognitive abilities in Down syndrome: the search for precursors

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There is a strong body of evidence in the literature that points to a relationship between phonological awareness (PA) and reading skills in typically developing (TD) children (Bradley & Bryant, 1983; Goswami & Bryant, 1990; Carroll, Snowling, Stevenson, and Hulme, 2003). However, this relationship is less clear for children with neurodevelopmental disorders such as Down syndrome (DS), who may present with a different, weaker phonological relationship than TD children (Gombert, 2002), or another kind of pattern for learning to read, that relies on visual skills rather than phonological skills (Rocha & Jarrold, 2008). This study aims to investigate the precursors of PA in TD children and in children with DS, in order to 1) understand the differences between these two populations in terms of whether PA constitutes the same basic support for cognitive abilities, and 2) provide insights for early intervention to bootstrap phonological awareness and, in a cascading effect, reading skills. To reach this aim, we are correlating measures of PA with measures from several perceptual and cognitive tasks (e.g. phonological memory, sustained attention, executive function, sound/pitch discrimination, inhibition, rapid naming and sentence repetition). By identifying the precursors of phonological awareness in more basic-level cognitive abilities, we can provide a better understanding of how phonological awareness develops, and then devise intervention strategies for different developmental trajectories and populations.

17. Inferencing from text: It's vocabulary that matters

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Purpose: Many children with communication disorders have reading comprehension difficulties, and in order to target interventions effectively it is important to identify which specific components of comprehension are especially challenging. The current study explored the relationship between text inferencing skill, autistic symptomatology and language phenotype.

Method: Typically developing children ($n=32$), children with autism spectrum disorders (ASD) and age-appropriate structural language skills (ALN; $n=27$), children with ASD and language impairment ($n=15$) and non-autistic children with language impairment ($n=12$) were administered the Neale Analysis of Reading Ability-II and responses to literal and inferential questions were analysed. **Results:** For the sample as a whole, inferencing competence was predicted by oral language skill, with autistic symptomatology not contributing significant

variance. However, whilst only 12.5% of typically developing children found answering inferential questions disproportionately challenging relative to answering literal questions, one third of children with ALN demonstrated inferencing deficits, as did over 50% of children with language impairments, regardless of ASD status. **Conclusion:** These results indicate that children with language impairments are most likely to find inferencing challenging, but practitioners will also need to monitor the inferencing skills of children with ASD and good language and single word reading skills.

18. Too much or too little? The Comprehension of Overstatements and Understatements in Typically Developing (TD) Individuals and those with Autism Spectrum Disorders (ASD)

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Figurative language, such as metaphor, irony, overstatements, and understatements, are ubiquitous in everyday language and play a significant role in how we conceptualise thought and the world around us. It is an aspect of language that individuals with Autism Spectrum Disorders (ASD) are known to have difficulties with, for which current research is yet to determine a singular cause. Much of the available research into figurative language comprehension, whether for ASD or typically developing (TD) individuals, focuses primarily on metaphor and irony; hence, little is known about the comprehension of overstatements and understatements in ASD as well as in TD individuals. Similarly, we do not know how comprehension in these two populations compares, or what abilities may be a precursor for understanding these devices. The current study aimed to investigate these questions by assessing the comprehension of metaphors, irony, overstatements and understatements in TD (n=32) and ASD (n=18) participants aged between 7 and 15 years old, using a novel computerised story-completion task. Nonverbal Abilities, Receptive Vocabulary, Semantic Knowledge and first-order Theory of Mind (ToM) were also assessed. Analysis revealed that ASD participants performed worse at the figurative comprehension task compared to TD participants, particularly for irony. However, both groups performed worse on overstatements and understatements overall. Results also suggested that both Receptive Vocabulary and Semantic Knowledge predict level of comprehension of overstatements and understatements. ToM did not consistently impact performance in the ASD group.

19. Do children with autism change their behaviour in response to volatility in the environment?

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Adults can track reward probabilities across trials to estimate the volatility of the environment and modify their learning rate accordingly (Behrens et al., 2007). In a stable environment, participants take account of outcomes over many trials, whereas in a volatile environment, they weight their recent experience more strongly than their distant experience. Recent theoretical accounts suggest that individuals with autism make less use of prior information than typical

individuals. We therefore investigated whether children with autism aged 6 to 14 years ($n = 34$) change their behaviour in response to volatility in the environment to a lesser extent than age- and nonverbal ability-matched typical children ($n = 32$) and typical adults ($n = 21$). On each trial, participants chose between a green and a blue pirate chest, each associated with a randomly determined reward value. Yet, on each trial, the reward was given for only one stimulus. Participants completed this task under two conditions. In the *stable* condition, the ratio of the blue or green stimulus being rewarded was fixed at 75:25. In the *volatile* condition, the ratio alternated between 80:20 and 20:80 every 20 trials. All groups of participants increased their learning rate in the volatile condition compared to the stable condition. Critically, and as expected, children with autism updated their behaviour to a lesser extent than typical children and adults. These results provide evidence for atypical hierarchical learning in autism, and lend support for accounts proposing reduced use of prior information in autism.

20. The effects of co-occurring alexithymia on emotion recognition, mentalizing and well being in adolescents with ASD

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Autism Spectrum Disorder (ASD) is characterised primarily by difficulties in social interaction. ASD is often accompanied by difficulties in emotion processing and Theory of Mind (ToM). Research suggests that these difficulties may be in part due to a co-occurring personality trait known as alexithymia. However, it remains unclear whether alexithymia is specifically related to difficulties with emotion recognition, or if it extends to more complex social processing abilities (e.g., ToM), which are also atypical in individuals with ASD. Additionally, alexithymia is associated with emotional and health problems in typically developing populations, yet little is known about how it may impact upon the wellbeing of individuals with ASD. This paper extends previous findings by addressing the neurocognitive and behavioural correlates of alexithymia within a large, population-based sample of adolescents with ASD (*mean age = 15.46, SD = 5.72*). We found 55% of individuals with ASD reported elevated levels of co-occurring alexithymia. We compared performance on experimental tasks of emotion recognition and ToM ability between adolescents with ASD with co-occurring alexithymia and those without. Results showed that individuals with co-occurring alexithymia displayed decreased performance in tasks of emotion recognition (particularly in identifying anger), but that theory of mind ability remained comparable to those without alexithymia. We also administered questionnaires on behavioural and emotional difficulties and sensory processing. Alexithymia was associated with increased emotional difficulties and sensory processing atypicalities. Results suggest that alexithymia selectively impairs emotion processing but not higher order social cognitive functions, and contributes to additional emotional and sensory difficulties, within individuals with ASD.

21. Relationship Between Season of Birth And Educational Attainment in ALPSAC Support Existence of Relative Age Effect

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It has been suggested that season-of-birth can affect scholastic achievement and the chances of being diagnosed with a neurodevelopmental disorder. In this study, we investigate the relationship between season of birth, the presence of neurodevelopmental disorders, and scholastic attainment in children, in the ALSPAC child population cohort. We find that, as a group, Summer-born children perform better in tests of IQ, reading and spelling proficiency. Despite this, Summer-born children are more likely to be diagnosed with specific learning disorders, particularly those centred on reading and writing ability, and achieve fewer GCSEs than their counterparts. These effects are small in real terms but consistent across time points. Our data show that Summer-born children are at a disadvantage when directly compared to their classmates in subjective examinations, which do not adjust for absolute age. We suggest that such disadvantages could be offset by the use of age-normalised testing in state examinations.

22. The clinical features of Attention Deficit-Hyperactivity Disorder (ADHD) in 22q11.2 Deletion Syndrome

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Objective: Although ADHD is the most prevalent psychiatric disorder in children with 22q11.2DS, it remains unclear whether the clinical presentation of ADHD in children with 22q11.2DS is similar to that in idiopathic ADHD. The aim of this study is to compare the ADHD phenotype in children with and without 22q11.2DS by examining ADHD symptom scores, patterns of psychiatric comorbidity, IQ and gender distribution. **Method:** 46 children with 22q11.2DS and ADHD (mean age=9.6), 600 clinic children with established ADHD (mean age=10.8) and 77 children with ADHD from a population cohort (mean age=10.8) participated in the study. Psychopathology was assessed using parent-report research diagnostic instruments. **Results:** There was a higher proportion of females in the 22q11.2DS ADHD sample in relation to the other two groups ($\chi^2=22.74$, $p<0.001$ and $\chi^2=16.15$, $p<0.001$ respectively). The 22q11.2DS group showed a higher rate of ADHD inattentive type, and parents endorsed fewer hyperactive-impulsive symptoms in comparison to the clinical ($z=8.68$, $p<0.001$) and the population cohort ADHD group ($z=2.49$, $p=0.02$). The 22q11.2DS ADHD group parents reported less Oppositional Defiant Disorder/Conduct Disorder symptoms in relation to the clinical ($z=6.10$, $p<0.001$) and population cohort group ($z=-1.99$, $p=0.05$) and a higher rate of Generalized Anxiety Disorder. None of the 22q11.2 DS ADHD sample had received ADHD treatment. **Conclusions:** The clinical presentation of ADHD in 22q11.2DS is different from this in idiopathic ADHD. This could lead to clinical under-recognition of ADHD in this group. Examining psychopathology in 22q11.2DS can provide insights into the genetic origins of psychiatric problems, with implications beyond the 22q11.2DS population.

23. The relationship between temperament and brain development in infant siblings with autism spectrum disorder

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⁷The Infant Brain Imaging Study (IBIS) Network is an NIH funded Autism Center of Excellence project and consists of a consortium of 8 universities in the U.S. and Canada. Clinical Sites: University of North Carolina: J. Piven (IBIS Network PI), H.C. Hazlett, C. Chappell; University of Washington: S. Dager, A. Estes, D. Shaw; Washington University: K. Botteron, R. McKinstry, J. Constantino, J. Pruett; Children's Hospital of Philadelphia: R. Schultz, S. Paterson; University of Alberta: L. Zwaigenbaum; University of Minnesota: J. Elison; University of Calgary: G.B. Pike. Data Coordinating Center: Montreal Neurological Institute: A.C. Evans, D.L. Collins, V. Fonov, P. Kostopoulos; S. Das; Image Processing Core: University of Utah: G. Gerig; University of North Carolina: M. Styner; Statistical Analysis Core: University of North Carolina: H. Gu

Differences in temperament profiles are already present at 6 months in infants who develop autism spectrum disorder (ASD) (Paterson et al., 2014) and are some of the disorder's earliest behavioral signs. Brain imaging in these same infants has revealed that differences in white matter development are also present by 6 months (Wolff et al., 2012). Given these early differences in both domains, we aimed to characterize the association between white matter and individual differences in temperament at 6 and 12 months in infant siblings who received a diagnosis of ASD at two years. 37 infants who developed ASD (HRPos) and 83 infants with typically developing siblings (LR) were assessed longitudinally in a larger, multi-site study of brain and behavioral development in ASD, the Infant Brain Imaging Study. Temperament was assessed at 6 and 12 months using the IBQ-R (Gartstein & Rothbart, 2003) and white matter fractional anisotropy (FA) was obtained from Diffusion Tensor Imaging scans. Correlations between Surgency, Regulatory Control, Negative Affect, and FA in white matter fiber pathways at 6 and 12 months were examined. Preliminary analyses found no correlations between DTI and temperament at 12 months. However, in the HRPos group in particular, significant concurrent correlations were found at 6 months, as well as between 6-month DTI and 12-month temperament data, including between FA in the genu and uncinate fasciculus, tracts serving the orbitofrontal cortex, at 6 months and regulatory capacity at 12 months. These data will be discussed in the context of typical brain and temperament development.

24. Oculomotor function in children with and without Developmental Coordination Disorder

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Children with Developmental Coordination Disorder (DCD) present with significant motor difficulties, demonstrating problems with fine and gross motor control and coordination. Surprisingly very little research has assessed oculomotor function in these children. The aim of

this study was to compare basic oculomotor control in children with and without DCD. Twenty-five children, aged 7-10, that met the formal diagnosis for DCD were compared to 25 typically developing children matched by age and gender. Eye movements were recorded using Eyelink 1000, as children completed four tasks: fixation, horizontal smooth pursuit, and pro- and anti-saccades. The distinction between the latter tasks is that children either follow the target with their eyes when it moves from the central point (pro-saccade), or they inhibit a reflexive saccade and look in the opposite hemifield (anti-saccade) as quickly as possible when the target moves. Preliminary analyses reveal that children with DCD demonstrated significant oculomotor deficits compared to their typically developing peers. They had poorer fixation stability and made more drifts away from the visual target. They also made a higher number of saccades during smooth pursuit. Children with DCD had similar pro- and anti-saccade latencies to their peers, but they found the anti-saccade task very difficult, completing less than a quarter of the trials on average due to many anti-saccade errors. The findings are the first demonstration of oculomotor differences in children with DCD. Further examination of oculomotor dysfunction in this population may help to identify neural mechanisms involved in this disorder.

25. Processing speed does not mediate the relationship between interference control and inattention in VP children

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Background: Children born very preterm (≤ 32 weeks gestation; VP) are at increased risk for developing ADHD. In particular, the increased risk appears to be specific to symptoms of inattention, rather than hyperactivity/impulsivity. Evidence suggests that poor executive functioning (EF) may underlie inattention in general, however the different phenotypic profile of ADHD in VP versus full term (≥ 37 weeks gestation; FT) children suggests that the underlying mechanisms may differ. Some authors have suggested processing speed may mediate the relationship between EF and inattention in VP children. This study aimed to assess how switching, interference control and processing speed relate to inattention in VP and FT children. Method: A sample of 45 FT and 61 VP children aged 8-11 years with varying levels of inattention, as measured by the Conner's-3 parent questionnaire, was selected. They completed a combined switching and interference control task and the NEPSY-II finger-tapping subtest, measuring processing speed. Results: Despite no between-group performance differences, processing speed and interference control, but not switching, were significantly correlated with inattention in the VP children only. No significant relationships were found in the FT children. Mediation analysis revealed that while processing speed and interference control were related, and both explained some variance in inattention scores in the VP children, the relationship between interference control and inattention was not mediated by processing speed. Conclusions: Our findings suggest that mechanisms underlying inattentive behaviour may differ between VP and FT children, and that processing speed cannot always explain relationships between EF and inattention in VP children.

26. Dominant face processing patterns in Autism: A novel prompting paradigm and eyetracking study

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Previous research has established that people look more to the eyes than the mouth. However, the focus of first fixations to the face has received little attention. A novel prompting paradigm was designed to investigate first fixations and establish whether they can be manipulated. In this paradigm the participant had to distinguish the previously seen target face from an alternative image, where either the eyes or mouth were digitally altered. This was first conducted with no instructions on where to look (unprompted condition) and then with instructions to look to the changed region (prompted condition). Neurotypical adults found it difficult to inhibit looking towards the eyes in the prompted condition, even though this was not the optimal strategy, therefore establishing an eye dominance effect in this population. This novel paradigm is now being used for children with an autism spectrum disorder (ASD), a disorder characterised by impaired face processing as a result of reduced eye fixations. In the current study, 15 children with ASD (aged 7-11 years) are being compared to an age and IQ matched group of typically developing (TD) children. Performance on the task will be compared to a control task using houses, to establish the specificity of any findings. The data presented will establish whether ASD participants' first look locations when they view a face are different to TD participants. It will also establish whether children with ASD are able to alter their looking patterns in line with a prompt, or whether this is difficult, as in the neurotypical population.

27. The effect of visual perceptual load on auditory awareness in Autism Spectrum Disorder and across typical development

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Previous results demonstrated that when visual perceptual load increases, children and adults with ASD continue to process task-irrelevant visual stimuli whereas control participants do not, possibly reflecting an increased perceptual capacity in ASD (Remington et al., 2009; Swettenham et al., 2014). This study investigated whether the same applies for cross-modal contexts of selective attention. 26 children diagnosed with ASD and 44 typically developing children (TD), matched for chronological age and non-verbal IQ judged which line of a briefly presented cross (110ms) was longest. Participants were randomly assigned to either the high load (subtle line discrimination) or low load condition (gross discrimination). On the critical 7th trial, an unexpected, task-irrelevant auditory stimulus was played concurrently with the visual stimulus. Participants were then asked whether they had noticed anything else. TD children were more likely to notice the auditory stimulus in the low vs. high visual load task, $p = .005$. This was not the case however for children with ASD, who demonstrated similar detection rates across perceptual load conditions, yet reported greater awareness than controls in the high perceptual load condition, $p = .004$. Awareness rates for an auditory stimulus were reduced for TD controls under high visual perceptual load, but remained unaffected in children with ASD. These findings extend the hypothesis that individuals with ASD have an increased perceptual capacity to contexts involving cross modal selective attention. Additional findings on the effect of visual perceptual load on auditory awareness in TD children, adolescents and adults will also be presented.

Notes

College Map



ST. CATHERINE'S COLLEGE
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