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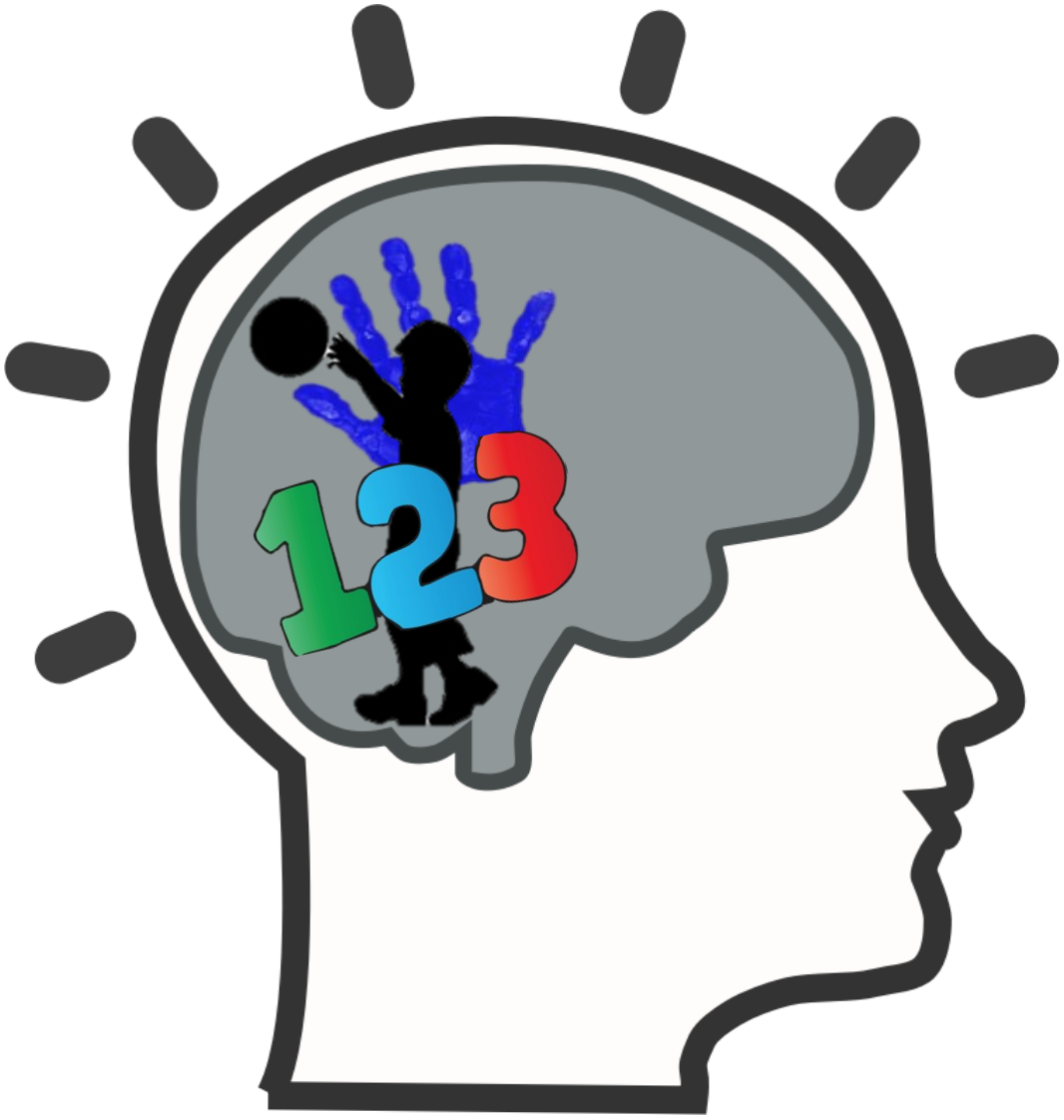

Neurodevelopmental Disorders Annual Seminar 2016

23rd June 2016

Institute of Education,

University College London

CoGDeV Lab

UCL

Institute of Education

www.cogdevlab.weebly.com/

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Dear colleagues,

Emily Farran and the Cognition, Genes and Developmental Variability (CoGDeV) lab (@cog_dev_lab; http://cogdevlab.weebly.com/) welcome you to UCL Institute of Education, for the Neurodevelopmental Disorders Annual Seminar 2016 (NDAS16). The seminar series started in 2012-2013 as a collaboration between Jo Van Herwegen, Emily Farran and Deborah Riby and provided a platform for early career as well as established researchers to discuss the application of recently developed tools and innovative research methods to the study of neurodevelopmental disorders. Due to the success of these initial seminars and the enthusiasm of the delegates, we formed a larger committee and launched the Neurodevelopmental Disorder Annual Seminar.

NDAS16 could not have come together without the help and contribution of many people. We thank them all. First, we would like to thank the keynote speakers who have given up their time and travelled to be here with us. We also thank all of you who are presenting an oral presentation or poster. I would personally like to thank the rest of the committee: Jo Van Herwegen, Deborah Riby, Gaia Scerif and Chris Oliver. Particular thanks goes to Emma Campbell, Leighanne Mayall, and the rest of the CoGDeV lab who did a large amount of the behind the scenes work.

We hope that you will enjoy the day, and for those of you who are attending tomorrow's workshop that you find that equally stimulating. We look forward to seeing you next year at Kingston University.

Dates for your diary:

Neurodevelopmental Disorders Annual Seminar 2017, 29th June 2017, Kingston University

Neurodevelopmental Disorders Workshop 2017, 30th June 2017, Kingston University

Student Bursaries

As part of the Neurodevelopmental Disorder Annual Seminar series, we will award student bursaries of up to £75 for each seminar, to contribute to the costs of conference registration and travel.
Congratulations to this year's awardees of student bursaries:

Magda Glod
Maria Pino
Sarah Watts
Amanda Gilhooly
Sophie Landa

Follow the day on Twitter:

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#NDAS16

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Oral Presentation Schedule

Time	Session A: Committee Room 1	Session B: Nunn Hall
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9.10	Spatial selection during movement preparation in adults with and without Developmental Coordination Disorder: An electrophysiological investigation *Xavier Job*	Executive functioning in Autism Spectrum Disorder: Charting inter-individual differences and delineating more homogenous subgroups *Lien van Eylen*
9.30	Overlapping but distinct profiles of motor and social skills in Autism Spectrum Disorder and Developmental Coordination Disorder *Hayley Leonard*	Investigating executive function in toddlers at risk for Autism Spectrum Disorder and/or Attention Deficit Hyperactivity Disorder *Alexandra Hendry*
9:50	Oculomotor control and motor ability in children with Autism Spectrum Disorders *Emma Sumner*	Childhood cognitive flexibility and theory of mind predict later behavioural difficulties in Autistic adolescents *Lorcan Kenny*
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11.30	Temporal and spatial perspective taking with Autism Spectrum Disorder *Hide Komeda*	Recognition of emotional expressions of varying intensity in children with and without Autism Spectrum Disorder *Sarah Griffiths*
11.50	Investigating visual integration in ASD using collinear facilitation *Emma Gowen*	Understanding strategic information use during emotional expression judgements in Williams syndrome *Louise Ewing*
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2.40	Comprehension of quantifiers and numerals in Autism Spectrum Disorders *Alexandra Perovic*	Looking but not learning: differences in gaze cue reading, visual attention and learning in 14 month old infants at risk for autism *Janet Parsons*
3.00	What has neuroscience taught us about the nature of mathematical difficulties? *Ann Dowker*	Relationship between recurrent infections and cognitive abilities an decline in Down Syndrome *Carla Startin*
3.20	The influence of domain-general and domain-specific abilities on number development in two neurodevelopmental disorders *Jo Van Herwegen*	Sleep and language development: A cross-syndrome infant study *Dean d'Souza*
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Poster Presentations

Session 1

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2. In-depth investigation of the face selective N170 ERP component in Williams Syndrome *Louise Ewing*
3. The development of route knowledge and configural knowledge of large-scale space in typical development, Down syndrome and Williams syndrome *Emily Farran*
4. An ERP / EEG investigation of the neural correlates of attention and inhibition in adults with Williams syndrome *Joanna Greer*
5. Studying risk and protective factors that might link Down syndrome in children aged 4 to 16 years to subsequent Alzheimer's disease *Kate Hughes*
6. Sleep and early cognitive development in children with Down syndrome *Anna Joyce*
7. Cognitive profile of Sotos syndrome *Chloe Lane*
8. Motor and spatial development in typical development and Individuals with Williams syndrome *Leighanne Mayall*
9. Brain and behaviour in Prader-Willi syndrome *Katherine Manning*
10. Differentiating subgroups of preschool children at risk for Mathematical Learning Disabilities *Bethany Nicholson*
11. Grammatical morphology in bilingual Williams syndrome: A single case study *Alexandra Perovic*
12. The effect of parental responsivity on language development for children with Down syndrome *Emily Seager*

13. Does viewing an object elicit internal motor programs for children with Developmental Coordination Disorder? *Emma Sumner*
14. Pathways to attention deficit hyperactivity disorder: the tuberous sclerosis model *Charlotte Tye*
15. Cycles phonological approach for remediating the phonological disorders in children with Down syndrome: A case study *Najwa Yousif*

Session 2

16. The relationship between theory of mind, social motivation and mimicry in autism spectrum condition. *Roser Canigueral*
17. The effect of autism and employment status on mental health and well-being. *Lisa Dockery*
18. Is visual search truly outstanding in autism? Search organization and categorical search in young children at risk *Brianna Doherty*
19. Predictors of adaptive behaviour, quality of life and behaviour problems in children with ASD *Kris Evers*
20. Atypical information-use in children with autism spectrum disorder during judgments of child and adult face identity *Louise Ewing*
21. Causal attributions, predictions and their relationship to heightened approachability in Williams Syndrome. *Amanda Gillooly*
22. Syndromic autism: fact or fiction? *Jennifer Glennon*
23. Sensory atypicalities in dyads of children with Autism Spectrum Disorder (ASD) and Their Parents. *Magdalena Glod*
24. Measuring anxiety in young children with Autism Spectrum Disorder: How effective is the Spence Children's Anxiety Scale? *Sophie Landa*

25. Compensating for social impairments in Autism Spectrum Disorders: A mechanism for adult outcome? *Lucy Livingston*
26. Interpersonal distance regulation in children with Williams syndrome: The effect of familiarity *Emma Lough*
27. When do children with autism spectrum disorder take common ground into account during communication? *Louise Malkin*
28. Symptoms and neurocognitive correlates of co-occurring anxiety in children at familial risk for Autism Spectrum Disorder *Bosiljka Milosavljevic*
29. How social vs. visual perspective-taking determine the interpretation of linguistic reference by 8-11-year-olds with ASD and age-matched peers *Lucy Pettifor*
30. A Longitudinal Investigation of Social and Communication Difficulties as a Risk Factor for the Development of Social Anxiety Symptoms. *Hannah Pickard*
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Abstracts for Keynote Speakers

Megan Freeth, University of Sheffield

Putting the "Social" into our Understanding of Autistic Social Cognition

Social cognition is a fundamental area of difficulty for autistic individuals. However, the vast majority of our knowledge of the core mechanistic differences in social cognition between autistic and neurotypical individuals comes from laboratory based studies where a social partner is not physically present. If we are to fully understand how the social world is perceived, processed and represented by autistic individuals we need to build that understanding using paradigms that involve genuine social encounters. This will help us to more effectively view the world through autistic eyes and understand the lived experience. In this talk I will present data from a range of different paradigms that involve, and manipulate, social presence in order to more fully comprehend the nature of autistic social cognition. I will discuss the challenges faced in using such paradigms but also the benefits and insights that this approach can produce.

Elisabeth L. Hill, Goldsmiths, University of London

Moving on up: the importance of the motor system in studying atypical development across the lifespan

Motor skill is central to everything that we do. No part of our daily lives can be achieved without a good degree of motor competence, and this has a significant impact on our ability to engage in the world, to support ourselves socially and economically and to achieve our full potential. Yet motor skill has generally been neglected when considering both typical and atypical development. Moreover, general awareness of a neurodevelopmental disorder diagnosed on the basis of motor difficulties – developmental coordination disorder (DCD; sometimes referred to as dyspraxia) – is relatively restricted within the general population and among professionals. This despite the fact that DCD is no less common than many other neurodevelopntal disorders that are widely recognised.

Fortunately the situation is changing. Inme recent years there has been a gradual increase in recognition of a raised level of motor difficulties within a range of neurodevelopmental disorders including autism, dyslexia, language impairment and ADHD. Similarly, the impact of motor difficulties on the development of a range of cognitive abilities, including social skills and language, is gradually being recognised in both typical and atypical development. Motor skill is now known to impact on activities of daily living, psychosocial factors, educational achievement and, in the longer term, on health, well-being and employment outcomes. In this talk, I will present evidence to illustrate the importance of motor skill in typical and atypical development across the lifespan using a range of methods and population groups. I will argue that motor development does not need to be the Cinderella of psychological research and a focus should be placed on the lifespan impact of such difficulties.

Abstracts for Oral Presentations

Executive Functioning in Children with Developmental Coordination Disorder and Motor Difficulties: a 2-Year Longitudinal Study

Maria. Bernardi[1], H.C. Leonard[2], E.L. Hill[3], N. Botting[1] & L.A. Henry[1]
[1]Division of Language and Communication Science, City University London
[2]University of Surrey, Guildford · School of Psychology
[3]Department of Psychology, Goldsmiths, University of London

The study aims to provide a longitudinal perspective of executive functioning (EF) in children with motor coordination difficulties and in children with a diagnosis of developmental coordination disorder (DCD). A group of 7-11 year old children (*N*=51) were assessed on screening measures of reasoning, language and motor skills, and a comprehensive battery of EF was administered. After 2-2.6 years children completed the same EF assessment battery, which included a verbal and a non-verbal measure for each of the following EFs: executive-loaded working memory, fluency, response inhibition, planning, and cognitive flexibility. Typically developing children (TD: *N*=17) were compared to those with a clinical diagnosis of DCD (*n*=17) and those with motor difficulties (MD: *N*=17), who were screened for motor impairments but had no diagnosis of DCD. At Time 1 children with DCD and MD had significantly lower scores than TD children on all of the non-verbal EF tasks. Children with DCD were similarly accurate to the TD children on verbal tasks of executive-loaded working memory, planning and switching. There was no difference between MD and TD children on all verbal EF measures. Two years later, at Time 2, children with DCD demonstrated significant gains in their non-verbal planning and switching abilities, compensating any difference to the TD group, although their difficulties in fluency, inhibition and non-verbal working memory persisted. The non-verbal EF profiles of children with MD remained significantly poorer than TD children.

Poor mathematical and visuospatial abilities in children with Cerebral Palsy: Are they related?

Emma Campbell[1], David Messer[2], Valerie Critten[2] and Emily Farran[1]
[1] Psychology and Human Development, UCL Institute of Education, [2] Centre for Research in Education and Educational Technology, Open University

Compared to their typically developing (TD) peers, difficulties in mathematics are much more likely in children with cerebral palsy (CP). Diminished locomotor experiences may mean that those with CP do not develop proficient spatial skills. Given the well-established link between visuospatial and mathematical abilities, it is possible that a deficit in spatial ability is a limiting factor for mathematical development in this group. The current study compared the mathematical ability (Wide Range Achievement Test- Fourth Edition) and visuospatial ability (Test of Visual Perceptual Skills [TVPS-R], Corsi Span, mental rotation) of a group of 37 children with CP, to 51 TD children. Verbal and non-verbal IQ were measured using the British Picture Vocabulary Scale and British Ability Scales III Matrices subtest. Despite comparable mental age on the IQ measures, the CP group had significantly poorer mathematical ability than the TD group. This was also the case for Corsi Span, Mental Rotation and the TVPS-R scores. When controlling for raw IQ scores, results suggested that low mathematical ability of the CP group was mediated by poor performance in visual-

perceptual and visuospatial tasks. In comparison, mathematical ability was highly correlated with Corsi Span for the TD group. These findings suggest that mathematical ability is impaired in children with CP, and may be related to a visuospatial processing deficit. In future, it will be important to investigate the root of any variance in such cognitive deficits, for example the aetiology of CP and degree of motor impairment.

What has Neuroscience Taught us about the Nature of Mathematical Difficulties?

Ann Dowker, Department of Experimental Psychology, Oxford University.

Neuroscience is exerting an increasing influence on education, through the application of the findings of brain-based research to guide approaches to teaching and intervention. Studies in neuroscience have informed the development of interventions for arithmetic: in particular through what they have taught us about the componential nature of arithmetic. The most striking evidence for the functional separability of different components of arithmetic (e.g. exact calculation and estimation) comes from neuropsychological studies of acquired dyscalculia. Functional brain imaging studies also provide converging evidence that different components of arithmetic can involve different brain areas and networks. Converging evidence comes from many behavioural studies of both children and adults, which indicate that discrepancies between different components of arithmetic are common in both typically and atypically functioning individuals. I will discuss the implications of the componential nature of arithmetic for our understanding of the nature of dyscalculia and whether it can be seen as a single entity. The implications for planning and formulating interventions with children with arithmetical difficulties will also be discussed. I will discuss one particular intervention, Catch Up Numeracy, which was developed on the basis of the componential nature of arithmetic.

Sleep and language development: A cross-syndrome infant study

Dean D'Souza[1], Hana D'Souza[1], Klara Horvath[2], and Annette Karmiloff-Smith[1]
[1]Centre for Brain and Cognitive Development, Birkbeck, University of London
[2]Department of Experimental Psychology, University of Oxford

Sleep is a fundamental constraint on brain and cognitive development. Here, we investigate its effects on language acquisition in 60 infants and toddlers with different neurodevelopmental disorders (Down [DS], fragile X [FXS], and Williams [WS] syndrome) and 60 typically developing (TD) controls. This is important for three reasons: (1) anecdotally, sleep is particularly disrupted in infants and toddlers with a neurodevelopmental disorder; (2) because early sleep measures predict later cognitive outcomes in typically developing (TD) children (see Ednick et al., 2009, for review), they may also predict outcomes in *atypically* developing children; and (3) sleep may provide a useful target for syndrome-specific interventions. We collected sleep and vocabulary-size data using a 10-day sleep diary (the Sleep and Naps Oxford Research Inventory; Horvath & Plunkett, in press) and parent report questionnaire (the Oxford Communicative Development Inventory; Hamilton, Plunkett & Schafer, 2000). DS, FXS, and WS were selected for comparison because sleep is disrupted in older children with these neurodevelopmental disorders (e.g., Ashworth et al., 2013; Annaz et al., 2011, 2013). Cross-sectional developmental trajectories and multi-level linear models confirm that sleep variables are indeed associated with

vocabulary size in TD children. They also show that sleep patterns are disrupted in infants and toddlers with a neurodevelopmental disorder. However, although relationships between sleep and language were found in TD and WS, they were absent in DS or FXS. This suggests differential effects of disrupted sleep on language acquisition.

Developmental specialization of the motor system in infants and toddlers with Down syndrome

Hana D'Souza[1,2], Jolanta Golan[1], Andrew J. Bremner[2], & Annette Karmiloff-Smith[1]
[1]Centre for Brain and Cognitive Development, Department of Psychological Sciences, Birkbeck University of London
[2]Sensorimotor Development Research Unit, Department of Psychology, Goldsmiths University of London

A growing body of evidence indicates that the infant brain starts out "broadly tuned", producing more widespread activation in response to stimuli than later in development. Such an account has hitherto been applied to socio-cognitive development. We investigate whether purposeful action is also initially "broadly tuned" and widespread across limbs. In a series of experiments, we found that *extraneous movements* (movements in the other limbs that accompany the movement of a limb engaged in goal-directed action) decreased between 9- and 12-months of age in typically developing (TD) infants. Thus, we concluded that infant motor activity starts out broadly tuned and becomes progressively specialized over development. We subsequently extended our investigation to include children with Down syndrome (DS), because this population is known to have motor difficulties. Thirteen infants and toddlers with DS and 24 TD controls were presented with small objects and encouraged to reach for them. Extraneous movements accompanying unimanual reaches were analysed using cross-sectional developmental trajectories. This analysis indicated delayed motor specialization in DS. This was the case for trajectories based on chronological age as well as mental age, suggesting that the developmental decrease of extraneous movements in DS is delayed beyond what would be expected for children at that developmental level. Taken together with growing evidence that motor difficulties often appear before the onset of other behavioural symptomatology in disorders of unclear etiology, this opens up an important line of research in the possibility of using extraneous movements as an early marker of neurodevelopmental difficulties.

Understanding strategic information use during emotional expression judgments in Williams syndrome

Louise Ewing[1], Annette Karmiloff-Smith[1], Emily K. Farran[2] & Marie L. Smith[1]
[1]Centre for Brain and Cognitive Development, Birkbeck, University of London
[2]Psychology and Human Development Department, UCL Institute of Education

Face processing is widely characterized as a strength in individuals with Williams syndrome (WS). Critically, however, research to date has been strongly focused on the processing of identity and the status of emotional expression-reading abilities is far less clear. Few have tackled this aspect of social perception empirically, but several studies report only mental-age appropriate skills in this domain (i.e., not constituting a perceptual strength, in contrast to identity processing). Disparity between identity and emotion processing skills is theoretically important: potentially raising questions about the contribution of social interest

and motivation to face perception (such a mechanism should broadly benefit processing skills). Still it remains possible that expression processing reflects atypical underlying processing strategies in WS. With this study, we take the most fine-grained look at emotion processing strategies in WS to date, using a cutting edge reverse correlation approach ('Bubbles'; Gosselin & Schyns, 2001) to pinpoint and contrast the specific visual features driving judgments of facial expression in a large group of individuals with WS and two neurotypical control groups (similar age, similar mental ability). Improving our knowledge regarding the capacity of face processing systems to compensate for atypical neural architecture advances our understanding not only of social processing in WS, but also of the processes underpinning typical face processing.

Sensory Atypicalities in Dyads of Children with Autism Spectrum Disorder (ASD) and Their Parents.

Magdalena Glod[1], Deborah M. Riby[2], Emma Honey,[3] & Jacqui Rodgers[1]
[1] Institute of Neuroscience, Newcastle University, UK
[2] Department of Psychology, Durham University, UK
[3] School of Psychology, Newcastle University, UK

Sensory atypicalities are a defining feature of autism spectrum disorder (ASD). To date, the relationship between sensory atypicalities in dyads of children with ASD and their parents has not been investigated. Exploring these relationships can contribute to an understanding of how phenotypic profiles may be inherited, and the extent to which familial factors might contribute towards children's sensory profiles, and constitute an aspect of the broader autism phenotype. Parents of 44 children with ASD and 30 typically developing (TD) children, aged between 3 and 14 years, participated. Information about children's sensory experiences was collected through parent report using the Sensory Profile questionnaire (Dunn, 1999). Information about parental sensory experiences was collected via self-report using the Adolescent/Adult Sensory Profile (Brown & Dunn, 2002). Parents of children with ASD had significantly higher scores than parents of TD children in relation to low registration, over responsivity and taste/smell sensory processing. Similar levels of agreement were obtained within ASD and TD parent-child dyads on a number of sensory atypicalities; nevertheless significant correlations were found between parents and children in ASD families but not TD dyads for sensation avoiding and auditory, visual and vestibular sensory processing. The findings suggest that there are similarities in sensory processing profiles between parents and their children in both ASD and TD dyads. Familial sensory processing factors are likely to contribute towards the broader autism phenotype. Further work is needed to explore genetic and environmental influences on the developmental pathways of the sensory atypicalities in ASD.

Investigating visual integration in Autism Spectrum Condition using collinear facilitation

Emma Gowen[1], Jachim.S[1] and Warren. P.A[2]

[1]Faculty of Life Sciences, University of Manchester
[2] School of Psychological Sciences, University of Manchester

Altered perceptual experiences are a common finding in Autism Spectrum Condition (ASC), possibly due to reduced integration of local information into a global percept. At the

neurophysiological level, visual integration is mediated by interactions that occur between visual neurons, involving horizontal, feedforward and feedback connections. In the current study, we investigated visual integration in adults with ASC using a collinear facilitation (CF) task. In CF, a faint Gabor target is easier to detect when flanked by high contrast, co-aligned Gabors compared to a no flanker condition. CF is mediated by propagation of excitatory signals from flanker to target cells along horizontal connections in V1 as well as feedback from higher visual areas. To investigate whether horizontal or feedback signals are altered in ASC we manipulated the timing of the flankers relative to the target so that the flankers could either occur before, simultaneously or following the target. CF in the latter condition is more reliant on feedback than the other timing conditions. Both ASC and controls showed significant CF for all three timings, which was maximal when flankers and target occurred simultaneously. There were no differences between the two participant groups. These results indicate that for these CF conditions, horizontal and feedback contributions are similar for ASC and control participants suggesting that for simple, early level stimuli, visual integration is typical in autistic adults.

Recognition of emotional expressions of varying intensity in children with and without autism spectrum disorder

Sarah Griffiths, Chris Jarrold, Ian Penton-Voak, Andy Woods, Marcus Munafò
University of Bristol, School of Experimental Psychology.

There is mixed evidence for deficits in recognition of facial expression of emotion in autism spectrum disorder (ASD). One reason for this is that many studies have been statistically underpowered due to small sample sizes. In the current study we aimed to collect a large sample of individuals with ASD by testing over the internet (current N = 61, projected N = 80, age range 6-16 years). Another possible reason for mixed findings is that studies often use high intensity facial expressions, which cannot reveal deficits in recognition of subtle naturalistic expressions. We therefore test the recognition of 6 basic facial expressions at 8 different intensity levels. Additionally, verbal and non-verbal mental age are measured. Social skills are measured using Social Responsiveness Scale which is completed by parents. We will report the outcome of a mixed ANCOVA to compare the group with ASD a control group of typically developing children on recognition of the 6 emotions at different intensity levels, controlling for verbal and non-verbal mental age. Regression will be used to assess whether parent reported social skills are associated with emotion recognition. The large sample size will allow us to determine whether recognition of low intensity facial expressions is impaired in young people with ASD. We will also discuss the strengths and weaknesses of using internet testing in this population.

Brain correlates of social cognition in children with ADHD and ASD

Madeleine J. Groom[1], Antonia Hamilton[2,3], Puja Kochhar[1] , Marina Simeou[1] Chris Hollis[1]
[1] Division of Psychiatry & Applied Psychology, School of Medicine, University Of Nottingham, UK
[2] School of Psychology, University Of Nottingham, UK
[3] Institute of Cognitive Neuroscience, UCL, UK

Many children with ADHD show co-occurring symptoms of autism spectrum disorder (ASD) but the basis of this overlap is poorly understood. The aims of this study were to measure

neural correlates of social cognition in ADHD to determine whether these are predicted by the severity of co-occurring ASD symptoms. Children aged 9 to 15 years with ADHD or ASD (*N*=31) and typically developing children (*N*=22) performed a visual cueing task. Cue direction was either congruent (valid) or incongruent (invalid) with target location and was either a pair of eyes gazing, or an arrow pointing, left right. We predicted that the degree of differentiation between arrow and gaze stimuli, reflected in the amplitude and topography of specific event-related potentials (ERPs), would be related to the severity of ASD symptoms in children with ADHD, indicating shared neural mechanisms underlying social cognition impairments in ADHD and ASD. Cue-locked ERPs, the Early Directing Attention Negativity (EDAN) and Late Directing Attention Positivity (LDAP) showed greater amplitude over the hemisphere contralateral to cue direction for Chevron cues. For Gaze cues however, there was a markedly different pattern with greater amplitude over right hemisphere regardless of cue direction, suggestive of right hemisphere specialisation in the processing of gaze cues. This pattern varied with severity of ASD symptoms such that the amplitude over right hemisphere was reduced in those with higher ASD symptoms, irrespective of diagnosis. These findings indicate a possible neural basis for the presence of ASD symptoms in children with co-occurring ADHD and ASD.

Investigating executive function in toddlers at risk for ASD and/or ADHD

Alexandra Hendry[1], Tony Charman[1], Emily Jones[2]
[1]Psychology & Neuroscience, King's College London
[2]Birkbeck Centre for Brain & Cognitive Development, University of London

ASD and ADHD are neurodevelopmental disorders that frequently co-occur. There is strong evidence to suggest that disruption to executive function (EF) is implicated in both ASD and ADHD, at least from the later preschool years onwards. However, the profile of impairment between and within the disorders is inconsistent. It is as yet unclear whether atypical performance on EF tasks in these populations might be linked to a distinct cognitive phenotype attributable to the deterioration or inadequate maturation of the prefrontal cortex, or to the accumulation of interference from elsewhere in the brain. Thus there is a need for longitudinal investigation of early EF ability in children who later go on to develop ASD and/or ADHD. This investigation has to date been hampered by the fact that performance on the limited available measures of early EF (emerging between the ages of 2 and 3) may be influenced by language ability and social engagement/compliance – both potentially-impaired domains in this population. In this talk I introduce a novel task which aims to circumvent these limitations and present some initial data from a sample of 2- and 3-year-olds at risk for ASD and/or ADHD.

Spatial selection during movement preparation in adults with and without Developmental Coordination Disorder: An electrophysiological investigation

Xavier Job[1], Jan de Fockert[1], Dan Brady[1], Elisabeth Hill[1], Caroline di Bernardi Luft[2], Jose van Velzen[1].
[1] Goldsmiths, University of London.
[2] Queen Mary, University of London.

Recent investigations reveal a deficit in visual-spatial attention in developmental

coordination disorder (DCD). Control mechanisms of spatial attention and movement preparation are increasingly considered inseparable, as both act to bias sensory processing at task-relevant locations in space. Here, the top-down control of sensory processing at goal locations of reaching movements is investigated in a group of adults with DCD as well as matched controls. Neural activity is recorded using electroencephalography (EEG) to assess the underlying mechanism of how movement preparation biases sensory perception of space, and whether these mechanisms differ in adults with DCD. A movement task cues participants to prepare reaching movements towards different goal locations in front of them as well as on the body surface. During movement preparation, visual and tactile processing is assessed using probe stimuli at movement goal locations. Event-related potentials (ERPs) elicited by these visual and tactile probe stimuli reveal top-down modulations of incoming sensory information by movement preparation. Compared to matched controls, adults with DCD showed enhanced modulations of visual perception at the goal of an upcoming movement. However, controls showed greater modulations of tactile perception at the goal of movements towards unseen personal space. These results suggest adults with DCD have an over-reliance on visual information during movement preparation and selectively bias action relevant locations differently from controls.

Childhood cognitive flexibility and theory of mind predict later behavioural difficulties in autistic adolescents.

Lorcan Kenny.[1], Cribb, S. [2], & Pellicano, E. [1,2]
[1] Centre for Research in Autism and Education (CRAE), UCL Institute of Education. London, UK.
[2] School of Psychology, University of Western Australia. Western Australia, Australia.

Longitudinal studies of autistic people show that the behavioural features of autism generally endure into adulthood. It remains unclear, however, whether individual differences in early cognitive skills are longitudinally related to individual differences in specific aspects of the behavioural phenotype. Here, we test the predictive validity of childhood theory of mind (ToM) and executive function (EF) on adolescent behavioural difficulties in a cohort of autistic youths over a 12-year period. Twenty-five autistic young people (2 female) took part in a prospective longitudinal study. Participants were assessed on a battery of tasks measuring components of EF (planning, set shifting, inhibition) and ToM (1st- and 2nd-order false belief) at Time 1 (*M*=5.4 years, *SD*=0.98 years) and completed a behavioural assessment at Time 2 (*M*=17.1 years, *SD*=0.88 years). We conducted a stepwise linear regression to test whether individual differences in childhood ToM and EF predicted variation in adolescent behavioural difficulties (as indexed by the Strengths and Difficulties Questionnaire) over and above that explained by verbal IQ. Individual differences in childhood cognitive flexibility, childhood ToM and adolescent verbal ability all predicted unique variance in adolescent behavioural difficulties (all p values < 0.049; total R^2=.57). These findings raise the possibility that early-emerging cognitive atypicalities could cause behavioural disruptions that persist into early adulthood, possibly even persisting beyond the cognitive atypicalities themselves.

Temporal and spatial perspective taking with autism spectrum disorders

Hidetsugu Komeda[1,2]., Yoko Mano[2,3,4]., Yoshi-Taka Matsuda[5]., Hidekazu Osanai[6]., Masahiro Kawasaki[7]., Takashi Kusumi[6]., Toshihiko Aso[8]., & Yasuko Funabiki[9].

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[2]Department of Psychology, University of London, Goldsmiths
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It is difficult for individuals with autism spectrum disorder (ASD) to take other people's perspective. One of the reasons for this atypicality is based on the difficulty in sharing temporal and spatial information with other people. 20 adults with ASD and 21 Typically Developing (TD) adults read stories in the MRI scanners. Ages (*M* = 31.5 for ASD, 32.0 for TD) and IQs (M = 113.7 for ASD, 112.0 for TD) were matched. We manipulated Time (No time passage vs. Time passage) and Location (Same vs. Different) conditions in the stories. In the different location condition, right temporal parietal junction (TPJ) in the ASD group was more activated than that in the TD group. Right TPJ is related to spatial perspective taking (Ferstl & von Cramon, 2007; Mano et al., 2009). In the time passage condition, anterior cingulate cortex (ACC) in the TD group was more activated than that in the ASD group. ACC is activated in the time perception, especially in comparing long and short interval estimation (Pouthas et al., 2005). The ASD group showed altered time perception during taking other people's perspective. Thus, Individuals with ASD rely on the spatial information rather than temporal information in engaging in perspective taking tasks. Because ASD group's perspective taking scores were positively correlated with the right TPJ activation in the no time passage with same location condition, individuals with ASD can take other people's perspective in the static situation rather than dynamic situation, including time passages.

Overlapping but distinct profiles of motor and social skills in Autism Spectrum Disorder and Developmental Coordination Disorder

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Motor and social difficulties are found in children with autism spectrum disorder (ASD) and with developmental coordination disorder (DCD) to varying degrees. The current study adopted a cross-syndrome design in order to assess the overlap of these symptoms in children with ASD and DCD, compared to typically-developing (TD) controls. Ninety-five children aged 7-10 completed motor and face processing assessments, and parents completed questionnaires concerning their child's early motor and current motor and social skills. Retrospective parent reports of early motor milestones suggested that children in both

the DCD and ASD groups crawled, stood and walked later on average than TD controls, although this difference was significant only in the DCD group. More than half of the ASD group met the cut-off for motor difficulties used to identify those with DCD, and the DCD group scored at a similar level to the ASD group on experimental and standardised measures of face processing. Furthermore, motor skill was a significant predictor of parent-reported socialisation in both the ASD and DCD groups. Thus, although children with ASD and DCD remain distinct in the severity of their core symptoms, relationships between social and motor skills are evident in both disorders. The identification of motor problems in early development could therefore have an important impact on later motor and social skills, and could provide opportunities for earlier intervention for those at risk of developmental difficulties.

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Local and global orientation processing in children on the autism spectrum

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Performance on orientation processing tasks could be a potential marker for atypical low-level visual processing in autism. A recent study showed no evidence of altered orientation processing across a range of tasks in autistic adults compared to neurotypical adults using single grating stimuli (Shafai et al., 2015). Yet, autistic individuals may differ in their ability to average orientation information across space, reflecting atypical visual integration. This study used an equivalent noise approach to quantify local and global limits to orientation processing in 26 autistic children aged 6 to 14 years, and 27 typically developing children matched in age and IQ. Children were asked to determine the overall orientation of a field of randomly positioned Gabor patterns while maintaining central fixation, within the context of a child-friendly 'game'. Autistic children showed similar degrees of sensitivity to orientation information as typical children both when the Gabor patterns shared the same orientation, and when the Gabor patterns had variable orientations. Equivalent noise modelling revealed that autistic children had similar levels of internal noise and averaged over a comparable number of samples as typical children. The autistic children also had similar thresholds as typical children in an orientation coherence task. Orientation discrimination thresholds were not related to levels of autism symptomatology or parent-reported sensory processing. In sum, it appears that orientation processing is not altered in autistic children. These results speak against theories of autistic perception proposing enhanced local and/or reduced global processing, and atypical levels of neural noise.

Looking but not learning: differences in gaze cue reading, visual attention and learning in 14 month old infants at risk for autism

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Research has suggested 13 and 36 month old infants who develop autism symptoms follow gaze but then look less at cued objects (Bedford et al., 2012) and do not learn word-object associations (Gliga et al., 2012). The current longitudinal study aimed to replicate and extend findings by investigating gaze cue use, visual attention and word learning in 14 month

old infants at risk for autism (*n*=96), due to having an older sibling with autism, and in low risk controls (*n*=21). Each infant viewed videos of a demonstrator turning, looking and labelling one of two different objects. Gaze behaviour was measured with an eye tracker. We measured the proportion of correct first looks, and the proportional amount of looking time to the correct and incorrect objects and to the face. Word learning was measured as preferential looking to the correct referent in "looking while listening" trials. Trial difficulty varied with either one or both objects being labelled then tested. Findings supported the conclusion gaze reading, not simply following, is necessary for learning (Gliga et al., 2012). No group difference was found in the proportion of correct first looks but at-risk infants that developed autism symptoms looked less at objects in general and more at faces. The whole group of at-risk infants showed no evidence of learning. This demonstrates that 14 month at-risk siblings may not use gaze cues as effectively as infants with no family history of autism. Furthermore, greater attention found to the demonstrator's moving face suggests competition from (facial) movement may interfere with processing and using gaze to learn information.

Comprehension of quantifiers and numerals in Autism Spectrum Disorders

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Investigating knowledge of linguistic constructs on the syntax/semantics interface seems particularly relevant in autism spectrum disorders (ASD). While pragmatic deficits are a defining characteristic of ASD, grammatical skills can vary from being intact to severely impaired. Our interpretation of quantifiers ('no', 'some', 'all') and numerals ('one', 'two', 'three') relies on both syntactic and pragmatic knowledge, along with the general ability to assess small quantities. Using an act-out method (Pouscoulous et al 2007), we tested comprehension of quantifiers and numerals in 15 children with ASD (CA: 5-11; *M*=9;03) and 15 younger typical controls (CA: 3;08-9;07; *M*=6;03) matched in gender and Verbal Mental Age. Overall, the ASD group performed significantly poorer on the experimental tasks, though similar patterns were observed in the two groups. On the Numerals task, both groups exhibited exact interpretation of numerals (Hurewitz et al, 2006). On the Quantifiers task, the most common error concerned the quantifier 'some': children sometimes failed to compute the scalar implicature, treating 'some' as compatible with 'all', a pattern widely reported in young typically developing children (Noveck, 2001). Importantly, closer inspection of results revealed differences in the performance of children with ASD whose scores on standardised measures of grammar and vocabulary signalled a language impairment - 'Autism with Language Impairment' (ALI) compared to those with 'Autism and Normal Language' (ALN) (Tager-Flusberg, 2006). While 9 ALN children showed a ceiling performance on quantifiers, 6 children with ALI revealed poor understanding of syntax and semantics of quantificational determiners in general, in addition to poor pragmatic-inferencing.

Eyes-Test and Theory of Mind Abilities in Children with Autism Spectrum Disorders: A Developmental Trajectories Approach

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Social cognition (SC) includes the cognitive processes apt to decode and encode the social world. Major difficulties in this domain are a defining feature of autism. Deficits in these skills hinder social inclusion and lead to social isolation in people with autism. This study aimed to identify a simple test to be used for screening SC in children with ASD. A simplified version of the Eyes-Test (Franco et al. 2014) was used together with a well-known test assessing different components of ToM (Comic Strip). Children with ASD were compared to typically developing children (TD) with a developmental trajectories approach, aiming to construct a function linking performance on specific experimental tasks with age and then assessing whether such function differs between the TD and disorder groups. The sample included 94 children (37 ASD [age range 61-157 months]; 57 TD [age range 60-147 months]). Chronological age and mental age means were not statistically different between the two groups. In general, children with ASD showed slower development at varying rates in all measures, with delayed onset compared to TD children. The Eyes-Test predicted performance in all components (belief, emotion, intention) of the Comic Strip Test.

Using functional gene networks to study developmental risk in rare genotypes

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With the increased availability of genetic testing, multiple monogenic alterations have been associated with atypical developmental outcomes. These outcomes were at least initially classified as "generalised developmental delay". However, as a growing number of individuals receive diagnoses, there is both the clinical imperative and the research opportunity to find ways to implement deeper phenotyping to reveal both general and more specific influences on learning for these individuals. One of the main challenges remains the rarity of individual genetic hits. We have proposed that a useful framework may be to group these "rare genotypes" according to the gene functional pathways implicated (Scerif & Baker, 2015, *JCPP*). Here we aim to report on the first set of findings generated from this approach, in which we targeted single gene aetiologies affecting the MAGUK family (Baker et al., 2015, *JND*). Inspired by our earlier work on the most common genetically inherited and monogenic cause of learning disability, fragile X syndrome (FXS), this work already highlights a number of implications and

needed future directions. First, links between genes, brain and cognition need to be situated in a developmental context, even in these monogenic disorders. Second, as some of these functional networks are associated with high risk for autism spectrum and attention difficulties, disorders that are in the main diagnosed through their constellation of behaviours later in childhood, the increase in early diagnoses offers the opportunity to study developmental trajectories of risk and resilience for these complex behaviourally-defined disorders and their comorbidity. We close by discussing both promise and caveats of this approach.

Relationship between recurrent infections and cognitive abilities and decline in Down syndrome

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People with Down syndrome (DS) show large variability in their cognitive profiles. Some have a mild intellectual disability (ID), while others a more severe ID. Individual differences are also seen for cognitive decline; some people receive a dementia diagnosis in their 40s while others do not show decline in their 60s. The London Down Syndrome Consortium (LonDownS) is investigating factors influencing these differences. We investigate the relationships between recurrent infections (which are common in DS) and cognitive abilities and decline in DS. We compared scores on measures of general and adaptive abilities for adults aged 16-35 who have and do not have a history of recurrent infections. We investigated the prevalence of recurrent infections for 'extremes' of the dementia phenotype; those diagnosed with dementia before age 55, and those not diagnosed with dementia aged 55+. Adults who have a history of recurrent infections show poorer general and adaptive abilities compared to those who do not. History of recurrent infections was more common in adults diagnosed with dementia before age 55 compared to those not diagnosed with dementia aged 55+. History of recurrent infections is associated with poorer abilities in DS, and is linked to an early onset of dementia. This may be due to increased microglial activation and cytokine production following infections, resulting in neuronal damage. Alternatively, poorer immune system function and poorer abilities / early dementia onset may represent an overall 'poorer health' phenotype, or there may be a mediating factor influencing both immune and cognitive function.

Can dyslexic readers get off the garden path? An eye movement study of syntactic processing

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Epidemiological studies suggest that dyslexia has a prevalence of 5%-10%, and tends to co-occur with Attention-Deficit /Hyperactivity Disorder in 30%-40% of cases. However, little is known about the causal basis of comorbidity. Studies that have examined the co-occurrence of dyslexia and ADHD, have primarily focused on single-word decoding, which excludes many essential aspects involved in successful reading. The most obvious one is syntax. Our research focuses on comorbidity of dyslexia and ADHD, and specifically, reading difficulties involved in sentence-level comprehension. One aspect of sentence processing, which is not involved in single-word decoding is working memory. This refers to the ability to "hold" words in memory as readers work their way through a sentence and only

after processing of the whole sentence, can readers extract the meaning. Both dyslexia and ADHD have been associated with deficits in working memory. The purpose of this project is to investigate syntactic processing in dyslexia and ADHD, as well as other factors (e.g. working memory, processing speed, and rapid naming) that may be causal in comorbidity. Findings from 22 dyslexics and 20 typically-developing controls show significantly higher total reading times, as well as significantly lower comprehension accuracy, indicating that dyslexic readers cannot get off the garden path. We anticipate a sample of 100, which will allow structural equation modelling to determine how symptoms of ADHD, working memory, and processing speed affect reading times and comprehension. These results take understanding of comorbidity and literacy issues in a new, and as of yet, under-researched area.

Oculomotor Control and Motor Ability in Children with Autism Spectrum Disorders

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Difficulties with inhibiting a response on antisaccade tasks have been shown to relate to language ability in Autism Spectrum Disorders (ASD). In addition to language problems, a number of studies highlight motor difficulties in ASD. The visual and motor systems are interdependent to some extent. The current study provides a comprehensive account of oculomotor control in ASD, and investigates the relationship between motor skill and oculomotor performance. Twenty-five children with ASD (7-10 years) and 25 typically-developing (TD) children completed fixation, horizontal smooth pursuit, and pro- and anti-saccade tasks. Eye movements were recorded using the Eyelink 1000 (SR-research). Motor competency was also assessed using the Movement-ABC2. Analyses revealed that children with ASD had poorer fixation stability than their peers. While the two groups were comparable on a slow speed measure of smooth pursuit, children with ASD presented with poorer pursuit gain than TD children on a faster pursuit task. However, no group differences were found for response preparation on the pro/antisaccade tasks or for response inhibition (anti-saccades) across the two groups. Of note, half of the ASD group scored below cut-off for a motor difficulty. Correlational analyses revealed a significant relationship between motor skill and pursuit gain for children with ASD, but not the control group. The findings are the first to consider a link between motor and oculomotor difficulties in children with ASD. Future research would benefit from considering this relationship in more detail.

Cross-modal selective attention and perceptual load in individuals with Autism Spectrum Disorders

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According to the increased perceptual capacity account (Remington et al. 2009), individuals with Autism Spectrum Disorders (ASD) have an enhanced capacity for processing perceptual information. We recently demonstrated that this increased perceptual capacity in ASD also operates across sensory modalities: increasing the perceptual load of a visual task reduced awareness of an *unexpected* auditory stimulus to a lesser extent in children with ASD than in typically developing (TD) children (Tillmann et al. 2015). The current

study assessed whether increasing the perceptual load in a visual search task also has less of an effect on detection sensitivity for an expected auditory stimulus (present on 50% of trials).
20 TD adolescents and 19 adolescents with ASD matched for age and non-verbal ability performed a visual search task under varying levels of perceptual load while simultaneously detecting presence/absence of an auditory tone embedded in noise. The intensity level of the auditory stimulus was just above each individual's pre-established perceptual threshold, thus controlling for individual differences in perceptual sensitivity.
The results indicated that at low perceptual load (one or two items in the central search array), detection sensitivity for the auditory stimulus did not differ between groups. However, when the perceptual load was higher (four items) auditory detection sensitivity was significantly reduced in TD individuals vs. individuals with ASD, who maintained a high level of detection. At even higher levels of perceptual load, there was no difference in detection sensitivity between groups. These findings confirm our hypothesis of an increased perceptual capacity in ASD.

Executive functioning in autism spectrum disorder: Charting inter-individual differences and delineating more homogeneous subgroups.

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Numerous studies have shown impairments in executive functioning (EF) in individuals with autism spectrum disorder (ASD) compared to typically developing (TD) controls. However, the often large inter-individual variability suggests that these impairments are not universal for ASD. We aim to chart the heterogeneity of EF within our ASD sample and investigate whether we can delineate more homogeneous ASD subgroups with a similar cognitive profile. Finally, we want to investigate whether these different subgroups (based on EF) are also characterized by differences in phenotypic ASD traits. Nine tasks and one questionnaire were administered from 58 individuals with ASD and 58 TD controls (aged 8-to-18 years), to measure five EF domains: i.e., inhibition, cognitive flexibility, working memory, generativity, and planning. A multiple case series analyses was used to examine the percentage of individuals with ASD that showed impaired / superior performance compared to the TD group. We are currently performing k-means cluster-analyses to trace more homogeneous ASD subgroups. Afterwards, we will compare whether the different clusters differ on ASD symptomatology, as measured with the Social Responsiveness Scale and the Repetitive Behaviour Scale – Revised. Preliminary results show that none of the EF impairments were found for all individuals with ASD and some individuals with ASD even performed better than controls on some of the EF measures. This stresses the importance of determining an individual profile of both strengths and weaknesses that can be used to design an intervention that is optimally adjusted to the individual's needs.

The influence of domain-general and domain-specific abilities on number development in two neurodevelopmental disorders

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Number abilities are impaired in both individuals with Williams syndrome (WS) and Down syndrome (DS). Yet, studies in infants have shown that these impairments are caused by deficits in different core systems: whilst those with DS show difficulties with subitizing, an impaired approximate number system (ANS) is thought to curtail number development in WS. Recent research in typically developing (TD) children has shown that not only ANS abilities but also number line and visuo-spatial abilities as well as counting and digit knowledge are all important for number development. To date, the development and interdependent relationships between these different factors have not been assessed in DS and WS. The current study examined the relationship between ANS, numberline abilities, visuospatial abilities, counting and general mathematical performance in 30 participants with WS and 30 with DS aged 8 to 40 years. Performance was compared against 3 groups of TD children (each group N=15): aged 4-5, 7-8 and 10-11. Participants were administered an ANS task in which they had to indicate which of two sets contained the larger quantity. In the number line task, participants were asked to indicate the positon of numbers 1-9 on a 0-10 scale and the numbers 3,4,6,8,12,14,17 on a 0-20 scale. Numerical Operations from Wechsler Individual Achievement Test were used to measure formal mathematical abilities. Finally, participants completed the Pattern Construction task (BAS-II) as well as a digit recognition and counting task. Preliminary analysis yields different developmental trajectories for individuals with WS and DS.

Abstracts for Poster Presentations

The relationship between theory of mind, social motivation and mimicry in autism spectrum condition

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Many different social difficulties have been identified in autism, including theory of mind (ToM), social motivation and mimicry. For example, people with autism do not find direct gaze rewarding and do not use gaze to modulate their mimicry. However, previous studies do not distinguish between the role of eye gaze as a low-level cue (perceptual) and as a high-level cue (linked with ToM). This makes it hard to determine whether differences in motivation and mimicry in people with autism are independent from difficulties in ToM. The aim of the present study is to assess whether social motivation and mimicry are independent from ToM, and explore how these processes are affected in people with autism. We will test 25 people with autism and 25 typical people who match the autistic participants. After manipulating their beliefs about whether another person (model) can see through different types of glasses, we will assess if their mimicry and their motivation to view videos depends on these beliefs: if effects of direct gaze are due to ToM, they should be stronger when participants believe the model can see them; if effects of direct gaze are due to low-level visual cues, they should be linked only to the visual appearance of the model. Results will show if both mimicry and motivation are linked to each other and to ToM. Our hypotheses are that social motivation and ToM are closely linked, and that mimicry performance in autistic people will be impaired due to disruptions in both processes.

Diverse profiles of anxiety-related disorders in fragile X, Cornelia de Lange and Rubinstein-Taybi syndromes

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Anxiety disorders are heightened in specific genetic syndromes in comparison to intellectual disability of heterogeneous aetiology. Existing research has not consistently explored the prevalence of types of anxiety disorder using comparable assessments. Identifying the types of anxiety disorder most associated with different genetic syndromes is important for targeted syndrome-specific interventions. The present study delineates the profile of anxiety disorders in individuals with fragile X (FXS), Cornelia de Lange (CdLS) and Rubinstein-Taybi syndromes (RTS). Parents of individuals with FXS (n=19), CdLS (n=13), and RTS (n=27) completed the Spence Child Anxiety Scale–Parent Version (SCAS-P). These data were compared to normative data for typically-developing children and children diagnosed with an anxiety disorder. Subscale-level analysis was conducted to identify differences in the profile of anxiety disorder in individuals with FXS, CdLS and RTS, and compared to normative data. Participants with CdLS scored higher than participants with FXS and RTS on the separation anxiety and generalised anxiety subscales of the SCAS-P. Scores did not differ between children diagnosed with an anxiety disorder and a) participants with FXS on

social phobia, panic/agoraphobia, physical injury fears, and obsessive-compulsive subscales b) participants with CdLS on separation anxiety, generalised anxiety, panic/agoraphobia, physical injury fears and obsessive-compulsive subscales, and c) participants with RTS on panic/agoraphobia and obsessive-compulsive subscales. The results support findings of elevated levels of anxiety in FXS, and obsessive-compulsive disorder in RTS. The results also document the severity and breadth of anxiety in CdLS, and highlight divergent profiles of anxiety between these groups.

The effect of autism and employment status on mental health and well-being

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Adults with Autism Spectrum Disorder (ASD) are known to show heightened symptoms of depression and anxiety and their employment outcomes are mixed. These areas are interrelated in the broader population. The current study considered the effect of autism and employment status on self-reports of anxiety, depression, life satisfaction and well-being. In a sample of 117 adults with autism (63 employed at the time of the study, 54 unemployed) vs. 48 adults without autism (22 employed at the time of the study, 26 unemployed), significant group differences were found, with the autism group reporting higher levels of anxiety and depression along with lower levels of life satisfaction and well-being ($p < .01$). Employment had a significant impact on depression in both groups (indicated by a main effect of employment and no group x employment interaction). Overall, while life satisfaction and mental well-being are concerns for adults with autism, employment can be a positive contributing factor and therefore focus should be placed on enabling adults with autism into work.

Is visual search truly outstanding in autism? Search organization and categorical search in young children at risk

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Enhanced visual search is one of the most replicated findings in the autism spectrum disorder (ASD) literature. Visual search in this context often refers to locating one target amongst distracters—less research has investigated search organization/systematicity

when there are multiple targets, and no studies to our knowledge have manipulated targets and distracters to investigate search systematicity based on task requirements. It is possible that in ASD performance will be poorer, in particular when targets represent a conceptual category as opposed to an exemplar and thus require conceptual knowledge. In contrast, it is possible that performance will be enhanced when exemplar targets are perceptually similar to distracters, thus requiring perceptual abilities known to be enhanced in ASD. One-hundred and five 36-month-olds at high and low ASD risk participated in the cancellation task. Children were asked to search for and touch a) cats among inanimate objects (baseline, “exemplar search”), b) animals amongst inanimate objects (to test conceptual knowledge, “conceptual search”), and c) dogs amongst furniture (to test for discrimination between perceptually similar objects, “perceptual search”). The Autism Diagnostic Observation Scale (ADOS) and Child Behaviour Checklist (CBCL) were used to assess severity of ASD and ADHD symptoms. Without including clinical symptoms, search systematicity and quality differs between conditions with least organized search in the conceptual condition and most in the exemplar condition. While controlling for motor/language abilities, ASD symptoms related to poorer quality search (speed/accuracy) during conceptual search. In addition, ASD and ADHD symptoms were associated with more disorganized search across conditions in an additive fashion. Not only do task requirements matter for multi-target search quality/organization, ASD and ADHD symptoms relate to less efficient/poorer search, with a particular deficit for conceptual search with higher ASD symptoms.

Predictors of adaptive behaviour, quality of life and behaviour problems in children with ASD

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The autism spectrum is characterized by a considerable amount of both intra- and inter-individual heterogeneity. Substantial variability in behavioural symptoms and neurocognitive functioning is notable amongst individuals with ASD, but also their outcomes are highly diverse. In our research project, we want to provide insight in the predictors of 1) adaptive behaviour, 2) quality of life, and 3) internalizing and externalizing behaviour problems. A cross-sectional study design is applied to a heterogeneous group of 2-to-18-year-old children at suspicion of ASD. Data collection is incorporated in the multidisciplinary ASD assessment at the Autism Expertise Centre of our university hospital. Our research protocol consists of socio-demographical, diagnostic, neuropsychological, somatic, and contextual factors. As data collection will start Spring 2016, no empirical data are available at this moment. Our presentation will focus mostly on discussing our study design. In addition, we will present some preliminary data. Insight in the underlying associations between socio-demographic, diagnostic, contextual, somatic, and neuropsychological characteristics on the one hand, and outcome variables on the other hand, helps us to understand and explain apparently inconsistent research findings. Furthermore, individual developmental trajectories will be better understood, and maybe even predicted, which is of high clinical relevance, both at the level of assessment and at the level of intervention.

Atypical information-use in children with autism spectrum disorder during judgements of child and adult face identity

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The ability to efficiently extract information from faces is critical for successful person perception and social interactions. Unusual patterns of fixation behaviour in individuals with autism spectrum disorder during face tasks hint at atypical processing strategies that could contribute to diminished face expertise in this group. One way to directly examine face-processing strategies is with the powerful Bubbles reverse correlation technique. Here, we used this technique incorporating important methodological controls to examine identity judgments in autistic children, typical children, and typical adults. Results indicated that autistic children relied upon the mouth region consistently for their identity categorisations of both child and adult face stimuli. In contrast, typical children and adults showed a more flexible profile of information-use. They modulated their face processing strategies to match test stimulus characteristics: sometimes selectively drawing upon the mouth region (child faces) and sometimes additionally including the eyes (adult faces). These findings constitute important new evidence that autistic children differ from typical comparison groups not only in the specific features they rely upon for their face judgments, but also more generally in the extent to which they demonstrate a flexible and adaptive profile of information use.

In-depth investigation of the face selective N170 ERP component in Williams Syndrome

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Despite its vital importance for successful social functioning, understanding of face perception remains limited for many vulnerable clinical populations. Williams Syndrome (WS) is a neurodevelopmental disorder, characterized by (among other things) an average IQ of 60, an uneven cognitive profile and a particular interest in, and processing ability for faces. Evidence has emerged to suggest that the unexpectedly strong abilities with faces in this group may be underpinned by atypical neurocognitive strategies, i.e., relatively diminished configural processing and an atypical reliance upon local (part/feature) recognition. However, more directed research is required to confirm and clarify this. Here, we provide a robust characterization of the early stages of face processing in adults with WS (n=11). We focus on the well-established face-selective N170 component, a hallmark of typical face processing, to examine the selectivity of the neural response to faces generally (vs. another object category), and to faces in their canonical upright orientation (a marker of specialised face processing mechanisms). Our results indicate clearly for the first time that individuals with WS do show this selective early neural responses to faces (as opposed to other object categories), but that this selectivity is atypical. These differences relative to neurotypical adults are in line with their reported perceptual processing biases towards

local/featural information (cf. the configural cues thought to critically underpin typical face processing expertise).

The development of route knowledge and configural knowledge of large-scale space in typical development, Down syndrome and Williams syndrome

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Typically developing children aged 5 to 11 years (TD, N=93), individuals with Down syndrome (DS, N=29) and individuals with Williams syndrome (WS, N=20) were asked to learn a route from A to B, a route from A to C and to find a novel short-cut from B to C, in two virtual environments (VE). Participants were able to learn novel routes, with poorest performance in the DS group, but the ability to find a short-cut, our measure of configural knowledge, was limited across all three groups. That is, 55/93 TD participants successfully found the shortcut on at least one of two VEs, compared to 3/29 participants with DS and 7/20 participants with WS. In summary, our findings demonstrate impaired configural knowledge in DS and in WS, with the strongest deficit in DS. We suggest that these groups rely on a rigid route knowledge based method for navigating and as a result are likely to get lost easily.

Causal attributions, predictions and their relationship to heightened approachability in Williams Syndrome

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Williams Syndrome (WS) is characterised by heightened social approach behaviour (SAB) towards strangers. When asked to identify the intentions of an actor from neutral and negative accounts, children with WS formed significantly fewer negative intention attributions than typically developing children (Godbee & Porter, 2013). The present study aimed to directly measure positive attributions and predictions in WS and their relationship to heightened SAB. 18 children with WS (7-16 years old) were recruited and matched to a typically developing child on verbal and non-verbal ability. Children completed an adapted version of Adolph's Approachability Task (Adolphs, Tranel, & Damasio, 1998) where they were asked to rate the approachability of an unfamiliar person across 20 images. The parent of each child also completed a questionnaire on their child's SAB. Children completed attribution and prediction scales which were developed by the researchers. They were asked

to identify the cause of an event (causal attribution measure) or the outcome of an event (prediction measure) within each vignette and selected their response from the positive, negative and neutral accounts provided. Children with WS demonstrated significantly higher SAB than typically developing children matched on verbal ($p = .040$) and non-verbal ability ($p < .001$). There was a significant relationship between the formation of positive attributions ($p = .037$) and positive predictions ($p = .037$) and parent reports of SAB. The findings from this study indicate that children with WS frequently expect positive outcomes from their social interactions and describe events positively, potentially accounting for their heightened approachability.

Syndromic Autism: Fact or Fiction?

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Debate exists as to the nature and validity of autism comorbidity within syndromic populations. Clinical insistence on phenotypic equivalence (i.e., identical presentations of autistic symptomology in syndromic and non-syndromic groups) continues to pose a challenge for families and individuals seeking a secondary diagnosis of autism. We conducted a review of the literature to evaluate current knowledge of the nature of comorbid autism profiles within Fragile X and Down syndrome populations specifically. Despite reaching clinical thresholds, significant symptomatic differences differentiate syndromic from idiopathic autism profiles, with behavioural data running contrary to traditional expectations of phenotypic equivalence. Expanding current diagnostic definitions of autism to include the visuo-perceptual and neurophysiological correlates of the disorder is necessary in order to explore the question: 'Is it *classic* autism?' Weak central coherence theory posits that autism symptoms emerge on account of a local processing bias and has received empirical support from eye tracking and brain imaging research. Uncovering the true nature of syndromic autism phenotypes requires evaluating whether this multilevel conceptualization of autism extends to individuals with a genetic syndrome who reach clinical thresholds for autism. Further, we propose a developmental interpretation of syndromic autism that takes into account the character of the genetic disorder and anticipates syndrome-specific autism profiles, since the expression of the 'typical' autism phenotype is coloured by syndromically defined atypicalities. Comparative analyses of syndromic and idiopathic autism phenotypes across multiple levels of description have the potential to optimize healthcare practice by increasing awareness amongst clinicians to facilitate timely and accurate autism diagnoses.

Sensory Atypicalities in Dyads of Children with Autism Spectrum Disorder (ASD) and Their Parents.

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Sensory atypicalities are a defining feature of autism spectrum disorder (ASD). To date, the relationship between sensory atypicalities in dyads of children with ASD and their parents has not been investigated. Exploring these relationships can contribute to an understanding of how phenotypic profiles may be inherited, and the extent to which familial factors might contribute towards children's sensory profiles and constitute an aspect of the broader autism phenotype. Parents of 44 children with ASD and 30 typically developing (TD) children, aged

between 3 and 14 years, participated. Information about children's sensory experiences was collected through parent report using the Sensory Profile questionnaire (Dunn, 1999). Information about parental sensory experiences was collected via self-report using the Adolescent/Adult Sensory Profile (Brown & Dunn, 2002). Parents of children with ASD had significantly higher scores than parents of TD children in relation to low registration, over responsivity and taste/smell sensory processing. Similar levels of agreement were obtained within ASD and TD parent-child dyads on a number of sensory atypicalities; nevertheless significant correlations were found between parents and children in ASD families but not TD dyads for sensation avoiding and auditory, visual and vestibular sensory processing. The findings suggest that there are similarities in sensory processing profiles between parents and their children in both ASD and TD dyads. Familial sensory processing factors are likely to contribute towards the broader autism phenotype. Further work is needed to explore genetic and environmental influences on the developmental pathways of the sensory atypicalities in ASD.

An ERP / EEG investigation of the neural correlates of attention and inhibition in adults with Williams syndrome

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Williams syndrome (WS) is a rare genetic developmental disorder accompanied with mild-to-moderate learning difficulties. The social / cognitive profiles of WS are widely documented in the literature, but we have limited knowledge of the neural profiles that subserve these behaviours. Research investigating executive dysfunction (Greer et al., 2013), and social approach behaviours (Little et al., 2013), has highlighted deficits in attentional lapse and inhibitory control that can be linked to atypicalities in frontal lobe function (Mobbs et al., 2007). Two electrophysiological studies were adopted to investigate how these deficits may be explained at the neural level: a) the three-stimulus Oddball task (ERP) which measures attention, orienting to sudden changes in the environment, and information processing, and b) an Eyes Closed / Eyes Open resting-states (EC/EO) paradigm (EEG) which measures the topographical distribution of cortico-electrical activity in the absence of task-directed cognitive processing. Participants included adults with WS (aged 35+yrs), typically developing chronologically aged-matched adults (CA), and typically developing children matched for verbal mental ability (MA). The main findings from the Oddball task identified attenuated N2 peak amplitude and increased P3a peak latency in response to novel stimuli, indicative of deficient inhibitory control, and inhibiting task irrelevant information. In the EC/EO task, inspection of the alpha / beta frequency bands identified over activity in upper-alpha, and unusually low variability compared with controls. Results are discussed in conjunction with the functional significance of the N2 / P300 ERP components, the alpha / beta EEG frequency bands, and the behavioural profile of WS.

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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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 (Lai & Williams, 1989). This study investigates the presence of individual differences that increase or decrease the likelihood of individuals with DS developing AD. What makes this project different from so many investigating neurodegeneration is that fact that we are studying *children*. Although this may seem counter-intuitive for an adult onset condition, 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 (Lemere et al, 1996; Leverenz & Raskind, 1998). Additionally individual differences in DS are observed as early as infancy (Karmiloff-Smith et al., 2016), demonstrating the potential for childhood to contain information about the changes occurring in the human brain prior to symptom onset. Materials and Methods: Eighty children between the ages of 4 and 14 have been 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. I present the preliminary results of our analysis of the first year of research, such as the reversal of target looking time over age in DS compared to TD, significant memory task differences (p=0.03, df=23) and interesting trends noticed in data so far.

Sleep and early cognitive development in children with Down syndrome

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In typically developing (TD) children, poor sleep contributes to cognitive difficulties. Children with Down syndrome (DS) have severe sleep problems, particularly with breathing, as well as cognitive and behavioural difficulties. It is currently unknown how sleep problems affect early cognitive development in individuals with DS. This study explores, for the first time, the relationship between objective measures of sleep and well-validated indices of early cognitive development in 2- to 4 year-olds with DS and age-matched TD children. Sleep was monitored using home respiratory polysomnography and children completed the Mullen Scales of Early Learning to assess motor skills, visual reception and language development. Preliminary results show increased obstructive apnoeas and hypopnoeas during sleep in

children with DS. Cognitive development was delayed relative to the TD group, with expressive language being a particular area of weakness for children with DS. We report preliminary data on the relationship between sleep and cognitive development and expect that sleep problems contribute to delays in early cognitive abilities. These findings will support the notion that sleep problems should be examined and treated from an early age in children with DS, which may be crucial for achieving the greatest cognitive outcomes. Since DS is the most common sporadic developmental disorder, this will have wide-reaching clinical implications and set the stage for follow-up intervention studies.

Measuring anxiety in young children with Autism Spectrum Disorder: How effective is the Spence Children's Anxiety Scale?

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Anxiety is highly prevalent in children with ASD, and it is important to effectively identify anxious children to provide them and their families with support. The Spence Children's Anxiety Scale – Parent rated (SCAS-P) is often used to screen for anxiety. However, it was developed for typically developing children and its effectiveness for young children (<8 years) with ASD has not been investigated. Descriptive statistics indicated which items in the SCAS-P were rarely endorsed in an ASD sample (n=129). The effects of age, gender and ability were explored using independent t-tests. Polychoric factor analyses examined the structure of the SCAS-P. Two focus groups were then run with parents of children with ASD to discuss these results, and how parents felt the SCAS-P could be improved to measure anxiety in their children.
Parents rarely endorsed items relating to physical symptoms of panic in their children. Age, gender and ability had non-significant effects on anxiety. A one-factor solution best fitted the data, explaining 30% of variance. In focus groups, parents felt that intolerance of uncertainty and sensory sensitivity were important aspects of anxiety in children with ASD; they also identified language used in the SCAS-P to describe symptoms that may be unsuitable for children with ASD. The SCAS-P has a different internal structure and may contain redundant items for young children with ASD; there are also important aspects of anxiety in ASD that it does not capture. Developing an anxiety measure specifically for this population is therefore indicated.

Cognitive profile of Sotos syndrome

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Sotos syndrome is a congenital overgrowth disorder with an incidence of approximately 1 in 14,000. Intellectual disability is one of the cardinal features. The aim of the present study was to establish whether there is a specific cognitive profile associated with Sotos syndrome. Cognitive abilities were assessed using the British Ability Scales, third edition (BAS3). Participants were 23 individuals with Sotos (mean age = 19.07 years, SD = 11.56; range of 6 – 50 years). The BAS3 provides a general conceptual ability score (GCA) which indicates general level of intellectual functioning (100 is the population average). Mean GCA score of the participants was 62.57 (SD = 16.18) and ranged from 39 – 97. Verbal ability scores (M = 77.14, SD = 3.53) were significantly higher than both spatial ability scores (M =

68.57, SD = 3.39) (p <.001) and non-verbal reasoning ability scores (M = 61.71, SD = 2.76) (p <.001). Spatial ability scores were significantly higher than non-verbal reasoning ability scores (p <.001), indicating that the typical profile for Sotos syndrome is Verbal>Spatial>Non-verbal reasoning ability. In addition, scores on a short-term visual memory task were significantly higher than scores on a spatial visualisation task (p = .002), suggesting a relative strength in spatial memory in this population. These findings provide a preliminary indication of the cognitive profile of individuals with Sotos syndrome.

Compensation in Autism Spectrum Disorder: The mismatch between social cognition and behavior

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Background: Heterogeneity in outcome for individuals with Autism Spectrum Disorder (ASD) is vast, ranging from those who experience persistent social difficulties to a subset who no longer fulfil diagnostic criteria. One candidate mechanism underpinning disparate pathways to outcome is compensation, which is the hypothesised phenomenon that observable autistic behaviour may improve despite continued core cognitive impairments.
Rationale: We propose that amongst individuals with ASD, there are genetically and environmentally-shaped individual differences in the ability to compensate for difficulties in the social world that may not be reflective of the cognitive burden for ASD *per se*. We hypothesise that instead, compensatory ability may be influenced by or associated with additional cognitive factors (e.g. IQ, executive functioning), social motivation and mental wellbeing (e.g. anxiety).
Main points: This study will investigate compensatory ability in 12-14 year-olds with ASD (n=140) by examining the discrepancy between Theory of Mind ability and observable autistic behaviours. The relations between compensatory ability, a range of cognitive factors and mental wellbeing will be explored. Participants are drawn from a twin cohort, including their unaffected co-twins (n=70), allowing for further investigation of whether compensatory ability varies as a function of genetic burden for ASD.
Conclusions: This study aims to elucidate the factors associated with the ability to compensate for social difficulties in ASD, which may be dissociable from ASD itself. This has potential implications for harnessing compensatory resources amongst those most at risk for poor outcome.

Interpersonal distance regulation in children with Williams syndrome: The effect of familiarity

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Personal space refers to a protective barrier that we strive to maintain around our body. In the current study, we examined personal space regulation in young people with the developmental disorder of Williams syndrome (WS; n = 18) and their typically developing (TD), chronological age-matched peers. The study incorporated a parent report questionnaire (Social Responsiveness Scale, SRS; Constantinno & Gruber, 2005) and an experimental stop-distance paradigm. Individuals with WS were reported by their parents to be more likely to violate the personal space of others compared to TD children. In the experimental stop-distance task, the WS group maintained a significantly shorter

interpersonal distance. Interestingly, when children with WS were approached by an unfamiliar adult, they let that individual come significantly closer to them compared to the decisions made by the TD group. Likewise, when the individuals with WS were approaching an unfamiliar adult, they stood much closer than their TD peers, suggesting that WS individuals struggle to regulate their personal space when interacting with unfamiliar people. These differences were not observed with familiar people. Findings are discussed in relation to the wider social profile associated with WS, and the possible impact of atypical personal space regulation on social vulnerability.

When do children with autism spectrum disorder take common ground into account during communication?

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Common ground refers to the mutual, common, or joint knowledge, beliefs, and suppositions that individual's share. Whilst typically developing children are thought to use this shared knowledge to aid both expressive and receptive communication from an early age, individuals with autism spectrum disorder (ASD) are generally recognised as having difficulties in using common ground to guide spontaneous language usage. Conversely, it has been suggested that some adolescents with high-functioning autism demonstrate awareness of the need to adjust the amount of information they provide based on common ground. To date, no-one has experimentally investigated this in children with ASD younger than 8 years. We have developed a novel paradigm to examine whether children aged 5-8 years with and without ASD use common ground during referential communication tasks embedded within shared play construction activities, firstly, to comprehend ambiguous requests and, secondly, to provide an appropriate amount of information when instructing a listener how to construct a toy. In a two-experimenter paradigm, common ground is manipulated by having children complete each activity with only one experimenter. The results will contribute to current understanding of why children with ASD experience communication breakdowns.

Brain and behaviour in Prader-Willi syndrome

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The diverse characteristics of PWS, as well as previous research, suggest atypical brain development and functioning across distributed neural networks. It is likely that the difficulties with emotional regulation and behaviour may be associated with abnormalities in the limbic cortico-striatal-thalamic circuitry implicated in emotional cognition and regulation. 20 participants with PWS, aged between 19-28 years, completed measures of cognition and behaviour, and underwent an MRI scan comprising multiparameter mapping, resting state fMRI, and DTI. MRI data for comparison was available for age and gender matched 40 typically-developing controls. A VBM analysis of grey matter morphology found widespread areas of increased volume in PWS across frontal, parietal, cingulate and temporal regions,

extending into the more superior and anterior regions of the occipital lobe. Ventromedial and wider orbitofrontal areas showed decreased volume, as did the right lateral PFC and areas of the bilateral medial temporal lobes, temporal poles, and posterior parietal into occipital cortex. Within the PWS group itself, greater severity of maladaptive behaviours was associated with reduced volume in the left insula and bilateral cingulate. Widespread morphological abnormalities were found in PWS compared to typically-developing control participants in areas previously reported to show atypical anatomy or function in PWS and related behaviours. Volume in the cingulate and insula cortices, in particular, were associated with severity of maladaptive behaviour in PWS, and are widely implicated in emotional processing and interoception. The largely bilateral nature of the morphological differences indicates an early and systemic biological basis to developmental abnormalities.

Motor and spatial development in typical development and individuals with Williams syndrome

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Williams Syndrome (WS) is a relatively rare genetic neurodevelopmental disorder, which is characterised by psychological, neurophysiological and neuroanatomical features (Hocking, Bradshaw & Rinehart, 2008). Typically, individuals with WS show difficulties in their visuospatial skills, but relative strengths in their verbal abilities (Morris and Mervis, 1999). One significant area of interest in the WS profile is the noted difficulties in motor abilities, with these individuals generally showing significant delay in reaching motor milestones (Carrasco, Castillo, Aravena, Rothhammer and Aboitiz, 2005), however as these are not part of the classic clinical description, they have been scarcely investigated. The aim of this study is to develop a full motor profile for individuals with WS in relation to typically developing mental aged matched controls. Motor ability will also be related to small scale spatial skills. Motor ability will be assessed using the Bruininks–Oseretsky Test version 2 (BOT-2) short form (Bruininks & Bruininks, 2005), and small scale spatial skills will be assessed using motor and non-motor versions of the Block Design task, and the mental rotation task. It is hypothesised that, if participants score equally poorly on *both* motor and non-motor tasks, and *both* tasks correlate with motor skills, then early problems with motor skills have had developmental knock-on effects on perceptual abilities in WS. Alternatively, if participants score equally poorly on *both* motor and non-motor tasks, and *only the motor tasks* correlate with motor skills (yet motor skills are still impaired), then we can hypothesise that motor abilities have not impacted on perception, but rather that motor and perception are independently delayed in WS. The results of the study are forthcoming and will be discussed in relation to the research question.

Symptoms and neurocognitive correlates of co-occurring anxiety in children at familial risk for Autism Spectrum Disorder

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Autism Spectrum Disorder (ASD) is characterised by difficulties in social communication and restricted and repetitive patterns of behaviour. Additionally, anxiety is one of the most frequently co-occurring conditions among individuals with ASD and their relatives. However, in spite of the high prevalence and the functional impairment associated with anxiety, little is known about the neurocognitive correlates of this condition in individuals with ASD and their relatives. Attentional bias to threat is commonly observed in children with anxiety. Similar research in individuals with ASD is scarce and inconclusive. Furthermore, it has not been explored in family members of individuals with ASD. The present study examined anxiety symptoms and their underlying cognitive correlates in children at increased familial risk for ASD. A cohort of children at high-risk for ASD (HR) and a typically developing control group (LR) were studied prospectively since infancy. Anxiety symptoms and attentional bias to threat were measured when the children were aged 6-8 years. The Spence Children's Anxiety Scale Parent- and Self-report were administered to parents and children. The children completed a threat bias task, which examined ability to disengage attention from threatening and positive stimuli. Additionally, diagnostic measures for ASD were administered to make a research diagnosis. HR children, particularly those with ASD, were reported by parents as having elevated anxiety symptoms compared to the LR group. However, there were no significant differences in self-reported anxiety. Furthermore, preliminary analyses on the threat bias task suggest that HR children exhibit delayed disengagement from threatening, but not positive, stimuli.

Differentiating subgroups of preschool children at risk for Mathematical Learning Disabilities

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Mathematics learning disabilities (MLD) are estimated to affect between 5% and 10% of school-age children (Barbaresi, Katusic, Colligan, Weaver, & Jacobsen, 2005; Shalev, Manor, & Gross-Tsur, 2005). Although the specific cognitive abilities that contribute to MLD are still under investigation, certain areas have emerged as playing key roles in the development of mathematical abilities, including both domain general (e.g., impaired working memory and speed of processing) and domain specific abilities (e.g., impaired numerical skills and Approximate Number System abilities). Although previous studies have examined which cognitive abilities relate to mathematical difficulties in children and adults with MLD, little is known about the rate of MLD among preschoolers or what abilities may

explain their mathematical difficulties. The current study investigated mathematical abilities in 300 preschoolers aged 3 to 5 years old and examined the proportion of children who were considered at risk for MLD, having scored lower than the 35th percentile on the Test of Early Mathematical Abilities. Cluster analysis was used to identify subgroups. The results highlight the differences in executive functions, number knowledge and the Approximate Number System between these subgroups of at-risk children with low mathematical abilities. Current findings suggest that children at risk for MLD constitute a very heterogeneous group. Therefore, different intervention strategies will need to be put into place for these subtypes. However, more research is needed about how these subtypes differ over development.

Grammatical morphology in bilingual Williams syndrome: A single case study

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Research on the effects of bilingualism on cognitive and linguistic development of children with neurodevelopmental disorders is crucial in informing and guiding clinical decision-making; however, bilingualism in the context of learning difficulties is poorly-documented. This study investigates language skills of a 5–year-old English/French bilingual child with Williams syndrome (WS), focussing specifically on grammatical morphology. Difficulties were observed in both of the child's languages, with tense-marking morphemes considerably more challenging than non-tense-marking morphemes. The French tense-marking auxiliary verb 'avoir' was more frequently omitted than the preposition 'a' - unrelated to tense but of the same form as the problematic 'a' in passé composé. In English, the child omitted the present tense-marker '-s' more frequently than plural marker '-s'. While determiners ('le'/'la'/'un'/'une') were rarely omitted, incorrect masculine forms were often used where feminine were required, as is reported for French monolinguals with WS (Karmiloff-Smith et al, 1997). Results from standardised tests, both French and English, indicate that our participant was functioning at a level typical for a young child with WS, exhibiting deficits in expressive vocabulary and grammar but relative strengths in receptive vocabulary. Our findings suggests that bilingualism does not exacerbate the linguistic difficulties in WS. Interestingly, our participant's performance on a measure of verbal working memory was within the average range. While data from one participant are far from generalizable, this result could be interpreted as one beneficial consequence of bilingualism, in line with research demonstrating cognitive advantages of bilingualism related to working memory(e.g.Blom,etal,2014).

How social vs. visual perspective-taking determine the interpretation of linguistic reference by 8-11-year-olds with ASD and age-matched peers.

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Children with ASD frequently fail to take their listener's perspective into account when interpreting language. However, when these skills are tapped experimentally, they often perform well. This may be because the field has utilized only level one visual perspective taking (VPL1) - the ability to take into account whether the speaker can see a given object.

However, VPL1 might be carried out without mentalising, simply calculating gaze direction. Moll and Kadipasaoglu (2013) argue that prior to the acquisition of visual perspective taking, typically-developing children are adept at 'social' perspective taking, i.e. where they must take into account perspective specific to a particular individual. Level two visual perspective taking (VPL2) – understanding HOW the speaker perceives an object – may align with mentalising (e.g., Pearson et al., 2015). We have tested 16 typically-developing and 15 children with ASD to date (age range 8-11 years), comparing the interpretation of ambiguous linguistic reference (e.g. 'that ball', where the child can see two balls) in VPL1, VPL2 and social perspective-taking contexts. Following Moll and Kadipasaoglu (2013) children with ASD should show better performance in visual- than in social-perspective taking conditions, whereas typically-developing children should show the reverse pattern. A 2 x 2 ANOVA found a significant effect for Group ($p = .05$) with the effect for Condition of marginal significance ($p = .08$). The interaction was not significant ($p = .89$). Social-perspective taking was more difficult than VPL1 ($p = .024$). Experimental performance overall showed a moderate relationship of marginal significance ($p = .063$) with parent-rated 'advanced' mentalising.

A Longitudinal Investigation of Social and Communication Difficulties as a Risk Factor for the Development of Social Anxiety Symptoms

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Social and communication difficulties are elevated in children and adolescents with Social Anxiety Disorder (SAD). However, to date there is a lack of research exploring the causal relationship between these difficulties and the development of social anxiety symptoms. Social and communication difficulties are a prominent feature of Autism Spectrum Disorders (ASD), which co-occurs highly with SAD. Co-occurring psychiatric disorders, such as SAD, in ASD are known to have debilitating effects above and beyond the primary difficulties. Therefore research is imperative to enhance our understanding of the risk factors underpinning the development of social anxiety, both within ASD populations and those with elevated autistic traits in the general population. By examining the relationship at a population level we can infer whether social and communication difficulties in ASD may increase this population's risk for social anxiety. The present study aims to disentangle the relationship between social and communication difficulties, as measured by the Social Communication and Disorders Checklist, and the development of social anxiety, as measured by the Development and Well-Being Assessment (DAWBA). Parent-report longitudinal data has been collected from a subset of children (N~8,000) in the Avalon Longitudinal Study of Parents and Children (ALSPAC) cohort at three time points: 7, 10 and 13 years old. The research findings could have significant implications for the development of interventions aiming to alleviate social anxiety symptoms, as well as preventing the clinical presentation of SAD by incorporating a greater focus on the therapeutic use of social skills training.

The effect of parental responsivity on language development for children with Down syndrome

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Mothers whose children have developmental delays such as Down syndrome have been found to be more directing and intrusive during interactions with their children (Tannock, 1988; Glenn, Dayus, Cunningham & Horgan, 2001). Being overly directive may have a negative impact on a child's cognitive and language development. Currently no study has followed two groups (DS and TD group) longitudinally and assessed whether parental responsivity is related to the child's concurrent or longitudinal language level. Our current study followed a group of children with DS (n=14) and typically developing children (n=35) for 1 year. The groups were matched for non-verbal mental age; the DS group were followed from 18-21 months to 30-35 months and the TD group from 9-11 months to 22-23 months. A 5-minute parent child play interaction was filmed at 2 time points 6 months apart for both groups. Receptive and expressive language measures were taken at 3 time points. The study addresses the following questions: 1) Will there be differences in parental responsivity between the two groups? Specifically, will the parents of DS children act more directive during interactions? 2) If parents are rated as being overly directive and not sensitive during interactions will this have a negative impact on their child's language concurrently or longitudinally? Preliminary results suggest there are differences between the two groups of parents, specifically the parents whose children have DS are showing more physical intrusions during interactions. Results are currently being analysed and will be ready for presentation at the conference.

Does viewing an object elicit internal motor programs for children with Developmental Coordination Disorder?

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Affordance theory postulates that objects are perceived not only in terms of their size and shape, but also in relation to the possibilities for action. The current study investigated whether children with and without Developmental Coordination Disorder (DCD) generate internal motor programs that support compatible actions towards an object. Twenty-eight children with DCD, aged 7-10 years, were compared to 28 typically-developing controls. Children held a cylinder device that they pressed using a power grip, and a small button mimicing a precision grip. They viewed objects (neutral, and others affording power or precision grips) and were told to press one of the devices quickly when a colour appeared over the object; e.g. pressing the cylinder if orange, and the button if purple. Half of the trials were object grip/colour compatible and the remaining were incompatible. Analyses revealed that children with DCD made more errors and had slower reaction times than the control group. A compatibility effect was evident for both groups when viewing objects that afford a power grip, meaning they were quicker to respond when objects matched the colour/grip they had been assigned. However, this compatibility effect was only found for the control group on the precision objects. Reaction time findings imply that a motor plan is generated

after presentation of power grip objects for both groups. A lack of a compatibility effect for the precision grip in the DCD group may be attributed to weaker precision (manual dexterity) skills, and thus a more immature object representation.

Pathways to attention deficit hyperactivity disorder: the tuberous sclerosis model

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Tuberous Sclerosis Complex (TSC) is associated with variable developmental outcomes, including attention deficit hyperactivity disorder (ADHD). Individuals with ADHD show elevated response time variability (RTV). We aimed to characterise the pathway to cognitive deficits associated with ADHD symptoms in TSC. Participants were recruited from the TS 2000 Study Cohort, a nationally ascertained longitudinal study of TSC. In Phase 1 of the study, data on epilepsy, cortical tuber count and other clinical correlates were gathered. In Phase 2 of the study, information on developmental outcome including ADHD was gathered using the Development and Wellbeing Assessment (DAWBA). A Go/No-Go task (n=56) was administered. RTs were modelled using an ex-Gaussian curve and the sequence of RTs was analysed using a fast Fourier transform (FFT). Increased RTV was associated with ADHD symptoms. Individuals with a higher cortical tuber count had elevated RTV. Structural equation modelling indicated a significant pathway from genetic mutation, to epilepsy severity in the first two years of life, to RTV, through to ADHD symptoms. The findings indicate increased RTV is a feature of ADHD in TSC, and demonstrates a homology between idiopathic and syndromic cases of ADHD. This suggests that RTV mediates the relationship between epilepsy and ADHD symptoms in TSC. These findings hold key implications for cognitive neuroscientific understanding of ADHD. Identification of objective markers that are associated with ADHD in TSC will aid in targeting more specific treatment and intervention strategies.

A Comparison of the Relationship Between Sensory Responsivity and Restricted/Repetitive Behaviours in ASD and Williams Syndrome

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Whilst an association between sensory processing and restricted/repetitive behaviours (RRBs) has been established in Autism Spectrum Disorder (ASD), little is known about the extent to which this relationship is syndrome-specific. The current study aimed to compare

the relationship between sensory responsivity and restricted/repetitive behaviours in two neurodevelopmental conditions; ASD and Williams Syndrome (WS). Parental questionnaire data were collated for 66 individuals with ASD (8-15 years) and 66 individuals with WS (4-39 years). Correlational and mediational analyses were conducted. The study identified a strikingly comparable sensory profile between ASD and WS groups, with profiles differing by a small-medium difference in sensory hyperresponsivity (higher in WS). Higher hyporesponsivity in ASD was identified only in the Auditory sensitivity and Physical stamina sensory domains. Both hyporesponsivity and hyperresponsivity correlated with restricted/repetitive behaviours in both groups, with consistently stronger associations found in the ASD group. Hyperresponsivity had a small mediational effect on the relationship between diagnostic group and both sub-factors of RRB (Insistence on Sameness behaviours and Repetitive Sensori-Motor behaviours). Hyporesponsivity by itself did not mediate the relationship between group and restricted/repetitive behaviours. This study suggests that ASD and WS have comparable overall sensory profiles; and that sensory responsivity does not explain the majority of variance in the relationship between diagnostic group and restricted/repetitive behaviours in ASD and WS.

Cycles Phonological Approach for Remediating the Phonological Disorders in Children with Down syndrome: A case study

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The aim of the study was to examine the effectiveness of the cycles approach in remediating the phonological disorders of highly unintelligible child with Down syndrome aged 5:8. Down syndrome or Trisomy 21 can be defined as an additional copy of chromosome 21 which affects children's cognitive abilities and speech and language development. A single case multiple-baseline design across behaviours was used to evaluate the effectiveness of the cycles-based intervention. The design involved a series of single-subject A-B (non-intervention/intervention) designs which, by staggering the start of intervention across behaviours, allow replication of any intervention effect to be replicated. The two most deviant sound patterns were selected based on the initial speech assessment. The intervention consisted of two cycles: the first cycle targeted /s/-cluster reduction with three sounds /p/, /t/ and /k/. The second cycle was planned to treat velar fronting. The treated targets indicated noticeable improvement due to applying intervention, whereas the untreated targets did not improve unless treatment was applied. The production improvement could be attributed to the treatment procedure rather than to any other unrelated variables.

Notes