

# **Centre for Brain and Cognitive Development**

Biannual report 2014–2016



## Funding

**Action Medical Research and Great Ormond Street Hospital Children's Charity Autistica Autour des Williams BIAL Foundation Bill and Melinda Gates Foundation British Academy Department of Health, UK Economic and Social Research Council Education Endowment Foundation** Edward Glover CMG and Dame Audrey Glover **European Commission European Research Council Garfield Weston Foundation The Great Britain Sasakawa Foundation Innovative Medicines Initiative – EU Jacobs Foundation** L'Oreal UK and Ireland **Leverhulme Trust** The Maurice Wohl Charitable Foundation **Medical Research Council MQ: Transforming Mental Health Royal Society Simons Foundation** Waterloo Foundation Wellcome Trust **The Wolfson Foundation** 

#### Babylab www.cbcd.bbk.ac.uk/babylab

Bridge Lab www.bridgelab.bbk.ac.uk

Developmental Neurocognition Lab www.bbk.ac.uk/psychology/dnl

Genes Environment Lifespan Lab www.gel.bbk.ac.uk



## Introduction

Welcome to our biennial progress report for the period October 2014–2016. The report illustrates some of the major projects, themes and achievements of members of the Centre for Brain and Cognitive Development (CBCD), and builds on our previous reports.

The Centre was established in October 1998 when Mark Johnson and his team moved to Birkbeck, University of London, from the former Medical Research Council Cognitive Development Unit.

Denis Mareschal joined in the same year as a founder member, and steady growth since then has involved the addition of faculty members Michael Thomas (from the Institute of Child Health, University College London in 2002), Fred Dick (from the University of California, San Diego in 2004), Annette Karmiloff-Smith (from the Institute of Child Health, University College London in 2006), Natasha Kirkham (from Stanford in 2007), Angelica Ronald (from the Institute of Psychiatry, Psychology and Neuroscience, King's College in 2007), Emma Meaburn (from the Institute of Psychiatry, Psychology and Neuroscience, King's College in 2009), Matthew Longo (from University College London in 2010), Marie Smith (from the MRC Cognition and Brain Sciences Unit, Cambridge in 2010), Tim Smith (from the University of Edinburgh in 2011) Iroise Dumontheil (from the Institute of Cognitive Neuroscience, University College London in 2012) Clare Press (from University of Reading in 2012), Adam Tierney (from Northwestern University in 2015) and Emily Jones when she took up a lectureship at Birkbeck in 2015. In addition, Drs Victoria Southgate and Atsushi Senju obtained prestigious fellowships (from the Wellcome Trust and Medical Research Council) enabling them to develop their own research teams within the Centre. In line with the Centre's increasing impact, Professors Tony Charman (Institute of Psychiatry, Psychology and Neuroscience, King's College) and Clare Elwell (University College London) have joined us as visiting professors in the last two years.

The CBCD is a dynamic and continually changing entity refreshed by new post-docs and research fellows, and it has become a major centre for postgraduate training (see CBCD Scientists). Some have retained membership of the CBCD as Affiliated Scientists. We are particularly pleased that many former members have gone on to establish their own labs and research centres elsewhere in Europe, North America and Australia.

The CBCD is also a place of training for the future generation of international researchers. We are very proud of our doctoral (PhD) students who have completed their degrees over the last few years. The calibre of their success is witnessed by the international prizes that they have received for their doctoral research from such organisations as the American Psychological Association and the Cognitive Science Society (USA).

The work of CBCD members continues to be characterised by its use of converging methods (behavioural testing, eye tracking, ERP, EEG, optical imaging, EMG, computer modelling, functional and structural MRI), and by its theory-driven programmes of empirical research on visual, cognitive, and language development in human infants, children and adults.

While the CBCD shares common infrastructure, it is further organised into several constituent labs, each with its own particular focus. Some members of the CBCD are also members of associated centres such as the Centre for Educational Neuroscience (educationalneuroscience. org.uk/), Birkbeck-UCL Centre for Neuroimaging (BUCNI; http://bucni. psychol.ucl.ac.uk/), the Birkbeck Psychology Genetics Grouping (bbk. ac.uk/psychology/our-research/research-groups/genetics-grouping), and the BRIDGE Lab (bridgelab.bbk.ac.uk).

We are delighted to have received funding from the Maurice Wohl Charitable Foundation and the Wolfson Foundation for a new, state of the art TodderLab facility. Using the latest wireless technologies, the Wohl Wolfson ToddlerLab will enable the advanced scientific study of brain development for children from 18 months to three or four years, in an environment simulating familiar surroundings for toddlers. It will enable us to understand development in more real world contexts, in which the children interact with each other and are free to roam about.

In addition to many individual collaborations, the CBCD also maintains strong collaborative partnerships with the Institute of Psychiatry, Psychology and Neuroscience (King's College London), the Institute for Research in Child Development (University of East London), University College London Medical Physics, and the LonDownS Consortium in London. We have several partnerships with commercial companies including Acuity ETS Ltd and Procter and Gamble.

Needless to say, the work undertaken at CBCD is only possible through the generous support of our many funders, Birkbeck and the numerous families and children who have volunteered their time. We hope that you enjoy reading the report.

## Theory, methods and training

Members of the CBCD take collective responsibility to create an advanced training environment to increase expertise in our area of science at a national, European, and international level. In addition to the many PhD students, post-docs and research fellows we have trained, we are leading our third EU Marie Curie Doctoral Training Programme (European Industrial Doctorate: Individualised Interventions in Learning: Bridging Advanced Learning Science and 21st Century Technology).

Students, postgraduates, and faculty of the CBCD have continued to win awards over the past two years that reflect not only on their personal achievements and excellence, but also on the supportive research environment provided by the CBCD.

Research at the CBCD is characterised by being both theoretically motivated and methodologically rigorous. For example, the BabyLab has pioneered methods for measuring brain functions in babies. Our regular training courses have contributed to a very rapid expansion in the number of labs that now conduct this kind of work internationally. In addition, with collaborators in Medical Physics at UCL we have helped to develop optical imaging methods (NIRS) for studying brain functions in infants. We are also collaborating on the development of wearable technology suitable for toddlers.

The Developmental Neurocognition Lab and BabyLab have developed computer-modelling techniques for simulating the development of aspects of cognition, their individual variability and gene-environment interactions. Recently, we have facilitated genetic approaches to understanding individual differences in infant and child behaviour and brain function, and a new "wetlab" facility for DNA analysis has been constructed (The Bridge Lab).

Methods commonly used at the CBCD include:

EEG: Electroencephalography – a method of measuring the spontaneous electrical activity of the brain.

ERP: Event-related potentials – a method to measure the changes in the electrical activity of the brain triggered by a specific sensory event.

MRI: Magnetic resonance imaging - a method of scanning the structure of the brain.

Functional MRI: An MRI method which allows researchers to see which regions of the brain are active.

NIRS: Near infrared spectroscopy – a method of imaging brain function that involves tiny changes in light levels.





## Awards

## Media

#### **Professor Frederic Dick** Appointed Fellow of the Association for Psychological Science, 2014

Dr Iroise Dumontheil

British Psychological Society, Spearman Medal, 2015

#### Dr Maria Laura Filippetti

American Psychological Association 'Division 7: Developmental Psychology' Dissertation Award, 2015

Dr Teodora Gliga British Psychological Society, The Neil O'Connor Award, 2016

Professor Mark Johnson Huttenlocher Prize (for Developmental Cognitive Neuroscience), 2015

#### Professor Annette Karmiloff-Smith

Elected chair of the Bloomsbury Centre for Genetic Epidemiology and Statistics, 2014

#### Dr Angelica Ronald

American Psychological Society Janet Taylor Spence Award, 2014

#### Dr Atsushi Senju

Margaret Donaldson Early Career Prize, British Psychological Society, 2015; Nakayama Award, Award for Distinguished Early and Middle Career Contributions (Shorei-sho), Nakayama Foundation for Human Science, 2015

#### **Professor Michael Thomas**

Appointed Fellow of the Association for Psychological Science, 2014

#### Dr Kristen Swan Tummeltshammer

American Psychological Association 'Division 7: Developmental Psychology' Dissertation Award, 2016

Studies carried out at CBCD are frequently recognised in the national and international media, including:

BBC One BBC Two BBC Radio Four Canadian Discovery Channel Fox News National Geographic New York Times Radio Five Live The Daily Telegraph The Daily Telegraph The Daily Mail The Evening Standard The Guardian The Huffington Post Wired Magazine Yahoo News

## Media Highlights

#### Radio 4's Today Programme 9 October 2014

Discussion led by Professor Denis Mareschal on an educational neuroscience-based intervention aimed at improving primary school children's math and sciences academic achievement.

#### **BBC** World News Horizons

23 November 2014 "The Brain"

#### The Guardian

**10 June 2015** "The Secret Life of Babies" event

## Scientists



#### Professor Mark Johnson FBA Director of CBCD and MRC Programme Leader

Currently, Professor Johnson's main project involves leading large-scale longitudinal studies on babies atrisk for a later diagnosis of Autism Spectrum Disorder (ASD;BASIS – British Autism Study of Infant Siblings) or attention deficit hyperactivity disorder (ADHD;STAARS – STudying

Autism and ADHD in at-Risk Siblings), a project that now involves multiple sites across Europe (EU-AIMS, Eurosibs). These studies attempt to elucidate mechanisms of typical and atypical cognitive development through analyses that include genetics, various measures of brain structure and function, cognitive studies, parentchild interaction and family context. In essence, we attempt to trace the typical and atypical postnatal functional development of the human brain within its surrounding social and physical environment. Recently, research has been directed to potential early interventions that may boost aspects of development in infants at-risk for less optimal outcomes.

To read about our latest work in Nature please follow this link: nature. com/news/the-big-baby-experiment-1.18701

Green, J., Charman, T., Pickles, A., Wai Wan, M., Elsabbagh, M., Slomins, V., Taylor, C., McNally, J., Booth, R., Gliga, T., Jones, E.J.H., Harrop, C., Bedford, R., Johnson, M.H., and the BASIS team (2015). Parent-mediated intervention versus no intervention for infants at high-risk of autism: A parallel, single-blind, randomised trial, The Lancet Psychiatry, 2, 133-140, doi: http://dx.doi.org/10.1016/S2215-0366(14)00091-1.

Johnson, M.H., Senju, A., and Tomalski, P. (2014). The two-process theory of face processing: Modifications based on two decades of data from infants and adults, Neuroscience and Biobehavioural Reviews, 50, 169-179, doi: 10.1016/j.neubiorev.2014.10.009.

Johnson, M.H., Gliga, T., Jones, E.J.H., and Charman, T. (2015). Infant development, autism and ADHD: Early pathways to emerging disorders, Journal of Child Psychology and Psychiatry, 56, 228-247, doi: 10.1111/jcpp.12328.



#### Professor Denis Mareschal Co-Director of CBCD

Professor Mareschal has continued to investigate the mechanisms of perceptual and cognitive development across infancy and childhood. His recent research has focused on how young children maintain distant goals in everyday action sequences, for example when making a sandwich. A second line of research has asked how our understanding of time

and duration may be grounded in early infant motor activity. The repeated actions that we see so often in infants provide them with an opportunity to learn how long actions on the world last. Finally, he has been involved in promoting the use of developmental cognitive

neuroscience to develop better and more effective educational programmes - an approach sometimes referred to as Educational Neuroscience. He has been leading a large-scale project (UnLocke unlocke.org) exploring the impact of teaching children to "Stop and think" rather than just respond with their immediate intuition, and on learning counterintuitive math and science concepts.

Freier, L., Cooper, R.P., and Mareschal, D. (2015). The planning and execution of natural sequential actions in the preschool years, Cognition, 144, 58-66, doi: 10.1016/j.cognition.2015.07.005.

Mareschal, D. (2016). The neuroscience of conceptual learning in science and mathematics, Current Opinion in Behavioural Sciences, 10, 14-18, doi: 10.1016/j.cobeha.2016.06.001.

Mareschal, I., Otsuka, Y., Clifford, C.W.G., and Mareschal, D. (2016). Are you looking at me? How children's gaze judgments improve with age, Developmental Psychology, 52, 695-703, doi: 10.1037/ dev0000100.



#### Professor Michael Thomas Director of the Centre for Educational Neuroscience and Director of Developmental Neurocognition Laboratory

Professor Thomas's recent work has focused on computational modelling of development in large populations, and translational research in educational neuroscience focusing on brain plasticity. With regard to computational modelling, he has

investigated how brain plasticity is linked to intelligence, the possible mechanisms by which autism impacts on brain development; and how behavioural interventions can alleviate developmental deficits. With regard to educational neuroscience, he has explored the implication of new findings from genetics (e.g., on the heritability of children's exam results) for parents, teachers, and policymakers. Current projects involve ways to improve science and maths education in primary age children using principles from neuroscience, and evaluating possible influences of mobile phone use on teenage brain development.

Thomas, M.S.C. (2016). Do more intelligent brains retain heightened plasticity for longer in development? A computational investigation, Developmental Cognitive Neuroscience, 19, 258-269, doi: 10.1016/j. dcn.2016.04.002.

Thomas, M.S.C. (2016). Understanding delay in developmental disorders, Child Development Perspectives, 10, 73-80, doi: 10.1111/ cdep.12169.

Thomas, M.S.C., Davis, R., Karmiloff-Smith, A., Knowland, V.C.P., and Charman, T. (2016). The over-pruning hypothesis of autism, Developmental Science, 19, 284-305, doi: 10.1111/desc.12303.



#### Professor Gergely Csibra Co-Director of the Cognitive Development Center (CDC), CEU, Hungary

Professor Csibra has continued his work on receptive communication in infants, and especially on how infantdirected communication is exploited in learning about the world. He is also involved in studies on infants' understanding of social relations and

early mental state attribution.

Lloyd-Fox, S., Széplaki-Köllőd, B., Yin, J., Csibra, G. (2015). Are you talking to me? Neural activations in 6-month-old infants in response to being addressed during natural interactions, Cortex, 70, 35-48, doi: 10.1016/j.cortex.2015.02.005.

Marno, H. and Csibra, G. (2015). Toddlers' favor communicatively presented information over statistical reliability in learning about artifacts, PloS One, 10, doi: 10.1371/journal.pone.0122129.

Tatone, D., Geraci, A., and Csibra, G. (2015). Giving and taking: Representational building blocks of active resource-transfer events in human infants, Cognition, 137, 47-62, doi: 10.1016/j. cognition.2014.12.007.



### Professor Annette Karmiloff-Smith CBE, FBA, FMedSci

Professorial Research Fellow

Professor Karmiloff-Smith and students have continued crosssyndrome, cross-domain research on infants and children with neurodevelopmental disorders of known genetic origin such as Williams syndrome (WS), Down syndrome (DS) and Fragile X syndrome (FXS). Her research focuses on the basic-level

underpinnings in infancy to subsequent cognitive-level development of attention, language, mathematics, memory, social cognition and face processing. A current Wellcome Trust grant (LonDownS) including genetics, cell biology, mouse models, sleep and neuropsychological testing is focused on infants with Down syndrome as a model for subsequent Alzheimer's Dementia in adulthood, because individuals with Down syndrome are at high genetic risk of Alzheimer's dementia.

D'Souza, D., D'Souza, H., Johnson, M.H., and Karmiloff-Smith, A. (2015). Concurrent relations between face scanning and language: A cross-syndrome infant study, PLOS ONE, 10, e0139319, doi: 10.1371/journal.pone. 0139319.

D'Souza, D., Cole, V., Farran, E.K., Brown, J.H., Humphreys, K., Howard, J., Rodic, M., Dekker, T.M., D'Souza, H., and Karmiloff-Smith, A. (2015). Face processing in Williams syndrome is already atypical in infancy, Frontiers in Psychology, 6, 760, doi: 10.3389/fpsyg.2015.00760.

Karmiloff-Smith, A., Al-Janabi, T., D'Souza, H., Groet, J., Massand, E., Mok, K, Startin, C., Fisher, E., Hardy, J., Nizetic, D., Tybulewicz, V. and Strydom, A. (2016). The Importance of Understanding Individual Differences in Down Syndrome, F1000Research, 5, 389, doi: 10.12688/f1000research.7506.1.



#### Professor Frederic Dick Professor of Cognitive Neuroscience and Director of Birkbeck/UCL Centre for NeuroImaging

Professor Dick's work focuses on the acquisition, development, and elaboration of expert skills in higherlevel audition and spoken language. This research uses experimental models of short- and longer-term

auditory learning in order to understand the cognitive, perceptual, and neural mechanisms underlying complex skills such as spoken language comprehension and auditory scene analysis. In order to constrain and ground these experimental models in basic anatomical and physiological research on auditory learning in non-human mammals, he and his collaborators have developed non-invasive MRI methods of delineating auditory areas in humans.

Carey, D., Rosen, S., Krishnan, S., Pearce, M.T., Shepherd, A., Aydelott, J., and Dick, F. (2015). Generality and specificity in the effects of musical expertise on perception and cognition. Cognition, 137, 81–105, doi: 10.1016/j.cognition.2014.12.005.

Dick, F., Krishnan, S., Leech, R., and Curtin, S. (2016). 'Language Development in Neurobiology of Language' In Hickok, G. & Small, S. (Eds.), Neurobiology of Language (pp. 373-389). Academic Press.

Krishnan, S., Leech, R., Mercure, E., Lloyd-Fox, S., and Dick, F. (2014). Convergent and Divergent fMRI Responses in Children and Adults to Increasing Language Production Demand, Cerebral Cortex, 25, 3261-77, doi: 10.1093/cercor/bhu120.



#### Professor Matthew Longo Professor of Cognitive Neuroscience and Director of the Body Representation Laboratory

Professor Longo investigates the cognitive and neural bases of our experience and mental representation of our own body, and how this influences our perception of touch, pain, and space. His research uses a broad range of methods, including perceptual psychophysics, EEG, and MRI.

Azañón, E., Radulova, S., Haggard, P., and Longo, M.R. (2016). Does the crossed-limb deficit affect the uncrossed portions of limbs?, Journal of Experimental Psychology: Human Perception and Performance, 42, 1320-1331, doi: 10.1037/xhp0000206.

Le Cornu Knight, F., Longo, M., and Bremner, A.J. (2014). Categorical perception of tactile distance, Cognition, 131, 254-262, doi: 10.1016/j.cognition.2014.01.005.

Longo, M.R. (2015). Intuitive anatomy: Distortions of conceptual knowledge of hand structure, Cognition, 142, 230-235, doi: 10.1016/j.cognition.2015.05.024.



#### Professor Tony Charman Visiting Professor

Professor Charman holds the Chair in Clinical Child Psychology at the Institute of Psychiatry, Psychology & Neuroscience, King's College London. His main research interest is the investigation of social cognitive development in children with autism and the clinical application of this work via screening, diagnostic,

epidemiological, intervention, and 'at-risk' studies. He is a Chartered Clinical Psychologist and works in a specialist service for children with autism and complex neurodevelopmental conditions at the South London and Maudsley NHS Foundation Trust. He has published more than 250 peer-reviewed papers and over 30 book chapters. He has served on a number of expert panels for the Medical Research Council and NICE in the UK, NIH in the USA and the WHO.

Charman, T., Young, G.S., Brian, J., Carter, A., Carver, J.L., Chawarska, K., Curtin, S., Dobkins, K., Elsabbagh, M., Georgiades, S., Hertz-Picciotto I., Hutman, T., Iverson, J.M., Jones, E.J., Landa, R., Macari S., Messinger, D., Nelson, C.A., Ozonoff, S., Saulnire, C., Stone, W.L., Tager-Flusberg, H., Webb, S.J., Yirmiya, N., and Zwaigenbaum, L. (2016). Non-ASD outcomes at 36 months in siblings at familial risk for autism spectrum disorder (ASD): A Baby Siblings Research Consortium (BSRC) study, Autism Research, Jul 15, doi: 10.1002/aur.1669.

Charman, T., Baird, G., Simonoff, E., Chandler, S., Davison-Jenkins, A., Sharma, A., O'Sullivan, T., Pickles, A. (2016). Does the use of screening instruments for autism spectrum disorder improve the accuracy of referrals from community child health services to autism diagnostic services? Developmental Medicine and Child Neurology, 58, 369-375, doi: 10.1111/dmcn.12874.

Pickles, A., Le Couteur, A., Leadbitter, K., Salomone, E., Cole-Fletcher, R., Tobin, H., Gammer, I., Lowry, J., Vamvakas, G., Byford, B., Aldred, C.R. Slonims, V., McConachie, H., Howlin, P., Parr, J., Charman, T., and Jonathan, G. (in press). Long-term symptom reduction following a randomised controlled trial of preschool autism treatment, Lancet.



#### Professor Clare Elwell Visiting Professor

Professor Elwell is a Professor of Medical Physics in the Department of Medical Physics and Biomedical Engineering at UCL. She leads the NIRS research group developing novel optical systems for monitoring and imaging the human body. Her research projects include studies of autism, acute brain injury in adults, children and infants, sports

performance, migraine and malaria. Her most recent project is the use of NIRS to investigate malnutrition related brain development in rural Gambia, resulting in the first functional brain imaging of infants in Africa. Her research is supported by the EPSRC, MRC, Wellcome Trust, Bill and Melinda Gates Foundation and industrial collaborators Hamamatsu Photonics and Hitachi Medical Systems. Begus K., Lloyd-Fox S., Halliday D., Papademetriou M., Darboe M.K., Prentice A.M., Moore S.E., Elwell C.E. (2016). Using fNIRS to Study Working Memory of Infants in Rural Africa, Advances in Experimental Medicine and Biology, 876, 273-9, doi: 10.1007/978-1-4939-3023-4\_34.

Blasi A., Lloyd-Fox S., Johnson M.H., Elwell C.E. (2014). Test-retest reliability of functional near infrared spectroscopy in infants, Neurophotonics, 1, doi: 10.1117/1.NPh.1.2.025005.

Lloyd-Fox, S., Papademetriou, M., Everdell, N.L., Darboe, M.K., Wegmuller, R., Prentice, A.M., Moore, S.E. and Elwell, C.E. (2014). Functional near infrared spectroscopy (fNIRS) to assess cognitive function in infants in rural Africa, Scientific Reports, 4, 4740, doi: 10.1038/srep04740.



#### Dr Caspar Addyman Postdoctoral Researcher

Dr Addyman is interested in learning mechanisms in early infancy and whether these are the same as those found in adults. He runs studies with babies and builds computational models of behaviour. His research on time perception has shown that babies already have a remarkably adult-like awareness of time from 4 months old, but that their ability to act

on this develops later. His modelling work has led to a new theoretical explanation for how our brains judge short time intervals. He has also looked at what science can learn from baby laughter and is currently writing a book on the subject. This recently led him to Brazil working with Pampers (Procter and Gamble) to see what makes a good night's sleep for babies. Surprisingly, Brazilian babies almost always woke up very happy. He is currently seeing if the same is true for British babies.

In September 2015, Dr Addyman left Birkbeck after 14 years (with 10 years at the CBCD). He has taken up a fellowship at Goldsmiths in South London and works in their Infant Lab with two CBCD alumni Prof Andy Bremner and Dr Rhiannon Thomas.

Addyman, C., Rocha, S., and Mareschal, D. (2014). Mapping the origins of time: Scalar errors in infant time estimation, Developmental Psychology, 50, 2030–2035, doi: 10.1037/a0037108.

Addyman, C., French, R.M., and Thomas, E. (2016). Computational models of interval timing. Current Opinion in Behavioural Sciences, 8, 140–146, doi: 10.1016/j.cobeha.2016.01.004.

Fautrelle, L., Mareschal, D., French, R., Addyman, C. and Thomas, E. (2015). Motor Activity Improves Temporal Expectancy. PLOS ONE, 10, e0119187, doi: 10.1371/journal.pone.0119187.



#### Dr Jannath Begum Ali Postdoctoral Researcher

Dr Begum Ali investigates the development of body representations, with a specific focus on the emergence, and development of, multisensory perception and integration (with specific consideration of cross-modal interactions between vision, proprioception, and touch). One key finding has been that

infants' neglect the location of touch in the external environment until around six months of age. Dr Begum Ali has also investigated the developmental drivers of body representations; for example, the roles of active sensorimotor experience and brain maturation.

Further, her research has examined the interaction between vision and touch within the first six months of life. Currently, the research has been extended to include audio-visual interactions to examine how information from multiple sensory sources are combined and used. Her research uses a variety of behavioural and neurophysiological measures (such as EEG) in typically developing infants, children and adults.

Begum Ali, J., Cowie, D. and Bremner, A.J. (2014). Effects of posture on tactile localisation by 4 years of age are modulated by sight of the hands: Evidence for an early acquired external spatial frame of reference, Developmental Science, 17, 935-943, doi: 10.1111/ desc.12184.

Begum Ali, J., Spence, C. and Bremner, A.J. (2015). Human infants' ability to perceive touch in external space develops postnatally, Current Biology, 25, 978-979, doi: 10.1016/j.cub.2015.08.055.

Rigato, S., Begum Ali, J., van Velzen, J. and Bremner, A.J. (2014). The neural basis of somatosensory remapping develops in human infancy, Current Biology, 24, 1222-1226, doi: 10.1016/j.cub.2014.04.004.



#### Dr Anna Blasi Postdoctoral Researcher

Dr Blasi has continued to investigate the early neurocognitive development of brain regions involved in social communication. She has been part of the British Autism Study of Infant Siblings (BASIS) team since 2010. She has published several papers relating brain activation and behavioural measures of infants at risk for ASD, as

well as brain activation and measures of outcome at 3 years. She has also contributed to the further development of functional NIRS (fNIRS) as an imaging technique for infant studies and has combined, for the first time in babies, fNIRS with functional MRI (fMRI) in a simultaneous study.

\*Blasi, A., Lloyd-Fox, S., Elwell, C.E. and Johnson, M.H. (2014). Test-retest reliability of fNIRS in infants, Neurophotonics, 1, 025005 (\* Blasi and Lloyd-Fox and are joint first authors), doi: 10.1117/1. NPh.1.2.025005.

Blasi, A., Lloyd-Fox, S., Sethna, V., Brammer, M.J., Mercure, E., Murray L., Williams, C.R., Simmons, A., Murphy, D.M., and Johnson,

M.H. (2015). Atypical processing of voice sounds in infants at risk for autism spectrum disorder, Cortex, 71, 122-133, doi: 10.1016/j. cortex.2015.06.015.

Lloyd-Fox, S., Richards, J.E., Blasi, A., Murphy, D.G.M., Elwell, C.E. and Johnson, M.H. (2014). Co-registering fNIRS with underlying cortical areas in infants, Neurophotonics, 1, 025006, doi: 10.1117/1. NPh.1.2.025006.



#### Dr Daniel Brady Postdoctoral Researcher

Dr Brady is interested in motor control and learning and their neural correlates in typical and atypical populations (primarily developmental coordination disorder, DCD). As part of his PhD research, he examined the neural correlates of motor learning in adults with and without DCD using both electroencephalography

(EEG) and transcranial magnetic stimulation (TMS). Currently, he is working as part of the London Down Syndrome (LonDownS) Consortium, assisting with the data analysis on the infant and toddler stream. The LonDownS Consortium is a multidisciplinary team of human geneticists, cellular biologists, psychiatrists, psychologists, neuroscientists, and mouse geneticists, whose aim is to understand the link between Down syndrome and Alzheimer's disease, and to identify protective and risk factors that could inform interventions.



#### Dr Hannah Broadbent Postdoctoral Researcher

Dr Broadbent's current research focuses on the development of multisensory integration in pre- and primary school aged children, and whether information from different sensory modalities supports or inhibits learning across this age range. Recent studies have examined whether multisensory compared to

uni-sensory information can better support the learning of incidental categorical information, and whether the addition of concurrent uni- or multi-sensory cognitive load tasks affect learning differentially between 5 and 10 years of age.

Broadbent, H., Farran, E.K., Chin, E., Metcalfe, K., Tassabehji, M., Turnpenny, P., Sansbury, F., Meaburn, E., Karmiloff-Smith, A., (2014). Genetic contributions to visuospatial cognition in Williams syndrome: Insights from two contrasting partial deletion patients, Journal of Neurodevelopmental Disorders, 6, 18, doi: 10.1186/1866-1955-6-18.

Broadbent, H., Farran, E.K., and Tolmie, A. (2014). Egocentric and allocentric navigation strategies in Williams syndrome and typical development, Developmental Science, 17, 920-34, doi: 10.1111/ desc.12176.

Broadbent, H., Farran, E.K., and Tolmie, A. (2014). Object-based mental rotation and visual perspective-taking in typical development and Williams syndrome, Developmental Neuropsychology, 39, 205-25, doi: 10.1080/87565641.2013.876027.



#### Dr Celeste Cheung Postdoctoral Researcher

After completing her PhD in 2013, Dr Cheung worked as a postdoctoral researcher on the BASIS project. Her research interest is in understanding the factors and predictors of neurodevelopmental disorders across the lifespan, with a primary focus on ADHD and ASD. In 2015, she began working on a Leverhulme Trust-

funded TABLET (Toddler Attentional Behaviours and LEarning with Touchscreens) project, led by Dr Tim Smith, which is the first scientific study of its kind to investigate how 6 month to 3 year old infants are using touchscreen devices and how this use (or lack of use) is influencing their cognitive, brain and social development. Dr Cheung is leaving the CBCD in September 2016 to work at The Brilliant Club, an education charity that aims to widen highly-selective university access for pupils from under-represented groups.

Cheung, C.H.M., Rijsdijk, F., McLoughlin, G., Faraone, S.V., Asherson, P., and Kuntsi, J. (2015). Childhood predictors of adolescent and young adult outcome in ADHD, Journal of Psychiatric Research, 1, doi: 10.1016/j.jpsychires.2015.01.011.

Cheung, C.H.M., Rijsdijk, F., McLoughlin, G., Banaschewski, T., Brandeis, D., Asherson, P. and Kuntsi, J. (2016). Cognitive and neurophysiological markers of ADHD persistence and remission, British Journal of Psychiatry, 208, 548 – 555, doi: 10.1192/bjp. bp.114.145185.

Du Rietz, E., Cheung C.H.M., McLoughlin, G., Brandeis, D., Banaschewski, T., Asherson, P. and Kuntsi, J. (2016). Self-report of ADHD shows limited agreement with objective markers of persistence and remittance, Journal of Psychiatric Research, 82, 91-99, doi: 10.1016/j.jpsychires.2016.07.020.



#### Dr Carina de Klerk Postdoctoral Researcher

Dr de Klerk is interested in the typical and atypical development of social cognition, action understanding and imitation and the brain mechanisms that underlie these abilities. With her PhD research, Dr de Klerk investigated how action experience influences the strength of perceptualmotor couplings in the infant brain, and the role these couplings play in

infants' ability to predict others' actions. With her current postdoctoral research, Dr de Klerk is investigating the development of mimicry in infancy using EMG and fNIRS. Together with Drs Victoria Southgate and Antonia Hamilton (UCL), and PhD student Chiara Bulgarelli, the team are following a group of sixty infants from 4 months until 3 years of age to investigate how factors such as sensorimotor experience, infants' growing social cognitive abilities, and increasing brain connectivity, influence the development of mimicry from infancy to toddlerhood.

de Klerk, C.C., Johnson, M.H., and Southgate, V. (2015). An EEG study

on the somatotopic organisation of sensorimotor cortex activation during action execution and observation in infancy, Developmental Cognitive Neuroscience, 15, 1-10, doi: 10.1016/j.dcn.2015.08.004.

de Klerk, C.C.J.M., Johnson, M.H., Heyes, C.M., and Southgate, V. (2015). Baby Steps: investigating the development of perceptualmotor couplings in infancy, Developmental Science, 18, 270-280, doi: 10.1111/desc.12226.

de Klerk, C.C.J.M., Gliga, T., Charman, T., Johnson, M.H., and the BASIS team (2014). Face engagement during infancy predicts later face recognition ability in younger siblings of children with autism, Developmental Science, 17, 596-611, doi: 10.1111/desc.12141.



#### Dr Hana D'Souza Postdoctoral Research Fellow

Dr D'Souza is interested in mechanisms of typical and atypical development, focusing on children with neurodevelopmental disorders of known genetic origin, such as Down syndrome, Fragile X syndrome, and Williams syndrome. In her PhD research, she examined motor specialisation in typically developing infants as well as infants and

toddlers with Down syndrome. As part of the London Down Syndrome (LonDownS) Consortium, she is currently investigating individual differences and interactions between various domains and levels of description across development in infants and toddlers with Down syndrome. The LonDownS Consortium is a multidisciplinary team of human geneticists, cellular biologists, psychiatrists, psychologists, neuroscientists, and mouse geneticists, whose aim is to understand the link between Down syndrome and Alzheimer's disease, and to identify protective and risk factors that could inform interventions.

D'Souza, D., D'Souza, H., Johnson, M. H., and Karmiloff-Smith, A. (2015). Concurrent relations between face scanning and language: a cross-syndrome infant study, PLOS ONE, 10, e0139319. doi: 10.1371/journal.pone.0139319.

D'Souza, H., Cowie, D., Karmiloff-Smith, A., & Bremner, A. J. (2016). Specialisation of the motor system in infancy: From broad tuning to selectively specialized purposeful actions, Developmental Science, doi: 10.1111/desc.12409.

Karmiloff-Smith, A., Al-Janabi, T., D'Souza, H., Groet, J., Massand, E., Mok, K, Startin, C., Fisher, E., Hardy, J., Nizetic, D., Tybulewicz, V. and Strydom, A. (2016). The importance of understanding individual differences in Down syndrome, F1000Research, 5, 389, doi: 10.12688/f1000research.7506.1.



#### Dr Iroise Dumontheil Reader in Cognitive Neuroscience

Dr Dumontheil's research examines social and executive functions in adulthood and their development during adolescence. In particular, she studies the interaction between social cognition and cognitive control processes. Her research combines behavioural, structural and functional neuroimaging methods, as well as

the study of the effect of genetic polymorphisms on cognition. She has recently been researching the effect of genetic polymorphisms affecting the dopamine system on the development of relational reasoning, emotional regulation, and both social and standard working memory measures; the effect of mindfulness meditation training in healthy adults and adolescents on self-regulation and other executive functions; the effects of mobile phone use on adolescent cognition, in collaboration with researchers at Imperial College; she has collaborated with Cardboard Citizens to develop and evaluate the impact of Meta, a forum theatre play about the teenage brain; and she is working on the UnLocke project, investigating the potential benefit of an intervention focusing on the inhibition of misconceptions for science and maths success in primary school.

Dumontheil I., Wolf L., and Blakemore S.-J. (2016). Audience effects on the neural correlates of relational reasoning in adolescence, Neuropsychologia, 87, 85-95, doi: 10.1016/j. neuropsychologia.2016.05.001.

Dumontheil I. (2016). Adolescent brain development, Current Opinion in Behavioural Sciences, 10, 39-44, doi: 10.1016/j. cobeha.2016.04.012.

Symeonidou I., Dumontheil I., Chow W.-Y., and Breheny R. (2016). Development of online use of theory of mind in adolescence: an eyetracking study, Journal of Experimental Child Psychology, 149, 81-97, doi: 10.1016/j.jecp.2015.11.007.

#### **Dr Louise Ewing**

#### **Postdoctoral Researcher**

Dr Ewing's research investigates how faces are immensely rich in social information and by adulthood, most people are remarkably skilled at reading this information. She is particularly interested in how these abilities emerge and improve between infancy and adulthood, and how face processing might differ in children and adults with atypical developmental trajectories, e.g., individuals with ASD and Williams Syndrome. Dr Ewing has been working with Dr Marie Smith and Professor Annette Karmiloff-Smith at Birkbeck College, and Dr Emily Farran at the Institute of Education (UCL), on a Leverhulme Trust funded grant that is using the Bubbles technique to explore developmental shifts in the strategies used to evaluate faces in typical children and individuals with Williams Syndrome.

Dr Ewing started a lectureship at the University of East Anglia in December 2015.

Ewing, L., Caulfield, F., Read, A., and Rhodes, G. (2014). Appearancebased trust behaviour is reduced in children with autism spectrum disorder, Autism, 19, 1002-09, doi: 10.1177/1362361314559431.

Ewing, L., Caulfield, F., Read, A., and Rhodes, G. (2015). Perceived trustworthiness of faces drives trust behaviour in children.

Developmental Science, 18, 327-34, doi: 10.1111/desc.12218.

Rhodes, G., Pond, S., Burton, N., Kloth, N., Jeffery, L., Bell, J., Ewing, L., Calder, A.J., and Palermo, R. (2015). How distinct is the coding of face identity and expression? Evidence for some common dimensions in face space, Cognition, 142, 123-37, doi: 10.1016/j. cognition.2015.05.012.



#### Dr Teodora Gliga Programme Leader, Infant Siblings Studies

Dr Gliga is particularly interested in the typical and atypical development of learning heuristics, e.g., how infants learn to select reliable and useful information or to weigh conceptual and perceptual input when acquiring new knowledge.

Begus, K., Southgate, V., and Gliga,

T. (2015). Neural mechanisms of infant learning: differences in frontal theta activity during object exploration modulate subsequent object recognition, Biology Letters, 11, 20150041, doi: 10.1098/ rsbl.2015.0041.

Gliga, T., Smith, T.J., Likely, N., Charman, T., and Johnson, M.H. (2015). Early visual foraging in relationship to familial risk for autism and hyperactivity/inattention, Journal of Attention Disorders, 1087054715616490, doi: 10.1177/1087054715616490.

Gliga, T., Bedford, R., Charman, T., Johnson, M.H., and the BASIS Team (2015). Enhanced visual search in infancy predicts emerging autism symptoms, Current Biology, 25, 1727-30, doi: 10.1016/j. cub.2015.05.011.



#### Dr Emily Jones Lecturer

Dr Jones leads the BASIS-affiliated STAARS project and coordinates the EU-AIMS cross-European study of infants with older siblings with ASD. She is also involved in collaborative longitudinal studies of infants with genetic disorders such as Neurofibromatosis Type 1, and early intervention development for high-risk

infants. Her research interests include using cognitive, behavioural and psychophysiological methods to characterise attention, learning and memory in typical and atypical development. The long-term goal of this research is to understand the mechanisms that contribute to individual differences in developmental trajectories, and how those processes may be disrupted in disorders such as ASD and ADHD.

Jones, E.J.H., Venema, K., Earl, R., Lowy, R., Barnes, K., Estes, A., Dawson, G., and Webb, S.J. (2016). Reduced engagement with social stimuli in 6-month-old infants with later Autism Spectrum Disorder: A longitudinal prospective study of infants at high familial risk, Journal of Neurodevelopmental Disorders, 8, doi: 10.1186/s11689-016-9139-8.

Jones, E.J.H., Venema, K., Earl, R., Lowy, R., and Webb, S.J. (in press). Infant social attention: an intermediate phenotype of ASD? Journal of Child Psychology and Psychiatry. Jones, E.J.H., Venema, K., Lowy, R., Earl, R., and Webb, S.J. (2015). Developmental changes in infant brain activity during naturalistic social experiences, Developmental Psychobiology, 57, 842-853, doi: 10.1002/dev.21336.



#### Dr Natasha Kirkham Senior Lecturer

Dr Kirkham is interested in how infants and children learn to understand the natural world around them, specifically how they process rich and complex multisensory inputs. Over the past two years Dr. Kirkham has been working on two lines of research: (1) In collaboration with former PhD students Dr Rachel Wu and Dr Kristen Tummeltshammer,

Dr Kirkham has been investigating a) when and how infants use the patterns in their environment to predict future events, b) the roles of salience and predictability in infant learning, and c) how attention is deployed during visual learning with social/non-social cues. (2) In an ESRC-funded investigation, Dr Kirkham and Professor Mareschal are looking at the benefits/costs of multisensory information on learning during primary school years. This work is run in collaboration with current PhD student Anna Peng, and postdoctoral researcher Hannah Broadbent. All of these questions are being investigated using eye tracking methodologies and behavioural measures.

Tummeltshammer, K.S., Amso, D., French, R.M., and Kirkham. N.Z. (2016).. Across space and time: Infants learn from backward and forward visual statistics, Developmental Science.

Tummeltshammer, K.S., Mareschal, D., and Kirkham, N.Z. (2014). Infants' Selective Attention to Reliable Visual Cues in the Presence of Salient Distractors, Child Development, 85, 1981-94, doi: 10.1111/ cdev.12239.

Tummeltshammer, K.S., Wu, R., Sobel, D.M., and Kirkham, N.Z. (2014).

Infants Track the Reliability of Potential Informants, Psychological Science, 25, 1730-38, doi: 10.1177/0956797614540178.



#### Dr Sarah Lloyd-Fox Postdoctoral Researcher

Dr Lloyd-Fox's research interests focus around the development and application of fNIRS to study the mechanisms of cognitive development. Her research has focused on the understanding of the development of social cognition during early infancy and how the brain becomes specialised for this purpose. A second line of her research is to

understand the cognitive and neural mechanisms that contribute to individual differences in developmental trajectories, and how those processes may be compromised in early development by risk factors such as developmental disorders (ASD) and undernutrition. She also runs the fNIRS Lab at the CBCD and has spent the last nine years developing this technique for use with infants. Recently, she has been involved in promoting its use in low-income and/or field-based settings in Africa and Asia.

Lloyd-Fox, S., Papademetriou, M., Darboe, M.K., Everdell, N.L., Wegmuller, R., Prentice, A.M., Moore, S.E. and Elwell, C.E. (2014). Functional near infrared spectroscopy (fNIRS) to assess cognitive function in infants in rural Africa, Nature Scientific Reports, 4, 4740, doi: 10.1038/srep04740.

Lloyd-Fox, S., Wu, R., Richards, J.E., Elwell, C.E. and Johnson, M.H. (2015). Cortical Activation to Action Perception is associated with action production abilities in young infants, Cerebral Cortex, 25, 289-297, doi: 10.1093/cercor/bht207.

Lloyd-Fox, S. (2015). 'Researching the brain in neurodevelopmental disorders' in Van Herwegen, J. and Riby, D. (Eds). Neurodevelopmental Disorders: Research Challenges and Solutions, Routledge Psychology Press, Hove, UK.



#### Dr Luke Mason Postdoctoral Researcher

Dr Mason joined the CBCD in 2013 having completed his PhD on motor preparation and attention in 2012. He uses EEG and eye tracking to investigate attention, visual processing and multisensory integration from infancy to adulthood in disorders such as ASD and ADHD, specialising in large multimodal datasets such as the BASIS, EU-AIMS

and BRIGHT studies.

Loth, E., Spooren, W., Ham, L.M., Isaac, M.B., Auriche-Benichou, C., Banaschewski, T., Charman, T. Collier, D., de Andres-Trelles, F., Durston, S., Ecker, C., Elferink, A., Haberkamp, M., Hemmings, R., Johnson, M.H., Jones, E.J., Khwaja, O.S., Lenton, S., Mason, L. et al (2016). Identification and validation of biomarkers for autism spectrum disorders, Nature Reviews Drug Discovery, 15, 70-73, doi: 10.1038/nrd.2015.7.

Mason, L., Linnell, K.J., Davis, R., and Van Velzen, J. (2015). Visual processing at goal and effector locations is dynamically enhanced during motor preparation, NeuroImage, 117, 243-49, doi: 10.1016/j. neuroimage.2015.05.066.

Rigato, S., Bremner, A.J., Mason, L., Pickering, A., Davis, R., and Velzen, J. (2013). The electrophysiological time course of somatosensory spatial remapping: vision of the hands modulates effects of posture on somatosensory evoked potentials, European Journal of Neuroscience, 38, 2884-2892, doi: 10.1111/ejn.12292.



#### Dr Emma Meaburn Senior Lecturer

Dr Meaburn leads the Behavioural Genomics Research Group at the Department of Psychological Sciences, Birkbeck. The broad aim of their research is to use measured genomic information to better understand the biological basis of individual differences in behavioural domains and psychopathologies in

childhood and adolescence. They employ cutting-edge experimental methods for genomic data generation and use established and emerging statistical approaches to interrogate the data. Dr Meaburn is also the Director of the Birkbeck Research Into Developmental GEnomics (BRIDGE; bridgelab.bbk.ac.uk/) Lab, a state of-the-art biobanking and molecular biology lab where they conduct much of their research.

Marzi, S.J., Meaburn, E.L., Dempster, E.L., Lunnon, K., Paya-Cano, J.L., Smith, R.G., Volta, M., Troakes, C., Schalkwyk, L.C., and Mill, J. (2016). Tissue-specific patterns of allelically-skewed DNA methylation, Epigenetics, 11, 24-35, doi: 10.1080/15592294.2015.1127479.

Spain, S.L., Pedroso, I., Kadeva, N., Miller, M.B., Iacono, W.G., McGue, M., Stergiakouli, E., Smith, G.D., Putallaz, M., Lubinski, D., Meaburn, E.L., Plomin, R., and Simpson, M.A. (2015). A genome-wide analysis of putative functional and exonic variation associated with extremely high intelligence, Molecular Psychiatry, 21, 1152, doi: 10.1038/mp.2015.108.

Thomas, M.S.C., Kovas, Y., Meaburn, E.L., and Tolmie, A. (2015) What Can the Study of Genetics Offer to Educators? Mind, Brain and Education, 9, 72-80, doi: 10.1111/mbe.12077.

### Dr Clare Press

#### Senior Lecturer

Dr Press has been studying the mechanisms that underlie our ability to map between action and perception, as needed for action control, imitation and other social abilities. Action control and sensory processing impairments are widely reported in individuals with ASD alongside their more widely publicised social problems, but it is unclear what underlies these difficulties or the relationship between them. Her recent work has demonstrated that atypicalities in the way people with ASD move themselves, can explain their problems with understanding the subtleties of others' facial expressions and body movements.

Brewer, R., Biotti, F., Catmur, C., Press, C., Happe, F., Cook, R., & Bird, G. (2016). Can neurotypical individuals read autistic facial expressions? Atypical production of emotional facial expressions in Autism Spectrum Disorders, Autism Research, 9, 262-271, doi: 10.1002/aur.1508.

Edey, R., Cook, J., Brewer, R., Johnson, M., Bird, G., and Press, C. (in press) Interaction takes two: Typical adults exhibit mind-blindness towards those with Autism Spectrum Disorder. Journal of Abnormal Psychology, doi: 10.1037/abn0000199.

Press, C., and Cook, R. (2015). Beyond action-specific simulation: Domain-general motor contributions to perception. Trends in Cognitive Sciences, 19, 176-178, doi: 10.1016/j.tics.2015.01.006.



#### Dr Angelica Ronald Reader

Dr Ronald conducts behavioural genetic and molecular genetic research on psychopathology from infancy to adolescence. Her research has particularly focused on the genetic and environmental causes of autism spectrum conditions, psychotic experiences, and the causes of co-occurring

psychopathology in childhood and adolescence. Dr Ronald is a Reader at the CBCD and the Director of the Genes Environment Lifespan laboratory, a lab group within the CBCD established in 2011 (www.gel. bbk.ac.uk).

Ronald, A. (2015). Recent quantitative genetic research on psychotic experiences: New approaches to old questions, Current Opinion in Behavioural Sciences, 2, 81-88, doi: 10.1016/j.cobeha.2014.10.001.

Taylor, M.J., Freeman, D. and Ronald, A. (2016). Dimensional psychotic experiences in adolescence: Evidence from a taxometric study of a community-based sample, Psychiatry Research, 241, 35-42, doi: doi: 10.1016/j.psychres.2016.04.021.

Taylor, M.J., Lichtenstein, P., Larsson, H., Anckarsäter, H., Greven, C.U. and Ronald, A. (2016). Is there a female protective effect against ADHD? Evidence from two representative twin samples, Journal of the American Academy of Child and Adolescent Psychiatry, 55, 504-512, doi: 10.1016/j.jaac.2016.04.004.



#### Dr Simona Salomone Postdoctoral Researcher

Dr Salomone completed her PhD at the Institute of Neuroscience at Trinity College in Dublin, where she investigated the effects of a new partially home-based attention training programme for adults with ADHD. She also explored the neurophysiological markers of sustained attention deficits in adult ADHD using EEG. After

spending 20 months as a post-doctoral researcher at the Institute of Psychiatry, Psychology and Neuroscience (IoPPN), she joined the Centre for Brain and Cognitive Development in 2015, where she is coordinating the INTER-STAARS project, a clinical trial to test the efficacy of a novel attention training programme for infants at risk of ADHD. Her main research interests are cognitive rehabilitation, neuro-rehabilitation, ADHD and EEG.

Salomone, S., Robertson, I.H., Lynch, T., Pender, N., Fearon, C., Marnane, M., Balsters, J.H., Dockree, P.M. (2014). Autoimmune Brainstem Encephalopathy causing a partially reversible Minimally Conscious State and Selective Cognitive Impairments: a unique case report, Neurocase, 20, 569-580.

Salomone, S., Fleming, G.R., Castorina, M., Shanahan, J.M., O'Connell, R. G., Bramham, J., Robertson, I.H. (2015). The effects of a Self-Alert Training (SAT) program for adults with ADHD, Frontiers in Human Neuroscience, 10, 9-45, doi: 10.3389/fnhum.2015.00045.

Salomone, S., Fleming, G.R., O'Connell, R.G., Bramham, J., Robertson, I.H. (2016). Neuropsychological Deficits in Adult ADHD: Evidence for

Differential Attentional impairments, Deficient Executive Functions and High Self-Reported Functional Impairments, Journal of Attention Disorders, doi: 10.1177/1087054715623045.



#### Dr Atsushi Senju Reader and MRC Research Career Development Fellow

Dr Senju has been studying how people effortlessly and spontaneously understand signals of social communication, and how such skills develop. His recent work has greatly contributed to our understanding of how brains process social communication, how infants and young children develop such a skill,

how the social environment changes the way these skills develop, and why such a spontaneous processing of social information is difficult in individuals with ASD. His team is also developing new research methods using an infant-friendly head-mounted eye-tracker, to assess the use of eye gaze in real face-to-face interaction between infants and their caregivers.

Akechi, H., Stein, T., Senju, A., Kikuchi, Y., Tojo, Y., Osanai, T., Hasegawa, T. (2014). Absence of preferential unconscious processing of eye contact in adolescents with autism spectrum disorder, Autism Research, 7, 590-597, doi: 10.1002/aur.1397.

Johnson, M.H., Senju, A., and Tomalski, P. (2015). The two-process theory of face processing: Modifications based on two decades of data from infants and adults, Neuroscience & Biobehavioral Reviews, 50, 169-179, doi: 10.1016/j.neubiorev.2014.10.009.

Senju, A., Vernetti, A., Ganea, N., Hudry, K., Tucker, L., Charman, T., and Johnson, M.H. (2015). Early Social Experience Affects the Development of Eye Gaze Processing, Current Biology, 25, 3086-3091, doi: 10.1016/j.cub.2015.10.019.

#### Dr Marie Smith

#### **Senior Lecturer**

Dr Smith's research focuses on the perception and categorisation of visual stimuli, with a particular focus on the perception of faces and facial expressions of emotion. She is working to understand how information is processed during the perception of faces and how this processing is affected by emotional content, task demands, expectations and level of awareness. Recent projects seek to explore the development of specialised face processing abilities in young children (6-12yrs), in healthy ageing across the adult lifespan (65yrs+) and in patient populations (e.g., individuals with Williams syndrome, Down syndrome and ASD).

Jaensch, M., Van den Hurk, W., Dzhelyova, A., Hahn, D., Perrett, A., Richards, A. and Smith, M.L. (2014). Don't look back in Anger: the rewarding value of a female face is discounted by an angry expression, Journal of Experimental Psychology: Human Perception and Performance, 40, 2101-5, doi: 10.1037/a0038078.

Smith, M.L. and Merlusca, C. (2014). How task shapes the use of information during facial expression categorisations, Emotion, 14, 478-487, doi: 10.1037/a0035588.

Smith, M.L., Volna, B. and Ewing, L. (2016). Distinct Information Critically Distinguishes Judgments of Face Familiarity and Identity, Journal of Experimental Psychology: Human Perception and Performance, ISSN 0096-1523, doi: 10.1037/xhp0000243.



#### Dr Tim J. Smith Reader

Dr Smith's research focuses on how we actively attend to and perceive dynamic visual displays such as real-world scenes, cinema and interactive technologies (e.g., tablets and Virtual Reality). He uses advanced computational and behavioural methods, including eye tracking, psychophysiology and EEG to understand the factors

that influence visual attention, how these factors can be shaped by designers of audio visual experiences such as filmmakers and virtual environments and how, in turn, these technologies shape us. These questions are applied to infants over the first years of life, atypical groups (ASD and ADHD), and typical adults. His research has received exposure in the press (Wired magazine, NY Times, the Guardian, and the BBC) and has been presented at Dreamworks Animation, the British Film Institute and the Academy of Motion Picture Arts and Sciences.

Bedford, R.M., Saez De Urabain, I.R. Cheung, C.H.M., Karmiloff-Smith, A, and Smith, T.J. (2016). Toddlers' Fine Motor Milestone Achievement is Associated with Early Touchscreen Scrolling, Frontiers in Psychology, doi: 10.3389/fpsyg.2016.01108.

Smith, T.J. and Martin-Portugues Santacreu, J.Y. (2016). Match-action: the role of motion and audio in creating global change blindness in film, Media Psychology, doi: 10.1080/15213269.2016.1160789.

Wass, S.V. and Smith, T.J. (2014). Visual motherese? Signal-to-noise ratios in toddler-directed television, Developmental Science, 18, 24-37, doi: 10.1111/desc.12156.



#### Dr Victoria Southgate Senior Lecturer and Wellcome Trust Research Fellow

Dr Southgate's work is focused on identifying the cognitive and brain mechanisms involved in infants' abilities to make sense of others' actions and others' minds, and to acquire information from others. In recent years, she has been using EEG and fNIRS to identify neural

mechanisms involved in different social cognitive processes including Theory of Mind, action prediction, mimicry and information seeking.

Begus, K., Gliga, T., and Southgate, V. (2014). Infants learn what they want to learn: Responding to infant pointing leads to superior learning, PLoS One, 9, doi: 10.1371/journal.pone.0108817.

Southgate, V., and Vernetti, A. (2014). Belief-based action prediction in preverbal infants, Cognition, 130, 1-10, doi: 10.1016/j. cognition.2013.08.008.

Southgate, V., Begus, K., Lloyd-Fox, S., di Gangi, V., and Hamilton, A. (2014). Goal representation in the infant brain, Neuroimage, 85, 294-301, doi: 10.1016/j.neuroimage.2013.08.043.



#### Dr Adam Tierney Lecturer

Dr Tierney has been studying the neural foundations of the perception and production of rhythm. His work has revealed that rhythmic skill heavily relies upon the stability and precision of neural processing in the auditory system. He has also uncovered robust relationships between rhythm perception and language skills across multiple subject groups drawn from a

variety of developmental stages. This suggests that the development of rhythm skills and language proficiency may rely upon overlapping neural resources, suggesting that rhythm training may be an effective remedial strategy for some children with language learning impairments.

Kirman, J., Tierney, A., Fitzroy, A., Skoe, E., Amar, J. and Kraus, N. (2015). Continued maturation of auditory brainstem function during adolescence: a longitudinal approach, Clinical Neurophysiology, 126, 2348-55, doi: 10.1016/j.clinph.2015.01.026.

Woodruff-Carr, K., White-Schwoch, T., Tierney, A. and Kraus, N. (2015). Beat synchronisation predicts neural speech encoding and reading readiness in pre-schoolers, Proceedings of the National Academy of Sciences, 111, 14559-564, doi: 10.1073/pnas.1406219111.

Woodruff Carr K., Tierney A., White-Schwoch T., and Kraus N. (2016). Intertrial auditory neural stability supports beat synchronisation in pre-schoolers, Developmental Cognitive Neuroscience, 17, 76-82, doi: 10.1016/j.dcn.2015.12.003.



#### Dr Hannah Wilkinson Postdoctoral Researcher

Dr Wilkinson (née Smith) investigates the neuropsychological profiles of primary school pupils, especially those disadvantaged by social, emotional and behavioural difficulties, low socioeconomic status, or extreme poverty, to inform the development and evaluation of interventions that aim to improve behaviour and learning. This has involved taking

an Educational Neuroscience approach to examine the association between executive functions, classroom behaviour, and academic achievement. She is currently working on a large-scale project (UnLocke) exploring the impact of using a computerised learning activity to teach pupils to inhibit their immediate response, in order to learn counterintuitive concepts in maths and science.

Smith, H.R., Polenik, K., Nakasita, S., and Jones, A.P. (2012). Profiling social, emotional and behavioural difficulties of children involved in direct and indirect bullying behaviours, Emotional and Behavioural

#### Difficulties, 17, 243-257, doi: 10.1080/13632752.2012.704315.

Smith, H.R., Eryigit-Madzwamuse, S., & Barnes, J. (2013). Paternal Postnatal and Subsequent Mental Health Symptoms and Child Socio-Emotional and Behavioural Problems at School Entry. Infant and Child Development, 22, 335-48, doi: 10.1002/icd.1800.



Bree Pall



Candice Moore



Declan Clear



Leslie Tucker



Marian Greensmith

### **Affiliated Scientists**

Dr Rachael Bedford, King's College London Prof Andy Bremner, Goldsmiths, University of London Dr Mayada Elsabbagh, McGill University Dr Teresa Farroni, Centro Neuroscienze Cognitive Dr Roberto Filippi, Anglia Ruskin University Dr Karla Holmboe, King's College London Dr Elena Kushnerenko, University of East London Dr Evelyne Mercure, University College London Dr Greg Pasco, King's College London Prof Gaia Scerif, University of Oxford Dr Przemek Tomalski, University of Warsaw Dr Sam Wass, University of East London

### Scientific support staff

Leslie Tucker Research Support Leader and Centre Coordinator

Natasa Ganea Research Assistant

Sarah Kalwarowsky Research Assistant

Nadia Neesgaard Research Assistant

Tamsin Osbourne Research Assistant

Laura Pirazzoli Research Assistant

**Isabel Quiroz** Research Assistant

Michaela Rae Research Assistant

Chloe Taylor Research Assistant

Angelina Vernetti Research Assistant

### Administrative support

Marian Greensmith BabyLab Administrator

Bree Pall Senior Finance Administrator

Declan Clear Administrator

Candice Moore UnLocke Project Administrator

## Students



### Completed PhDs at the CBCD 2014-2016

#### Katarina Begus

The importance of active participation in learning, 2015

#### Maria Laura Filippetti

Body Perception in Infancy, 2015

#### Livia Freier

The interplay of top-down and bottom-up constraints in the development of the selection of action, 2015

#### **Kostas Papageorgiou**

Individual differences in infant visual attention: links to child temperament, behaviour and genetic variation, 2015

#### Barbara Pomiechowska

Linguistic and conceptual contributions to the development of object representations in infancy, 2015

#### Irati Rodriguez Saez de Urabain

Investigating the mechanisms underlying fixation durations during the first year of life: a computational account, 2015

#### Ayden Saffari

Discovering pathways to autism spectrum disorder by using functional and integrative genomics approaches to assess monozygotic twin differences, 2016

#### Dominika Sieradzka

Investigation into the contribution of common genetic variants to the aetiology of dimension-specific psychotic experiences in the general population of adolescents and the association with schizophrenia, 2016

#### Kristin Swan Tummeltshammer

Learning from statistics in the infant's visual world: toward an ecological approach, 2015

### **Current PhD students**

#### Jonathan Batten

Audio-visual influences on attention and perception in dynamic scenes.

#### Annie Brookman

The cognitive and neural mechanisms of adolescent science and maths reasoning.

#### Chiara Bulgarelli

The role of functional and effective connectivity in the development of social cognitive skills - An investigation on fNIRS and EEG data in a longitudinal sample exploring mimicry and self-other differentiation processes.

#### Francesco Caprini

Testing Models of Auditory Learning in Expert Listeners: Acoustical and Perceptual Processing in Designers of Novel Sounds.

#### **Daisy Crawley**

Cognitive and biological risk markers that relate to symptom severity and predict clinical outcome in ASD.

#### Viktoria Csink

Information as reward.

#### **Rachel Davis**

Computational modelling to investigate developmental trajectories of autism.

#### Georgina Donati

Emotion Regulation in Adolescence: Genetic effects and Academic Outcomes.

#### **Rosanna Edey**

The relationship between individual action kinematics and perception of others' actions.

#### Jennifer Glennon

Autism profiles in fragile X and Down Syndrome.

#### **Amy Goodwin**

Investigating mechanisms of effortful control and emotionality in infancy: a potential avenue for early interventions for ADHD.

#### Anna Gui

Risk and protective factors in neurodevelopment: Investigating genetic, familial and epigenetic contributions to social attention in infants with emerging Autism Spectrum Disorder and their first-degree relatives.

#### **Rianne Haartsen**

The development of functional connectivity in autism and its relation to emerging repetitive behaviour.

#### Jen Haensel

Cross-cultural development research on face processing.

#### Nanami Harada

Cultural influence in typical development and autism: comparing the UK and Japan.

#### **Alexandra Hendry**

Cognitive and behavioural development in toddlers at familial risk of ASD and ADHD.

#### **Kate Hughes**

Studying risk and protective factors in 4- to 16 year-olds to identify early genetic behavioural, neural and/ or cognitive relations between Down syndrome and subsequent Alzheimer's disease.

#### Anna Kolesnik

Investigating gamma oscillatory activity as a biomarker Excitation/ Inhibition imbalance in infants with an increased risk of ASD.

#### **Ines Mares**

Processing of eye contact in the subcortical pathway – testing the fast-track modulation model.

#### Suzanne Pahlman

An empirical and computational investigation of learning.

#### **Oliver Pain**

The Genetic Basis of Adolescent Psychotic Experiences.

#### Anna Peng

Task-switching in a multisensory environment across development.

#### Elena Serena Piccardi

Information sampling mechanisms in typical and atypical development.

#### Laura Pirazzoli

An investigation into the mechanisms and role of social touch in early development.

#### **Sinead Rocha**

Do we dance because we walk? Studying the development of sensorimotor synchronisation.

#### Maheen Faisal Siddiqui

The role of cytochrome in neural responses in infants.

#### Ana Maria Da Silva

Spontaneous fixation durations in children with Autism Spectrum Disorders.

#### Angelina Vernetti

Social attention and reward processing in typical development and autism.

#### **Daniel Yon**

What's special about motor contributions to perception?

In addition over 25 Master's students have successfully completed their training at the CBCD in the period 2014-2016. Congratulations to all.



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