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Late Childhood and Adolescence

The Educated Brain Policy Brief



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The Educated Brain Policy Brief:

Late Childhood and Adolescence

The Educated Brain Seminar Series:

Bringing education, psychology and neuroscience research together to better understand how we learn, and how we can promote learning across the lifespan through policy and practice.

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Executive Summary

This brief relates to the second seminar in a series of three around the theme of 'The Educated Brain'. Each research seminar includes talks from leading researchers and roundtable discussions about the links between research and policy and practice. Presentations at the second seminar built on discussions from seminar 1 by focusing on school years from age 8. Academic presentations covered: inequalities in educational outcomes, researching the adolescent brain, the role of rhythm in cognitive development, transition to secondary school and bilingualism. The keynote lecture delivered by Professor Charles Nelson reported on a body of work investigating the impact of early neglect on children and institutional care.

A summary of the morning's talks:

- Researchers (see also page 14) are studying factors which might interact to predict educational outcomes, with a focus on those from low socio-economic backgrounds who outperform expectations
- Neuroimaging methods are giving researchers new insights into adolescent brain development, although there are currently limitations
- A review of empirical studies shows no evidence for an adverse effect of multilingualism on the communication skills of children with developmental disorders
- Research finds a negative experience for autistic children when transitioning from primary to secondary school
- Recent research from auditory neuroscience provides a new perspective on how the brain encodes speech and insights into dyslexia
- Large scale, longitudinal research shows the damaging effects of institutionalized care across a range of measures, and across time periods

How does research relate to policy and practice?

- Knowledge gains about the specific drivers for educational success of low SES children can inform pre-school and school teachers about how to focus on the factors that are likely to improve their chances of educational success
- It is important to know that cognition is still developing in the adolescent brain
- Advice to educators and parents not to encourage bilingualism in children with developmental disorders may be challenged and reversed using research findings
- Schools, local authorities and parents can help to improve the transition experience of children with autism
- Music and motor skills interventions in order to build up rhythmic skills may improve reading for dyslexic children
- There are clear beneficial effects of foster care, and the importance of secure, attached relationships and stability of family life in children's early development.

How can we build better links between researchers, policy makers and practitioners?

- Continue relationships with teachers after training in order to foster interest in research, such as through mentoring
- Develop good relationships between schools and universities so that schools see the benefits of engaging in research and researchers understand the potential barriers to adopting new evidence-based interventions and can find ways to alleviate them
- Help develop a research into practice culture in schools that is supportive; schools see the benefits of becoming a 'research school'
- Target schools and teaching staff who may benefit most from engagement with research and try to overcome barriers to participation

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Can we bring together cognitive and environmental factors to explain educational outcomes?



Dr Duncan Astle

Programme Leader, Executive Processes Group, MRC Cognition and Brain Sciences Unit

Following appointments at University of Oxford and Royal Holloway, University of London, Duncan is currently a Programme Leader Track Scientist at the MRC Cognition and Brain Sciences Unit in Cambridge. His research explores the neural and cognitive mechanisms of attention and working memory in the typically and atypically developing brain and how these mechanisms give rise to variability in attentional control and working memory in childhood.

Key Points

- Growing up in a deprived environment can have a profoundly negative effect on a child's development
- The effect of early deprivation is persistent throughout people's lives
- Many disadvantaged children are resilient, however, and exceed the vocational and educational achievements of those who are wealthier
- The research is looking at how cognition, environmental and social influences interact to promote resilience
- Research findings include both a cross-sectional study that explores how cognitive, socio-economic and neural factors interact to predict educational outcomes and a prospective study that involves longitudinal brain imaging to track these interactions
- The research highlights the need for a better set of criteria for defining low SES children (e.g. current measure is often free school meals)

Why is this relevant to policy and practice?

The findings of the work will help to design interventions that match the specific needs of children from low socio-economic status backgrounds (SES) in order to enable them to reach their full potential.

Knowledge gains about the specific drivers for educational success of low SES children can inform pre-school and school teachers about how to focus on the specific factors that are likely to improve their chances of educational success.

- *Key reference: Feinstein, 2003*

Commentary

Why is this interesting and challenging?

- We already know that there is a performance gap between children from advantaged and disadvantaged backgrounds across a range of cognitive measures, and that some children lose over time, the relative attainment levels they have in earlier years to wealthier children, who in contrast, are able to 'catch up'
- Cross-sectional analysis shows however that some children do well despite difficult surroundings and that cognitive predictors of educational success are different for children from high and low socio-economic status
- The research is seeking to uncover why some children perform well and why others struggle from lower status groups and what kind of protective features these 'resilient' children have

How is the adolescent brain developing and what accounts for differences in development?



Dr Kirstie Whitaker

Research Associate, Department of Psychiatry University of Cambridge and 2016/2017 Mozilla Fellow for Science

Dr Whitaker is a researcher in the Brain Mapping Unit at the Department of Psychiatry, University of Cambridge and a passionate advocate for reproducible neuroimaging research.

Her work uses graph theory to study structural brain networks and seeks to explain why so many mental health disorders emerge during adolescence.

Key Points

- Adolescence is a period of human brain growth and the prolonged changes are in regions of the brain that are particularly important for complex cognition
- Current neuroimaging methods (MRI) are allowing researchers to image non-invasively participants as they grow up
- From fMRI scanning, researchers can observe differences in the thickness of the cortex; adolescents from lower SES groups have thinner cortex than their higher SES peers but we don't know at what stage of development this takes place
- Overall there are large disparities in adolescence because different parts of the brain develop at different times
- Open data sets are being used to understand MRI data and combine with data on cellular brain development

Why is this relevant to policy and practice?

It is important to know that cognition is still developing in the adolescent brain, because interventions have traditionally been focused on emotional maturity but assumed cognitive development is fairly steady. In criminal justice, neuroscience research is illuminating the policy issue around criminal responsibility and the impact of imprisonment on adolescent development and rehabilitation.

We need to explore more thoroughly how sensitive overall age is to cognitive development as MRI scans often cover broad age ranges in adolescence.

- *Key reference: Whitaker et al 2016*

Commentary

Why is this interesting and challenging?

- It is only relatively recently that researchers have discovered that the brain continues to develop during adolescence – the so-called ‘flexible adolescent brain’ – and this gives researchers the opportunity to understand much more about brain development at this important time in children's lives
- Studies show that socioeconomic status impacts on brain structure in adolescence, although this is not fully explained
- MRI data is providing researchers with improving observational data about brain development at various stages of childhood and adolescence but it needs to be combined with other types of data and explanatory frameworks to provide a full account of what is going on in the brain

Can people with developmental disorders function successfully as bilinguals?



Dr Napoleon Katsos

Reader in Experimental Pragmatics,
Department of Theoretical and Applied
Linguistics, University of Cambridge

Originally trained as a linguist, and working in Athens, Oxford and now Cambridge, Dr Katsos is interested in how we learn, process and use the meaning of words and sentences, drawing on linguistic theory and experimental psychology, including sentence processing and language acquisition.

He is committed to raising awareness about the challenges and benefits of raising children bilingually and to bridging information gaps between researchers, parents, teachers and policy makers in this area.

Key Points

- Dr Katsos' research addresses the commonly-held belief among parents and professionals that being bilingual may impair the language development of children with developmental disorders and disabilities
- The research reviewed existing empirical studies, and whilst there are gaps in the evidence to date, it found no evidence for an adverse effect of multilingualism on communication skills in such children
- This finding is supported by a study comparing monolingual and bilingual Chinese children with autism which also found no difference in communication skills
- Building up empirical research in this area is a key next step, and will be addressed as part of a new multilingualism research programme at Cambridge

Why is this relevant to policy and practice?

There are important policy implications for Speech and Language Therapists and education providers, in the light of these developing findings.

The social implications may include a positive impact on children with development disorders and their families, where children are currently excluded from some home and community relationships through not being able to access language and cultural learning with their peers.

- *Key references: American Psychiatric Association, 2013; Reetzke et al, 2015; Uljarevic et al, 2016*

Commentary

Why is this interesting and challenging?

- Over recent decades the social, cultural and cognitive benefits of multilingualism have been emphasized to the general population and an estimated two-thirds of the world's children grow up speaking more than one language
- Developmental disorders are also widespread, e.g., 1 in 100 people in UK are estimated to be on the Autistic Spectrum
- In contrast, the advice for children with developmental disorders is often to speak only one language
- The findings have social consequences for these children who may currently be excluded from home and community relationships because of languages they are prevented from learning

How can we improve the primary-to-secondary school transition for children on the autism spectrum?



Professor Liz Pellicano

Director, Centre for Research in Autism and Education, UCL Institute for Education, University College London

Professor Pellicano is an experimental psychologist committed to understanding the distinctive opportunities and challenges faced by autistic children, young people and adults. After training as an educational psychologist in Perth, Australia, Professor Pellicano has previously researched and taught at University of Oxford and University of Bristol. She is committed to ensuring the outcomes of her research are influential in education policy and understanding of autism.

Key Points

- The transition to secondary school is significant, and whilst many children adjust well to the challenge, some struggle to cope
- Children with autism may find the change particularly challenging and have an increased risk of a negative experience
- Professor Pellicano's research focused on a number of children with autism and their experiences of transitioning to secondary school
- The children did report negative experiences, and some factors were specific to them such as sensory issues, organisational problems, friendships and 'being different'
- The research identified the need for professional support for families of children with autism as well as system-level changes that could be made

Why is this relevant to policy and practice?

The research highlights school- and system-level factors that can influence a successful transition to secondary school for autistic children and suggests aspects of policy and practice that can improve the experience. These include support and advocacy on the part of families; communication; improving administrative processes and educational materials and guidance for secondary school SEN teams to support autistic children about the additional challenges they may be facing.

- *Key reference: McNerney et al, 2015.*

Commentary

Why is this interesting and challenging?

- Autistic children are known anecdotally to be vulnerable during the transition to secondary school, but little is known about the child-, school-, and system-level factors that can potentially make changing schools particularly difficult for these children
- The research points to school level and system level factors that were relevant to a successful transition to secondary school
- Research highlighted the importance of providing free, professional support to families of children with autism to help them through the transition
- The research also indicates specific changes that local authorities could make such as making timely decisions, ensuring processes are accessible to families, and providing regular communication to children and families

What role does rhythm play in dyslexia and brain development?



Professor Usha Goswami

Professor of Cognitive Developmental Neuroscience, University of Cambridge and Director of the Centre for Neuroscience in Education

After training as a primary school teacher, Professor Goswami decided to pursue research in child psychology, including at the University of Oxford before coming to Cambridge. Her research goal is to understand the brain basis of dyslexia and speech and language difficulties, and the utility of music and rhythm-based interventions. Professor Goswami has won a number of career awards for her work in this area.

Key Points

- Recent insights from auditory neuroscience provide a new perspective on how the brain encodes speech
- Research across a number of factors shows that awareness of phonology - “the sound system of a particular language” - is the best predictor of reading ability in children and across languages
- This research involves breaking down the levels of analysis to identify the role of rhythm impairment in dyslexia
- The rhythmic beat of speech is processed differently in dyslexia and this can be explored through experimental research which applies acoustic signals and maps brain response in both dyslexic and control groups
- Children listen to acoustic signals, and repeated beats in studies to uncover how they process the rhythmic beat of speech
- Results show that sensitivity to rhythmic structure is key to developing good phonological skills and children with dyslexia are relatively insensitive to rhythm

Why is this relevant to policy and practice?

The research points to interventions based on better rhythmic understanding through activities such as nursery rhymes, poetry, music, singing, dancing, marching and playing musical instruments in order to improve reading skills.

These activities could help children with dyslexia but also have wider application in improving reading and spelling abilities.

Interventions were found to be optimized if they combined a motor activity with music, and were started before the age of learning to read.

- *Key references: Goswami, 2015; Goswami, 2013*

Commentary

Why is this interesting and challenging?

- The data presented is the culmination of a large body of work by Professor Goswami, which has focused on building a causal explanation of dyslexia
- Professor Goswami’s work reasserts the importance of acoustics in understanding brain processing in speech and reading development and therefore what part is played by acoustics in disorders such as dyslexia
- The research points to music and motor skills interventions in order to build up rhythmic skills, that will improve reading
- Understanding rhythmic patterns could matter for all poor readers, and the framework developed points to interventions that could be applied more generally before reading starts to improve reading skills

How does early psychosocial deprivation affect brain and behavioural development?



Professor Charles Nelson

Professor of Paediatrics and Neuroscience, Harvard Medical School and Professor of Education, Harvard University

Professor Nelson heads the Nelson Laboratory at Boston Children's Hospital, which carries out research on many aspects of infant and child development. His research interests are concerned with the effects of early experience on brain and behavioural development, particularly the effects of early biological insults and early psychosocial adversity; that is, infants who experience profound early neglect.

Key Points

- A longitudinal study was launched in 2000 to examine the effects of institutionalized care in Romania on children's brain development (Bucharest Early Intervention Project)
- Children who were in institutionalized care at the start of the study were randomly assigned to two groups; half were placed in foster care and half remained in the institution
- A further group of children who were never institutionalized served as an additional control group
- The study conducted extensive assessment of the children at the start of the project and throughout its 16 year history
- Findings show large intervention effects across several measures; overall, the results show the damaging effects of institutionalized care across a range of measures, and across time periods
- Findings recommend that children should spend as little time as possible in institutionalized care and be placed in foster families ideally before age two

Why is this relevant to policy and practice?

The findings have direct relevance to the development of foster care systems, with the specific recommendation that children should be placed in foster care ideally before age two; as well as the benefits of maintained placement with one foster family. The findings are relevant to the 100 million children around the world who are abandoned or orphaned, and the 8 million who are being raised in institutional settings.

The findings also have important implications for government-funded early years programmes (Head Start, Sure Start), which should target the provision of caring and supportive learning environments for young children who may have developmental problems associated with parental neglect and also has implications for programmes to provide relevant information to parents.

- *Key reference: Almas et al, 2016.*

Commentary

Why is this interesting and challenging?

- The results provide long-term, in-depth analysis of the negative effects of institutionalized care on brain development; children from institutionalized care showed a higher prevalence of psychiatric disorders than children in both control groups and exhibited broader socio-emotional and behavioural problems
- The results show the variety of factors associated with institutionalized care that have negative effects; namely, high adult-to-child ratios, lack of individualized care, inconsistent staffing, sensory, emotional, cognitive and linguistic deprivation and lack of trustful relationships with caregivers.
- The results show the positive effects of foster care, and the importance of secure, attached relationships, responsive care, stability of family life in children's early development
- The study has direct implications for the development of foster care systems and for educating personnel and families within these systems

Afternoon Workshop:

How can we build links between teachers, researchers and policy makers?

Part I: what are the issues?

During the afternoon session, around 50 participants from research, policy and practitioner backgrounds focused on the broader question of how policy makers and practitioners could respond to the wide range of findings from education and neuroscience presented during the morning session'. In smaller groups, participants responded by thinking through practical ways in which research findings could be translated into classroom practice: what are the barriers to this and how might they be overcome, and what might be the mutual benefits for closer working between researchers, teachers and policy makers?

Structural Issues

- **Social media:** researchers need to develop social media strategies so that their research findings can reach wider audiences and can be used to develop sound interventions. Social media is being used by others to influence policy without being evidence-based.
- **Teacher training:** there is too much information to be confined to the one year PGCE training programme. There needs to be a mechanism whereby research and practitioner engagement is supported throughout a teacher's career.
- **Funding:** there is a lack of funding to support teachers' professional development and of ways to buy out teachers for research time
- **Teacher shortages:** this makes school support for training and development difficult
- **Building research participation** into routine practice of school such as Educational Endowment Foundation supported 'research schools' (See below)

How do we improve teachers' knowledge about research and their own professional development?

- Enhancing school alliances (research institutions and schools)
- Substantial increase in the time devoted to initial teacher education
- Requirement for a planned programme of Continuing Professional Development (CPD) for teachers
- Reflective and self-reflective practices embedded in teaching
- Teachers as researchers (action research, intervention studies)
- Mentoring schemes (beyond initial teacher training) with links to researchers

Afternoon Workshop:

How can we build links between teachers, researchers and policy makers?

Part II: taking action

Actions

- Set up a mentoring scheme beyond initial teacher training
- Appoint a 'school researcher' to coordinate links with researchers and appoint the equivalent in university research departments
- Build school alliances between research institutions and schools e.g. 'partner schools'
- Encourage teachers as researchers (e.g. action research)
- Create 'teacher learning teams' made up of researchers, practitioners and policy makers to consider ways to bring research into practice and practice in to learning
- Produce research summaries and other tools to make research findings accessible to practitioners and policy makers (e.g. digitalpromise.org)

What are the Challenges? (and how to overcome them)

- Time pressures (need to create space for teachers to learn and engage with research)
- Lack of continuing professional development for teachers that actions above could feed into
- Research engagement is not recognized as part of formal responsibilities or rewards for teachers currently
- Competing demands on teachers – data explosion in schools
- Focus on practical rather than classroom training in current PGCE programme (lack of time to engage trainee teachers with research)
- Teacher shortages in key areas
- Research either inaccessible or too remote to be applied directly in the classroom
- Lack of trust between teachers and policy makers

What are the Benefits?

- Professional development opportunities
- Potential to influence and co-create research design
- Bring classroom strategies closer to research questions and evidence
- Creating a beneficial culture of engagement between research, teaching, policy and practice
- Improving ways to share educational learning and practice
- Providing feedback and learning to researchers (on what is scalable, what is practical, what are the challenges to implementing research insights)
- Improved teacher learning and well-being

Potential for Improved Outcomes

- Improved educational outcomes
- Increased take-up of research-informed practice
- Improved classroom practice
- Push back on 'neuromyths' and other practices that can be challenged with sound research
- Research participation becomes part of routine school practice
- Improved research; informed by practitioners and policy makers
- Teacher as researcher – a respected (and rewarded) high status professional
- Improved understanding and trust between researchers, policy makers and practitioners in education field
- Research coordinated to minimize burden on schools and teachers

Afternoon Workshop:

How can we build links between teachers, researchers and policy makers?

Part III: next steps

What types of interaction between researchers, teachers and policy makers?

- **Information sharing**

Draw out practical and scalable interventions from research to help policy makers and practitioners

Produce research summaries that different groups can understand

Establish roles for research communication and engagement

- **Setting research questions**

Think about short-term policy questions and those with potentially a longer-term impact

Co-create with policy makers, researchers and teachers

- **Carrying out research**

Led by researchers and teachers (action research, intervention studies)

Coordinate research to minimize burden on schools and teachers

- **Sharing insights**

Applying and disseminating research findings

Bring classroom strategies closer to research questions and evidence

Make connections with individual teachers, practitioners and policy makers

- **Feedback and learning**

Be realistic about gaps between research, policy and practice

Reflective and self-reflective practices embedded in teaching

Good practice models and information sources

- **Educational Endowment Foundation** <https://educationendowmentfoundation.org.uk>

Funds, summarizes and disseminates education research evidence

Funds evaluations to establish effective approaches and interventions for improving pupil attainment

Supports teachers and school leaders to use evidence to inform decision making

Produces a teaching and learning 'toolkit' and other resources for schools

Funds schools that support the use of evidence: 'Research Schools' (see below)

- **Research Schools** <https://researchschool.org.uk>

Funded network of schools that support evidence-based practice in schools

- **Institute for Effective Education (IEE) at University of York** www.york.ac.uk/iee/

Education research unit that conducts research activity and impact work, including engagement activity in schools.

Partner in Research Schools project

- **Digital Promise (US)** digitalpromise.org

Produce research summaries that different groups can understand

Produce an on-line research map, with research made accessible to practitioners and policy makers

- **Frontiers for Young Minds** home.frontiersin.org

Open access science journal written and edited by children

List of Speakers

Chair

Dr Michelle Ellefson, Faculty of Education, University of Cambridge
Introduction and welcome

Speakers

Dr Duncan Astle, MRC Cognition and Brain Sciences Unit, University of Cambridge
The effect of poverty on cognition, the brain and education

Dr Kirstie Whitaker, Department of Psychiatry, University of Cambridge
The (still) developing adolescent brain

Dr Napoleon Katsos, Department of Linguistics, University of Cambridge
Can people with developmental disorders function successfully as bilinguals?

Professor Liz Pellicano, Centre for Research in Autism & Education, University College London
The primary-to-secondary school transition for children on the autism spectrum

Professor Usha Goswami, Centre for Neuroscience in Education, University of Cambridge
Dyslexia and the brain: the role of rhythm

Professor Charles Nelson, Harvard University
The effects of early psychosocial deprivation on brain and behavioural development: findings from the Bucharest Early Intervention Project

Stakeholder Responses (Afternoon Workshop):

Mr Graham Mallard, Cheltenham College

Ms Jane Warwick, PGCE Primary Programme Manager, Faculty of Education, University of Cambridge





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About the Educated Brain Seminar Series

The Educated Brain consists of a series of three research seminars alongside policy-focused events, to bring together academic thinking around educational neuroscience with implications for policy makers and practitioners.

Research seminars, to be held in April, October 2016 and May 2017, will focus on: Infancy and Early Childhood, Late Childhood and Adolescence, and Lifelong Learning.

The series is funded by the ESRC, and organized by three Strategic Research Initiatives at University of Cambridge: in Language Sciences, Neuroscience and Public Policy respectively.

Principal Investigators are:

Dr Sara Baker and Dr Michelle Ellefson, Faculty of Education and Professor Zoe Kourtzi, Department of Psychology.

Research Coordinators:

Dr Dervila Glynn, Cambridge Neuroscience, Ms Jane Walsh, Cambridge Language Sciences and Dr Charlotte Sausman, Cambridge Public Policy SRI.

For further information on Strategic Research Initiatives please visit:

www.cam.ac.uk/research/research-at-cambridge/strategic-research-initiatives-networks



The Cambridge Public Policy Strategic Research Initiative (SRI) aims to support public policy research across Cambridge University, working with colleagues in science, social science, the arts and humanities, to apply new thinking to public policy problems and promote research and analysis into the public policy process.

For more information, find us at:

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