Government Office for Science

Foresight

Learning difficulties:

Future challenges

MENTAL CAPITAL AND WELLBEING PROJECT

Mental Capital and Wellbeing: Making the most of ourselves in the 21st century

Learning difficulties: Future challenges

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This report is intended for:

Policy makers and a wide range of professionals and researchers whose interests relate to childhood development and learning difficulties. The report focuses on the UK but is also relevant to the interests of other countries.

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The Foresight Programme is run by the UK Government Office for Science under the direction of the Chief Scientific Adviser to HM Government. Foresight strengthens strategic policy-making in government by embedding a futures approach.

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Executive summary

The aim of the Foresight Project on Mental Capital[1] and Wellbeing[2] (www.foresight.gov.uk) is to advise the Government on how to achieve the best possible mental development and mental wellbeing for everyone in the UK in the future.

The starting point of the Project was to generate an understanding of the science of mental capital and wellbeing and to develop a vision for how the size and nature of the challenges exposed by the Project could evolve over the next 20 years – using the baseline assumption that existing policies and expenditure remain unchanged. To make the analysis tractable, the work was divided into five broad areas:

- Mental capital through life
- Learning through life
- Mental health
- Wellbeing and work, and
- Learning difficulties.

A comprehensive assessment of the scientific state-of-the art for these areas was undertaken by commissioning around 80 reviews. This report draws together the findings for "Learning difficulties" and identifies key challenges for the future. The final Project report, due for publication in October 2008, assesses policy choices and possible interventions across all five areas.

The evidence has shown that recent advances in genetics and neuroscience have led to important new insights into the heritable neural bases of many common learning difficulties. In particular, brains with learning difficulties are brains that are less efficient in particular and measurable aspects of processing; other aspects of processing are frequently preserved. Learning difficulties are biological in origin, but environments and genes interact, so that environments determine the impact of carrying certain genes, with co-action of genes and environments affecting the developmental trajectory[3].

An assessment of the situation today (Chapter 1) highlights the increased risk that children with learning difficulties suffer from mental ill-health, social exclusion, unemployment and criminal behaviour. Overall learning difficulties are estimated to affect up to 10% of children. Also, children affected with LDs (e.g. dyslexia, Attention Deficit Hyperactivity Disorder (ADHD), and Specific Language Impairment[4]) can show more than one disorder. For example, between 10–50% of children with SLI may also

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1 Mental capital refers to the totality of an individual's cognitive and emotional resources, including their cognitive capability, flexibility and efficiency of learning, emotional intelligence (e.g. empathy and social cognition), and resilience in the face of stress. The extent of an individual's resources reflects his/her basic endowment (genes and early biological programming), and their experiences and education, which take place throughout the lifecourse.

2 "Wellbeing" throughout this report refers to "mental wellbeing". Mental wellbeing is a dynamic state in which the individual is able to develop their potential, work productively and creatively, build strong and positive relationships with others, and contribute to their community. It is enhanced when an individual is able to fulfil their personal and social goals and achieve a sense of purpose in society.

3 Karmiloff-Smith (SR-D13). This is one of a number of science reviews commissioned by the Project. See Appendix B for a full list.

4 Snowling (SR-D2); Butterworth (SR-D4); Simonoff (SR-D11); Bishop (SR-D1)– see Appendix B

have developmental dyslexia. These children are essentially at the low end of the continuum of ability for reading, mathematics, distractibility or language. All of these learning difficulties have a brain basis and tend to run in families. Less common inherited learning difficulties (e.g. autism spectrum disorders[5]) also appear to represent the lowest point on an ability continuum. Thus those with appreciable but non-clinical difficulties with social cognition (e.g. a less severely-impaired ability to read the feelings and intentions of others) may still experience severe effects on their mental capital. For example, some children excluded from school for apparently wilful disruptive behaviour exhibit similar behaviours to children identified with disorders of social cognition[6].

The review of scientific developments has enabled the creation of a conceptual model describing the typical and atypical development of learning (Chapter 1). This model has been used as a conceptual framework for Chapter 2, which considers the multiple factors that influence the outcomes of learning difficulties in individuals. In turn, this analysis has provided signposts to possible strategies for interventions – both today and in the future (see below, and Chapter 3).

Scientific advances in genetics and neuroimaging offer a potential opportunity, within the next 20 years, to identify those children with learning difficulties in infancy. Genetic tests may be able to offer individualised diagnoses of a child's risk at a probabilistic level[7]. Cognitive neuroscience is already uncovering neural markers, or biomarkers, for detecting the different learning difficulties, measurable in infancy[8]. These advances will eventually enable environmental intervention from infancy. Such environmental interventions should be broadly conceived, and could include technological interventions (e.g. a cochlear implant for a deaf infant), improving caretaking behaviours, sensory interventions (e.g. to reinforce the acoustic information in language), new educational interventions (e.g. learning environments that enhance self-regulation skills, technology-enhanced learning of basic reading and numerical skills) and pharmacological cognitive enhancers[9].

Early detection and intervention would alter developmental learning *trajectories* for these children with consequent benefits throughout the lifecourse. This is clear from two fundamental principles of learning: early capability makes later learning more efficient; and enhancing early capability at the outset of learning also increases the complexity of what can be learned[10]. Enhancing mental capital at the beginning of learning will increase cognitive flexibility and cognitive reserve[11], as well as neural resilience[12], thereby improving future learning and future mental capital and wellbeing.

Current scientific knowledge provides clear guidance with respect to the cognitive and behavioural identification of future learning difficulties in the early primary years, and also guidance for optimal education and support (see Future Scenarios – Chapter 3). Importantly, the kinds of interventions that help children with learning difficulties can be similar for a number of learning difficulties.

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5 Baron-Cohen (SR-D10) – see Appendix B
6 Skuse (SR-D9) – see Appendix B
7 Plomin (SR-D7) – see Appendix B
8 Friedrich (SR-D14) – see Appendix B
9 See Project report, Kirkwood et al. *Mental capital through life: Future challenges* (Appendix A refers)
10 Heckman (2006)
11 Barnett and Sahakian (SR-E4) – see Appendix B
12 Elliott et al. (SR-E7) – see Appendix B

Developmental difficulties that affect learning, and that can be equally negative with respect to future mental capital and wellbeing, can be dramatically increased by adverse early social experiences, typically within dysfunctional and socially-disadvantaged environments (e.g. anti-social behaviour and conduct disorders[13]). Interventions that improve anti-social behaviour disorders will benefit a number of other learning difficulties (e.g. interventions aimed at improving "executive function", namely strategic control over one's cognitive and emotional processes[14]). Finally, there are later-onset disorders such as depression[15] and eating disorders[16] which emerge in adolescence and may also impair learning. These disorders also impact negatively on mental capital and wellbeing, and typify the overlap between learning difficulties and mental health (also considered by the Project – see Appendix A).

The evidence considered in this analysis shows that the interaction between learning difficulties, mental capital and mental wellbeing is profound and important. It also highlights those scientific developments which enable the development of new approaches to identification and treatment over the next 20 years. The final Project report[17] considers the interventions for learning difficulties which are likely to have the greatest potential for improving mental capital and wellbeing.

13 Hughes (SR-D8); Wolf and Buss (SR-E20) – see Appendix B

14 Greenberg (SR-A9); Bishop (SR-D1); Snowling (SR-D2); Hughes (SR-D8); Skuse (SR-D9); Baron-Cohen (SR-D10); Simonoff (SR-D11); Goodyer (SR-D15); Treasure (SR-D16) Barnett and Sahakian (SR-E4); Bradshaw (SR-E6); Paulus and Tapert (SR-E8); Sebastian et al. (SR-E15) – see Appendix B

15 Goodyer (SR-D15) – see Appendix B

16 Treasure (SR-D16) – see Appendix B

17 To be published in October 2008